ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

The following section describes the impacts of each alternative on natural resources, heritage resources, and socioeconomic resources. Impacts are discussed in terms of their direct, indirect, and cumulative effects. Direct effects are effects caused by the action and occurring at the same time and place. Indirect effects are effects caused by the action but occurring later in time or further removed in distance. Cumulative effects result from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions that are not included in the Proposed Action. The activities included in each cumulative effects analysis may vary. The ongoing and future activities that are planned or known in the Project Area are listed in the following section. The relevant regulatory and Forest Plan direction was also discussed for each impact topic to clarify importance of the topic and/or to support the impact analysis.

ONGOING OR FORESEEABLE FUTURE ACTIONS

The following projects are ongoing or foreseeable future actions within or near the Project Area. The need to include these actions in the individual resource analysis is dependent on the cumulative effects area and duration of effects for each resource. Future projects described in this section are not part of the decision to be made from this EA, and most will require separate environmental analysis documents and public involvement.

Fires and Fire Restoration Activities

Past logging, fire suppression, and grazing have altered the character of nearly the entire forest and dramatically increased the risk of wildfires. Besides the Hayman Fire, other large wildfires during the past seven years have also affected forest conditions on the Pike National Forest. At least seven fires burned about 31,000 acres near the project area including Big Turkey, Black Mountain, Buffalo Creek, High Meadows, Platte Springs, Schoonover, and Snaking fires. These have contributed soil disturbance and sediment movement into the streams in the area either directly or from fire suppression activities. Timber salvage, hazard tree removal, fuelwood removal, seeding, and planting are past and ongoing activities in these other burned areas.

Within the Hayman fire perimeter, BAER treatments have been applied on much of the area, and more treatments are likely to occur. Reforestation of the burned landscape is also likely to occur, particularly in salvage units where site-preparation costs would be much less. Hazard trees were removed along some roads in the area. There have also been timber salvage and restoration efforts on non-National Forest System (NFS) lands in the vicinity, including on Denver Water property around Cheesman Reservoir.

Watershed Restoration Activities

The Upper South Platte Protection and Restoration and National Fire Plan projects were initiated in response to wildfire and existing large-scale fire risks that threatens property and human life, and exacerbate soil and water quality problems. Under the Upper South Platte Project, vegetation treatments designed to reduce fire risks, erosion, and sedimentation have been approved for over 17,000 acres. Over 1,000 acres have been treated to date. The Upper South Platte project partners, including Denver Water and Colorado State Forest Service, are currently doing similar work on private property in and near the project area. Other ongoing or future Upper South Platte Projects include road reclamation, trail improvements, and Buffalo Creek burn area revegetation.

National Fire Plan projects include hazard fuel management activities on AG Ranch, Fish Creek, Rocky Messenger, and Sledgehammer project areas. The Draft Environmental Impact Statement for the Trout-West Fuels Reduction Project was recently released for public review. Prescribed fires were recently completed in China Wall and Polhemous areas and are planned for the Miller Gulch area. Sheepnose and Trout Creek timber projects have also been recently completed.

IMPACTS ON SOIL AND WATER

The effects of post-fire salvage logging on soil and water resources have not been extensively studied. No research has occurred in Colorado, although several experiments are underway. The available data is summarized by McIver and Starr (2000).

Harvest research shows that new roads are the primary source of sediment; otherwise, impacts depend on site specifics and type of logging equipment used. Watershed area and slope are important predictors of runoff and sediment yield in post-fire logging operations. Soil type is important, especially when logging operations are occurring on coarse soils where hydrophobic tendencies are high. Lastly, burn severity is a major factor, with high-severity burned areas having the greatest susceptibility to further detrimental impact from salvage activity.

Research suggests that both positive and negative effects to soil and water resources can be found. Possible positive effects may include: 1) reducing fuel load on the forest floor, possibly decreasing catastrophic wildfire risks and subsequent erosion and flooding, 2) returning the burned area to historic snag densities, 3) protecting the forest floor with slash, benefiting bare soil for up to 20 years (Kuyumjian, pers. comm., 2003), and 4) breaking-up hydrophobic soil layers.

Negative effects may include: 1) accelerated erosion, especially in areas with steep slopes, highly erodible soils, and severely burned watersheds (McIver and Starr, 2000); 2) short-term increase in fuel loads as slash may take 20 years or more to decompose; 3) logging activity during drought may delay recovery; and 4) loss of needlecast recruitment, a valuable post-fire "mulch."

Regulatory and Forest Plan Direction

The desired future condition of the project area includes revegetated hillslopes and riparian areas, as well as watersheds that include salvage units to return to pre-fire sedimentation levels. A return to water quality that meets State Standards is also part of this desired future condition. This may take 9-15 years in the most severely burned areas (DeBano et al. 1996). While sedimentation levels will likely be reduced within 5-15 years, the return to baseline erosion rates is expected to take longer, regardless of salvage activity.

Best management practices (BMPs) are the primary mechanism to enable achievement of water quality goals. BMPs include, but are not limited to, structural and non-structural controls and operations and maintenance procedures to reduce or eliminate introduction of pollutants into receiving waters. Project specific BMPs are in the project file and incorporated by reference. These BMPs were based on Watershed Conservation Practices Handbook (WCP), Soil Management Handbook (Region 2 Supplement FSH 2509.18), State of Colorado Forest Stewardship Guidelines – Best Management Practices, and Clean Water Act regulations pertaining to silvicultural activities affecting the water (33 CFR 323.4). Pertinent Forest Plan Direction (Chapter 3, pages 72-74) follows:

- Maintain soil productivity, minimize human-caused soil erosion, and maintain the integrity of associated ecosystems.
- Limit intensive ground-disturbing activities on highly erodible sites.
- Identify upland areas that are immediately adjacent to Riparian (9A) MAs. Adjacent upland areas are those portions of a management area which, when subjected to management activities, have a potential for directly affecting the condition of the adjacent Riparian MAs.

Alternative 1 – No Action

Direct Effects. There will be no new impacts to soils or watersheds with the No Action Alternative. The ecosystem will be left to naturally recover, aided by the 2002 BAER treatments and pending 2003 BAER treatments. These emergency rehabilitation measures were put in place to mitigate sedimentation that threatened life, property, and water supplies. Given the private land within and adjacent to the burn, many critical areas were treated to hold soils in place. About 31,300 acres were treated in 2002. The integrity of these treatments will remain and continue to protect values at risk in the Hayman burn area.

There will be no change in snag densitities and no additional slash for ground protection. However, the ground protection gained via BAER treatments will remain intact, and blowdown of some snags has likely begun, aiding in the protection of bare ground.

Indirect Effects. The exclusion of salvage activities will eliminate human-caused increases in sedimentation as they relate to this proposal. Natural succession will allow a gradual decrease in erosion and subsequent sediment delivery as soils return to baseline conditions and riparian vegetation recovers, resuming its role as a sediment filter. As previously mentioned, BAER treatments would be left undisturbed, allowing the treatments to function as originally intended.

In the No Action Alternative, nutrient cycling would increase via the proliferation of BAER seed germination and growth, and the natural revegetation process. The acreage with mulch will have the additional benefit of moisture and cover to help plant regrowth. Once annual grasses die off, decomposition begins. This will jump-start nutrient recycling. Snags may begin to recycle nutrients in 10 years, but larger snags may persist on the landscape for 50-100 years. A decrease in sediment delivered to streams would mean attaining State of Colorado water quality standards.

Analysis of Action Alternatives

Acreages of Burn Severity and Erosion Hazard within Salvage. Erosion hazard is a standard interpretation based on the inherent properties of soils and data collected when making the soil survey. The interpretation does not account for detrimental changes in the surface soil after catastrophic fire. Erosion hazard is moderate for half of Alternative 2 acreage, and the remainder mostly has high erosion potential (Table 12). Alternative 3 represents a similar split for erosion hazard, only for 3 times more acreage.

TABLE 12: EROSION HAZARD BY ALTERNATIVE

Erosion Hazard Potential	Alternative	Acres	% of Salvage
Low	2	186	7
Low	3	362	2
Mod	2	1,502	59
Mod	3	11,580	66
Severe	2	855	34
Severe	3	5,607	32
TOTAL	**2**	**2,543**	
TOTAL	**3**	**17,549**	

High burn severity accounts for 60% of the proposed salvage acres in Alternative 3 (Table 13). It also represents just under 50% of Alternative 2 acreage, but, most importantly, it avoids the very worst burned areas that are on treatable slopes. High burn severity is an indicator of the amount of heat transferred to the soil during high intensity fire activity (also see "Affected Environment, Soil and Water, BAER Treatments" section). The high severity rating means that the heat transfer has negatively altered physical and chemical soil properties, such as volatilization of organic compounds and increasing hydrophobicity.

TABLE 13: BURN SEVERITY BY ALTERNATIVE

Burn Severity	Alternative	Acres	% of Salvage
Unburned	2	9.5	0.4
Unburned	3	59.5	0.3
LOW	2	272.4	11
LOW	3	946.2	5.4
MOD	2	1,042.3	41
MOD	3	6,034.8	34
HIGH	2	12,19.4	48
HIGH	3	10,509.7	60
TOTAL	**2**	**2,543**	
TOTAL	**3**	**17,549**	

WEPP. The Water Erosion Prediction Project (WEPP) (Elliot et al. 2000) computer model was used to predict the amount of soil erosion that would be produced by each alternative. The WEPP model, like any model, has assumptions and the output is only an estimate. The model estimates are useful to provide context on the potential magnitude of the effects. The model may underestimate erosion rates if it does not account for certain variables that can affect erosion in

the project area. This model is currently the accepted method of post-fire erosion prediction in the USFS scientific community and is being applied region-wide for salvage analysis.

As shown in Table 14, the overall average predicted erosion rate is reduced following salvage. This is because the slash remaining after salvage treatments is expected to provide ground cover and reduce the erosion rate. Table 15 shows the predicted erosion rates in the various BAER treatment types, and Table 16 shows the predicted erosion totals from the various BAER treatment types following salvage. It should be noted that in some salvage units, there was more than one BAER treatment applied, and a weighted average of the percent cover for the unit as a whole was used in the WEPP model. As shown, salvage activities within air mulch as well as scarified and seeded areas will cause an increase in the erosion rate in those units. Erosion is expected to be less in air-seeded plots. It should also be noted that the air-seeded areas are high priority areas for further BAER treatments, possibly including air mulch, in 2003. This could negate the modeled benefit of slash from salvage activities. In addition, WEPP does not account for monsoonal type precipitation events like those expected in the project area. Erosion rates during those events may be higher than shown.

TABLE 14: PREDICTED EROSION RATES (WEPP EROSION PREDICTION MODELING)

(rates are tons/acre/year, totals are tons/year)	**pre-fire**	**post-fire**	**post-BAER**		**post-salvage**			
Alternative			**2**	**3**	**2**	**3**		
Ave. Erosion Rate	0	10	10	9	9	9		
100-yr Erosion Rate	1	55	55	51	50	48		
	pre-fire		**post-fire**		**post-BAER**		**post-salvage**	
Alternative	**2**	**3**	**2**	**3**	**2**	**3**	**2**	**3**
Total Ave. Erosion	51	351	25,099	173,250	25,099	148,664	22,709	148,418
Total 100-yr Erosion	3,560	24,574	140,653	970,867	140,653	837,113	126,260	830,335

TABLE 15: EROSION RATES FROM DIFFERENT BAER TREATMENT AREAS

	Post-BAER (T/ac/yr)		**Post-Salvage (T/ac/yr)**	
	average	**100-year**	**average**	**100-year**
No BAER treatment	10	55	9	50
Air seed only	10	52	9	50
Scarify/seed	8	46	8	47
Air mulch	6	37	7	40

TABLE 16: EROSION FROM DIFFERENT BAER TREATMENT AREAS FOLLOWING SALVAGE

(totals are tons/year, acre totals for each unit are grouped by primary BAER treatment type)

	acres w/in alt.3	**pre-fire**		**post-fire**		**post-baer**		**post salvage**	
		avg	**100 year**	**avg**	**100 year**	**avg**	**100year**	**avg**	**100 year**
No BAER treatment	5,750	56	3,920	27,636	154,868	27,636	154,868	25,004	139,020
Air Seed Only	2,564	69	4,816	33,953	190,266	32,246	180,009	30,719	170,796
Scarify/Seed	7,299	175	12,217	86,133	482,674	71,561	402,988	74,048	414,129
Air Mulch	1,940	52	3,621	25,529	143,059	17,221	99,249	18,648	106,391

Additional WILDCAT runoff modeling was also used to compare the different watersheds with proposed salvage activities (Table 17). The average percent of the watershed in salvage is 18%, but ranges from 0 to 70%. As shown, the average runoff rate will increase following salvage. This runoff will be somewhat reduced through the addition of slash, but; as with the erosion rates, this will only benefit non-BAER areas as well as air-seeded only. This modeling was done using the BAER treatment "design storm", that is, the 25-year, 1 hour event, the largest storm that the BAER treatments are expected to be able to withstand. Larger events could cause much greater runoff.

TABLE 17: WILDCAT RUNOFF MODELING

	Peak CSM (cubic feet/second/sq.mile)			
	pre-fire	**post-fire**	**treatment**	**salvage**
Average	74	278	161	170
Maximum	123	633	358	360
Minimum	27	33	27	32

Alternative 2 – Harvest in Areas Without BAER Treatments

Direct Effects. Alternative 2 could impact soils via displacement from harvest equipment and logs being skidded down skid trails. Compaction is negligible on these soil types. The slash that will be left on-site will mitigate erosion. Post-fire erosion rates calculated using the WEPP model range from 10 to 55 tons/acre/year, and 15% effective ground cover from slash will bring the rates down slightly to 9 to 50 tons/acre/yr (see Table 14 above).

One mile of temporary road would be constructed, which would add approximately 7 tons/year of erosion from the project area. This amounts to about 1 ton/year of additional sediment delivered to the streams. A 100-foot buffer between the road and the streams accounts for the rate reduction from erosion to delivery.

Salvage, proposed for 2,500 of the 137,000-acre burn area, will not have measurable impacts, given that activities are largely limited to slopes of 25% or less. Slash would cover an estimated 15% of the salvage units providing effective ground cover.

Many snags will also remain. Blowdown of some snags has likely begun, aiding in the protection of bare ground. Snags will continue to add some amount of sediment catchment/erosion control over time, as they fall to the ground and become coarse woody debris.

Alternative 2, which excludes BAER treatment disturbance and should not interfere with pending treatments, will benefit the burn area as a whole. Introducing slash on high- and moderate-severity burn areas will protect the untreated surface soils and maintain the more effective ground cover of mulch and other rehabilitation treatments already in place. This alternative also provides for coarse woody debris recruitment and long-term soil productivity. Keeping soil displacement to a minimum plus effective cover would minimize sediment delivery. Additionally, leaving BAER-treated acres undisturbed will allow recovery to continue without setback.

Indirect Effects. According to the WEPP model, sediment delivery to streams will be decreased slightly, following the same trend as erosion. It is difficult to rely solely on the model because it

can not account for all site-specific parameters. The difference between Alternatives 1 and 2 with regard to sediment delivery is negligible.

Slash, in addition to providing ground cover, supplies nutrients once decomposition begins. It is important to note that the process of decomposition in this climate is very slow, so even the smallest pieces of debris will not return nutrients to the soil profile for a minimum of 3 years, with approximately 20 years residence time for average-sized slash. Natural revegetation, aided by undisturbed BAER treatments on approximately 31,000 acres, will begin the nutrient recycling process within the first year after the fire, once annual grasses die off and start to decompose. This means that BAER seeding that germinated last year has already begun this process, and is best left undisturbed so as not to set restoration back by one year. Snags will not provide much to the nutrient cycle until decomposition begins. Smaller snags may begin this process within 10 years, but most will start truly breaking down in 25 years or more.

Alternative 3 – Proposed Action

Direct Effects. Approximately 12,000 acres of Alternative 3 units occur within existing BAER treatment areas. This proposed activity may potentially negate some of the benefit that the treatments provided, especially temporary roads and skid trails. This would be a temporary effect until a replacement treatment of equal or greater effectiveness was applied to the disturbed areas. Alternative 3 will impact soils via displacement from harvest equipment and logs being skidded down skid trails. BMPs would be applied to mitigate this impact.

Additional impacts to soils will occur due to salvage. Displacement of soils by logging equipment will increase erosion potential. A direct beneficial effect of salvage will be the placement of slash on the ground. This will provide ground cover, but this may not provide an overall decrease in erosion.

The WEPP model showed that the scarified and seeded acres and the aerially mulched acres had an increased erosion potential following harvesting (Tables 12 and 13 above). This indicates that those treatments are more effective than slash placement. Therefore, the percent ground cover provided by BAER treatments will be replaced in-kind with slash and mulch. Air-seeded and non-BAER areas had a decreased erosion potential due to slash left after the harvest; however, mulch will be used where slash does not provide the pre-salvage cover in the unit. Additionally, the 9 miles of temporary road that would be constructed under this alternative will add approximately 63 tons/year of erosion from the project area.

Indirect Effects. There would be increases in sediment delivery, mainly from the scarified and seeded and aerially mulched acres. Flood flows could increase from BAER-treated areas that are salvaged. That is, flood flow potential that was decreased with BAER treatments could be reversed by salvage activities. It was estimated that 15% of the salvage units would be in a bare condition during salvage operations. If a storm event occurs while the unit (or units) is being salvaged, the predicted increases could occur in erosion.

The temporary roads will add approximately 9 tons/year of additional sediment delivered to the streams. A 100-foot buffer between roads and streams accounts for the rate reduction from erosion to delivery.

Cumulative Effects

The effects of the Proposed Action will be cumulative on a local scale to ongoing effects from the Hayman Fire itself. Additional salvage, as well as restoration work, has also been occurring on the Denver Water property around Cheesman Reservoir and also on other private lands in the burn area. The effects of those actions should have similar effects to this proposed action, but the effects of proposed actions have potential to be cumulative to those actions. This could result in more runoff and sediment delivery to streams or in particular, Cheesman Reservoir.

In addition to the Hayman Fire, several other fires that occurred in the past seven years in the area including the Schoonover, High Meadow, Buffalo Creek and Big Turkey fires. The erosion and other effects of these fires, as discussed above, are so large in scale and so much greater than natural conditions that it is difficult to single out any other impacts, i.e., from existing roads, fuel hazard management projects, grazing, or recreational activities. Additional erosion and sediment delivery are included in the estimates given in the alternative discussion. Given the area is disturbed, the proposed salvage project would cause further potential degradation of these areas. Recovery time could increase and watershed risk may remain high for a longer period. By treating many more acres, Alternative 3 would have a greater effect than Alternative 2.

Conclusion

Adding slash to ground cover on fire-damaged soils areas that were not BAER treated would have the greatest positive effect on erosion rates. Ground disturbing activities on fire-damaged soils could cause minor increases in erosion and runoff pollution. BMPs would minimize these impacts. Alternative 3 impacts would be the same as alternative 2 for salvage units without BAER treatments. Under Alternative 3, ground disturbing activities in BAER treated areas would reduce BAER effectiveness by about 15% for 1 or 2 years. In addition to BMPs, disturbed BAER treatments would be replaced in-kind to minimize impacts.

IMPACTS ON VEGETATION

Regulatory and Forest Plan Direction

The Forest Plan directions (Chapter 3, pages III-4) on vegetation are:

- Practice vegetation management to provide multiple benefits using a comprehensive timber management program as a tool.

- Provide for increased production and productive use of wood fiber while maintaining or improving other resource values
- Improve age class and species distribution of tree stands forest-wide
- Perpetuate the aspen type
- Improve the health and vigor of all vegetation types

Other regulatory and management direction for vegetation relevant to this project are included in the National Forest Management Act (1976), Endangered Species Act (1973), USDA Departmental Regulation 9500-4, Forest Service Manual 2670, and Executive Order 13112 regarding non-native invasive species.

Alternative 1 – No Action

Direct Effects. Plant communities would follow the path of natural succession typical of that, which follows severe burns. Low severity burn areas would begin to show regeneration within three to five years. The interior portion of the Fire may take 60 years or longer to begin to show regeneration. The stress to plants of the fire and suppression efforts is being overcome naturally. Roots of shrubs and perennial herbs would resprout initiating this change. Aspen and oaks are also likely to resprout from live roots.

Communities on south to west-facing slopes would tend to recover more quickly because the plant species present are better adapted to open, dry environmental conditions. Tree-dominated communities are very slow to recover because, in many cases, no nearby seed source remains. This could take hundreds of years. Herbs within these communities vary in their survival depending on their habit and the severity of burning conditions at that site. The predicted soil loss could also slow recovery of these communities. As snags deteriorate and fall, they may provide places for seeds to become trapped where moisture is maintained, benefiting seedling growth.

Herbaceous and shrub dominated communities will continue to recover from burning. They will generally recover more quickly from the disturbance because the community structure is somewhat less complex than forested areas.

Noxious weeds are opportunistic and increase with site disturbance. They may also spread across bare soil areas exposed by the wildfire. Fire suppression activities have created conditions where their invasion is more likely in localized areas. They are likely to spread along roads and trails in the area.

Areas having BAER treatments would continue to provide protection to germinating seed and natural revegetation, and mulch applied during treatments would continue to retain moisture beneficial to plant growth.

No endangered, threatened, or RFSS plants are likely to be affected because none are known to occur in the area.

Indirect Effects. Nutrient release from ash would benefit both native and non-native plants. Nutrient cycling would increase in areas of BAER treatments because of seed germination and subsequent plant growth. As the planted annual grasses die off, decomposition begins, improving nutrient conditions for returning vegetation. Efforts are made to keep nutrients in the area by stabilizing roads and trails used in these actions.

Erosion of unstabilized roads and trails would continue, threatening the recovery of the plant communities and any endangered, threatened, or RFSS plants that might be present.

Alternative 2 – Harvest in Areas Without BAER Treatments

Direct Effects. Under this alternative, salvage timber harvest would only remove standing fire-killed trees from areas of high- and moderate burn-severity. Thus there would be no effect on large live trees. Logging operations would disturb soils in the areas where skidding and temporary roads and trails are used. It is anticipated that this could account for as much as 15 percent of the landscape in the treatment area, about 375 acres, which could slow recovery on these acres. This would probably dislodge herbaceous plants and break stems of shrubs where the actions occur. The amount of disturbance to the soils and plants would vary considerably. Areas at the distant ends of skid trails would receive the least damage, while log landings would receive the most. Plants in the less disturbed sites would be less likely to be severely damaged because the degree of initial disturbance was lower. These plants would then be able to recover quickly. Where there are more disturbances, plants that would be naturally recovering would receive additional stress, and some may not survive. Salvage logging may also disturb needle-cast "mulch" where activities occur. Rare plant surveys would be conducted to ensure that endangered, threatened, and RFSS plants would not be damaged by salvage activities.

Because of the soil disturbance, invasion of non-native plants is also likely to occur causing unwelcome competition to native plants in the communities. Additional ground disturbance from salvage operations would further spread weeds beyond existing roads and trails.

Indirect Effects. Nutrient cycling would increase in BAER units because of seed germination and subsequent plant growth. Slash provides nutrients for growing plants as it decomposes. Heavy equipment used in logging operations can expose the roots of plants leading to additional stress from desiccation. During logging, areas would be closed to the public, which would allow vegetation to grow with less threat of disturbance.

Alternative 3 – Proposed Action

Direct Effects. Under this alternative, salvage timber harvest would only remove standing fire-killed trees from areas of high- and moderate burn-severity. Thus, there would be no effect on large live trees. This alternative will have similar effects to Alternative 2, but would be of greater magnitude because of the greater size of the area to be treated. It is anticipated that this could

account for as much as 15 percent of the landscape in the salvage area: about 2,625 acres. Approximately two-thirds of the proposed salvage treatment areas are on northeasterly aspects.

Indirect Effects. This alternative would have similar indirect effects on nutrient cycling and vegetation as Alternative 2, but would be of greater magnitude because of the greater size of the area to be treated. It is anticipated that this could account for as much as 15 percent of the treatment area or about 2,625 acres.

Cumulative Effects

The scale of the Hayman fire area makes additional cumulative effects minor by comparison. Alternative 2 affects only 2% (2,500 acres) and alternative 3 affects only 13% (17,500 acres) in the burn area. This is in addition to the other 31,000 acres burned during other wildfires in recent years. Salvage operations on these burned areas plus under the action alternatives would cause a cumulative reduction in the number of standing fire-killed trees on the Forest.

Conclusion

Alternative 2 would disturb up to 375 acres of recovering ground vegetation on severely or moderately burnt areas. This would delay vegetation recovery on these acres for 1 or 2 years. Alternative 3 would be the same as alternative 2, except an additional 2,250 acres of severely burnt areas with BAER treatments and recovering ground vegetation would be disturbed, delaying recovery by 1 or 2 years. The action alternatives are consistent with Forest Plan management direction for vegetation.

IMPACTS ON WILDLIFE

The effects of the alternatives are compared by evaluating the changes in wildlife habitat in both the short and long-term. This is a qualitative analysis based on expected changes in the environment, focusing on the key issues. The effect of the proposed activities on threatened, endangered, proposed and sensitive species, as well as MIS is also discussed.

Regulatory and Forest Plan Direction

The Forest Plan guidance for management of wildlife relevant to the proposed action are:

- Increase diversity for wildlife and habitat improvement
- Increase winter range habitat capability for deer and elk
- Protect riparian areas and wetlands from degradation
- Provide for habitat needs of management indicator species in 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

Applicable laws include the Endangered Species Act as amended (1973) and the National Forest Management Act (1976).

Alternative 1 – No Action

Direct and Indirect Effects. Under No Action, no salvage would occur in the Hayman burn area and thus here would be no direct effects on wildlife or wildlife habitat. Rehabilitation of the burned forest would continue as originally outlined by the BAER team with modifications based on more current assessments.

Wildlife use of the treatment area would be directly related to the recovery of vegetation, as influenced by soil and water issues and BAER treatments (see "Soil and Water" section). In the short-term (1-10 years), snags, woody debris, grasses, forbs, shrub and deciduous seedlings would provide cover, feeding and breeding sites for wildlife. The density of aspen, cottonwood, willow, mountain mahogany and scrub oak would likely significantly increase over the next decade within the forest understory, riparian areas and openings (Gruell *et.al.* 1985; DeByle 1985). Riparian areas have the added benefit of providing travel pathways. Summer forage and winter browsing opportunities would increase. This trend would likely continue as the area is allowed to revegetate (Odell 2003; Vayhinger 2003). Predicted substantial amounts of soil erosion and sediment delivery as a result of the fire have the potential to slow vegetation recovery.

In the long-term (10-80 years), forest development may begin from surviving refuges and encroachment from the fire's edge. Live trees would increase diversity and provide important feeding, cover and breeding habitat for wildlife.

This alternative would result in the greatest amount of woody debris eventually reaching the ground, protecting the soil surface and encouraging vegetation recovery. Dense woody debris has been found to provide escape cover niches, and can enhance thermal/escape cover for wildlife.

Road access into the Forest would not change from its current condition. Wildlife disturbance and potential vegetation damage because of off-road use would not change from its current condition.

In the BE and MIS reports, this alternative was found to have no effect on the pawnee montane skipper, Preble's meadow jumping mouse, Mexican spotted owl and bald eagle, and no destruction or adverse modification of Mexican spotted owl critical habitat or Preble's meadow jumping mouse proposed critical habitat. It would not affect population trends for any of the selected Management Indicator Species.

Alternative 2 – Harvest in Areas Without BAER Treatments

Direct and Indirect Effects. Alternative 2 would remove approximately 2,500 acres of burned snags, or 4% of this habitat component available in the fire area. Four percent less downed woody debris would be available than in the No Action alternative. In localized areas, this may slightly reduce foraging, roosting, and nesting habitat for snag dependent species. Given the availability of similar habitat nearby, snags and woody debris are not likely to be limiting factors for wildlife. Forest Plan Standards and Guidelines for retaining snags and downed woody debris would be met through project design criteria.

The proposed treatments would have the potential to slow the recovery of vegetation on 15% of the treatment area, or approximately 375 acres. Reduced vegetative development slows the recovery of the site as functional wildlife habitat. This may be balanced by increased logging slash, which would reduce the risk of soil erosion and may enhance vegetation recovery.

Wildlife in the treatment area and immediate surroundings may be temporarily displaced, or modify their behavior as a result of increased noise levels and increased human and vehicle activity from logging operations. There is a slight increased risk of wildlife mortality from logging truck traffic. Approximately one mile of temporary road would be constructed. Open non-system roads encourage motorized and non-motorized access by Forest visitors that may lead to additional disturbance to wildlife, and damaged vegetation from unauthorized off-road vehicle use. These are all short-term effects. Project design requires obliteration of all temporary roads.

As a potential connected action, tree, and possibly shrub, plantings are more likely to occur in the future in this alternative than the No Action alternative. Compared to No Action, live trees would increase vegetative diversity and provide long-term feeding, cover and breeding sites for wildlife.

As part of the design criteria, habitat for all Federally-listed species would be avoided. In the BE and MIS reports, Alternative 2 was found to have no effect on the Pawnee montane skipper, Mexican spotted owl and bald eagle, and no destruction or adverse modification of Mexican spotted owl critical habitat. This alternative may affect, but would not likely adversely affect habitat for Preble's meadow jumping mouse and would not destroy or adversely modify proposed critical habitat for this species. The alternative may adversely impact individual tiger salamanders, northern goshawk, flammulated owl, three-toed woodpecker, Lewis' woodpecker, pygmy nuthatch, olive-sided flycatcher, golden-crowned kinglet, Townsend's big-eared bat, and fringed-tailed myotis, but would not likely result in a loss of viability on the Project Area, nor cause a trend to Federal listing or a loss of species viability rangewide. This alternative will have no impact on boreal owl, Merlin golden crowned kinglet, and dwarf shrew. Alternative 2 would not affect population trends for any of the selected Management Indicator Species.

Alternative 3 – Proposed Action

Direct and Indirect Effects. Alternative 3 would remove approximately 17,500 acres of burned snags, or 28% of this habitat component available in the fire area. In localized areas this may

slightly reduce foraging, roosting, and nesting habitat for snag dependant species. Cavity nesting birds may be at somewhat higher risk of direct mortality, though not many cavities will be constructed in the first year following fire. This alternative would provide 28% less downed woody debris than the No Action alternative and less thermal/escape cover for wildlife. Forest Plan Standards and Guidelines for retaining snags and downed woody debris would be met through project design criteria.

The proposed treatments would have the potential to slow the recovery of vegetation on 15% of the salvage area, or approximately 2,625 acres. Approximately 12,000 acres of BAER treatments would be affected and any initial recovery of these acres could be set back. Reduced vegetative development slows the recovery of the site as functional wildlife habitat.

Wildlife in the treatment area and immediate surroundings may be temporarily displaced, or modify their behavior as a result of increased noise levels, and increased human and vehicle activity from logging operations. There is a moderate increased risk of wildlife mortality from logging truck traffic. Approximately nine miles of temporary road would be constructed. Open non-system roads may encourage motorized and non-motorized access by Forest visitors that may lead to additional disturbance to wildlife and damaged vegetation from unauthorized off-road use. Road densities are currently exceeding Forest Plan standards and guidelines in a 4B area. Project design requires obliteration of all temporary roads.

Tree, and possibly shrub plantings are more likely to occur in the future on these treatment areas because of legal requirements and snag safety issues. Live trees would increase vegetative diversity and provide long-term feeding, cover and breeding sites for wildlife. This alternative may provide more acres of reforested habitat than Alternatives 1 or 2.

This alternative would provide the most heterogeneity within the fire landscape of all the alternatives, creating openings and increasing edge development. This diversity may attract certain wildlife species, particularly birds.

As part of the design criteria, habitat for all Federally-listed species would be avoided. However, soil and water analyses indicate this alternative slightly increases risk of sediment delivery over the short-term to downstream federally listed species habitat beyond the No Action Alternative and Alternative 2. BMPs to mitigate soil and water impacts would minimize this risk.

In the BE and MIS reports, Alternative 3 was found to have no effect on the Pawnee montane skipper, Mexican spotted owl and bald eagle, and no destruction or adverse modification of Mexican spotted owl critical habitat. This alternative may affect, but would not likely adversely affect habitat for Preble's meadow jumping mouse and would not destroy or adversely modify proposed critical habitat for this species. The alternative may adversely impact individual tiger salamanders, northern goshawk, flammulated owl, three-toed woodpecker, Lewis' woodpecker, pygmy nuthatch, olive-sided flycatcher, golden-crowned kinglet, Townsend's big-eared bat, and fringed-tailed myotis, but would not likely result in a loss of viability on the Planning area, nor cause a trend to Federal listing or a loss of species viability rangewide. This alternative will

have no impact on boreal owl, Merlin golden crowned kinglet, and dwarf shrew. Alternative 3 would not affect population trends for any of the selected Management Indicator species.

Cumulative Effects

Cumulative effects from recent wildfires and restoration effects, insect outbreaks, and completed and proposed fuel reduction projects are described in the "Ongoing and Foreseeable Actions" section above. In addition, ongoing activities contributing to cumulative effects on wildlife habitats include development on private lands, recreation, livestock grazing, and drought.

The action alternatives affect approximately 13% of the fire area; the effects of the proposed alternatives would be cumulative to the effects of the fire. Expected soil erosion rates and sediment delivery from the fire overshadow predicted effects from the salvage operations. Likewise, effects to wildlife and wildlife habitat from the proposed salvage operations would be incidental to the effects from expected flood events, sediment movement and habitat loss within the fire area.

Conclusion

Removing 4% of the burned snags from the Project Area under Alternative 2 and 28% under Alternative 3 would have a slight effect on snag-dependent species. Ground disturbing activities would slow vegetation recovery on 375 acres under Alternative 2 and 2,500 acres under Alternative 3. Salvage operations and truck traffic may temporarily displace or disturb wildlife. Although the action alternatives may affect some species, the effects would not or likely would not be adverse. The action alternative is consistent with Forest Plan management direction for wildlife.

IMPACTS ON FISHERIES

The primary concern for fisheries in the project area is the consequential flooding and erosion from the Hayman Fire area, and extreme sediment loading in stream habitat. The Hayman Fire drastically altered portions of the South Platte Watershed, depending on burn severity and intensity. The immediate post-fire effect is the movement of nutrients and sediments downstream into perennial streams. Probably the largest pollutant to the aquatic and riparian area is sediment. Ground disturbing activities associated with fire, such as BAER and salvage logging, contribute to the potential increase in erosion and sedimentation. In addition, natural precipitation processes have and will continue to contribute sediment loading into the aquatic environment. The removal of vegetation and organic material, in and on the soil surface, can also cause increased overland flow and subsequent erosion.

Suspended sediments affect aquatic organisms by killing them directly, by reducing growth rates and resistance to disease, by preventing successful development of eggs and larvae, by

modifying natural movement or migration patterns, or by reducing the natural availabilities of food (Marcus et al. 1990).

Excessive sediments affect the aquatic environment by filling interstitial spaces of critical spawning gravel. It can cause the loss of juvenile fish habitat along the edges and by filling side channels. Mature fish are affected by the sediment filling in pools used for critical over-winter habitat and cover for hiding and resting. Heavy sediment loading can cause the filling of stream channels (reducing depth and causing over widening) which reduces the overall quality of fish habitat. Erosion of sediment and debris flows during precipitation events can create temporary dams, migration barriers, and localized extinction (suspected to have occurred in Wigwam Creek after the Hayman fire) (Gallagher and Wagner 2003).

Ash from the burn can wash into the stream and absorb sunlight leading to higher stream temperatures and poor water quality. For example, at the confluence of Horse Creek and the South Platte, temperatures were recorded at an excess of 85 degrees in the month of August. Ash within the stream was a contributing factor along with loss of solar shading, loss of riparian shading, and an increase in direct solar heating.

The aquatic insect communities change after wildfires within riparian areas and stream channels. Direct effects of fire on aquatic insect communities generally are minor unless direct heat is involved (Minshall in press). Indirect effects from vegetation loss and hydrologic events (floods/runoff) may reduce density of aquatic insect populations by 85-90%. Smaller, headwater streams are more strongly affected than larger streams. In general, the effect of fire on aquatic invertebrates in otherwise intact, unfragmented stream ecosystems is not severe nor is recovery exceptionally long term. However, in watersheds already adversely impacted, fire can have much more severe effects. Stream recovery from fire is likely to be slower, more sporadic and possibly incomplete where natural processes are already impaired (Minshall, in press).

Sediment and debris flows can also help to restore the hydrology to the floodplain by raising the water table. This could lead to the widening and restoration of riparian vegetation along the stream reaches. Debris flows can diversify habitat, but this habitat can only be utilized if there is a source of fish and invertebrates nearby to colonize. Although low intensity fires may stimulate plant growth in riparian areas, high to moderate burn severity may cause soil damage and plant loss.

Regulatory and Forest Plan Direction

The Forest Plan guidance for management of wildlife relevant to the proposed action are:

- Maintain at least 40% of habitat potential and 80% of potential within riparian areas.
- Manage waters capable of supporting self-sustaining trout populations to provide for those populations.
- 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 which is determined to be limiting a fish population to a level below its potential to improve habitat conditions which may be limiting.

Applicable laws include the Endangered Species Act as amended (1973) and the National Forest Management Act (1976).

Alternative 1 – No Action

Direct and Indirect Effects. The direct and indirect effects on fisheries, aquatic habitat and the brook trout population with the no action alternative are closely correlated with the soil and watershed effects.

Trout populations are likely to decline due to the Hayman Fire effects. Depending on frequency of future flood events, trout populations may rebound as new wood is deposited into the stream. Sediment/wood will create new habitat. Large woody debris recruitment will help reconnect the stream with abandoned floodplains. Because of sections of opened canopy, riparian areas will regenerate and willow recovery will help rebuild streambanks. Reestablishment of beaver will help attenuate flooding and increase habitat complexity. Woody debris will increase the nutrients for macroinvertabrates and other primary producers and will increase habitat complexity within stream channels. (Minshall 2000). Highest macroinvertebrate diversity occurs approximately ten years after a fire if woody debris is allowed to fall into the riparian zone (Minshall 2000).

Alternative 2 – Harvest in Areas Without BAER Treatments

Direct and Indirect Effects. The direct and indirect effects on fisheries, aquatic habitat and the brook trout population with the action alternatives are closely correlated with the soil and watershed effects. Brook trout populations are likely to decline due to the Hayman Fire. This decline could increase if sedimentation occurs along the upper stream reaches near salvage activities. However, applying BMPs would help minimize these effects. A minimum of 100-foot buffer will do little to reduce the impacts of a large flood event, but will help to protect existing floodplains along these streams and will maintain woody material in the area to eventually fall into the stream system. The 100-foot buffer will not filter if there is not vegetation present, but keeping machinery out of the area will alleviate soil compaction and rutting, therefore lessening erosion effects.

Skidding will result in increased erosion during the project. Streams are already at extremely high sediment levels; erosion rates will be very high particularly during storm events. Roads are associated with disturbing basin hydrology and increasing acute and chronic sedimentation. The use of temporary roads and centralized landings placed outside of the riparian areas will reduce the amount of ground disturbance in this habitat. Without the action alternative, some of these road improvements will not be made in the near future.

The slight temporary increase in sediment delivery caused by salvage operations and construction and use of roads under this alternative (see "Impacts on Soil and Water" section) will have a negligible effect on existing fish habitat and populations compared to the extreme effects caused by the fire. The Hayman fire has caused major sediment loading that will continue to severely impact fish habitat in the project area.

Alternative 3 – Proposed Action

Direct and Indirect Effects. The effects on fisheries would be similar as for Alternative 2, except salvage operations and road construction and use would disturb a larger area resulting in more erosion and sediment runoff potentially affecting more stream habitat. However, applying BMPS would help minimize these effects. Any sediment caused by this alternative that may reach the streams would cause only a slight short-term increase in sediment (see "Impacts on Soil and Water" section). This would add a relatively small amount of material to the existing extreme sediment loading caused by the Hayman Fire. Thus, Alternative 3 will have a negligible effect on fish habitat and populations.

Cumulative Effects

Salvage operations have the potential to increase negative cumulative effects to the stream ecosystems by exacerbating soil disturbance, creating hydrological connections (runoff channels) to the streams and slowing recovery by increasing erosion potential.

Whirling Disease is present within all of the perennial streams in the burn. This has resulted in a dramatic change in the fish population in the area. Rainbow trout (a species that tolerates high densities) have done poorly in whirling diseased streams and populations have decreased in some stream reaches within the project area. Brown Trout (typically require more habitat for each fish) has increased in population but not to the same numbers of the rainbow trout. Whirling disease contributing organisms may increase due to increased sediments and temperatures in the fire area. This may negatively impact any remaining rainbow populations (the gold medal streams in particular).

Cheesman Reservoir will act as a sediment trap from upstream flows. Sediment effects will impact the water quality of the water supply for downstream urban areas. Because of the potential for excessive sediment loading, further water storage efforts may be required. Releases from Cheesman Reservoir may be needed to clear sediment from dam mechanisms. This would increase sediment deposition in the downstream Gold Medal habitat.

The Hayman and Schoonover Fires - Hazard Tree Removal Project has permitted the falling of burned snags along roads adjacent to streams. This has created traps for sediment and increased woody debris along several reaches. Salvage logging has also occurred on approximately 3,000 acres near Cheesman Reservoir and on some surrounding private lands affected by the fire.

Other activities contributing to the health of aquatic habitat and the brook trout population include riparian grazing, adjacent roads and road conditions, stream crossings by OHV, fuels reduction projects ongoing and proposed and private land development. Drought conditions have stressed the aquatic environment by drying up stream channels, draining local reservoirs, and raising water temperatures.

Conclusion

Compared to the no action alternative, the action alternatives will have negligible effects on fish habitat and populations. The proposed action is consistent with Forest Plan goals, standards, and guidelines for fisheries.

IMPACTS ON HERITAGE RESOURCES

Regulatory and Forest Plan Direction

Forest Plan direction on desired conditions for heritage resources are that all recorded heritage sites are evaluated for significance according to the criteria for the National Register of Historic Places (NRHP). Sites determined eligible are protected from adverse effects from all sources including activities in other program areas. Significant sites are preserved for scientific investigation or interpretation, and traditional cultural sites or locations are preserved and not publicized. Other appropriate public uses are designed and implemented as practicable.

Forest Plan management direction for heritage resources follows:

- Protect, find an adaptive use for, or interpret all cultural resources on National Forest System (NFS) lands which are listed on the National Register of Historic Places (NRHP), the National Register of Historic Landmarks, or that have been determined to be eligible for the National Registers of Historic Places (NRHP).
- Nominate or recommend cultural resource sites to the National Register of Historic Places (NRHP) by 1990 in the following priority:
    - Sites representing multiple themes;
    - Sites representing themes that are not currently on the National Register within the State; or,
    - Sites representing themes that are currently represented by single sites.

Alternative 1 – No Action

Direct and Indirect Effects. There are no direct or indirect effects to cultural resources.

Alternative 2 – Harvest in Areas Without BAER Treatments

Direct Effects. Alternative 2 would affect approximately 2,500 acres of National Forest system lands. Adequate cultural resource surveys were conducted on 255 acres previously and 2,120 acres have not been surveyed. A formal agreement has been made with the State Historic Preservation Office, to allow the undertaking to go forward without comment from SHPO as long as all newly discovered sites are treated as if they are eligible for nomination to the National Register of Historic Places (NRHP). In addition, those previously recorded sites determined significant cultural properties will also be avoided during the development of the proposed timber salvage units. The avoidance of these cultural resources will result in no direct affects to cultural sites during the implementation of this alternative. There is no difference in direct effects to cultural sites when comparing Alternative 2 to Alternative 3.

Indirect Effects. Alternative 2 will have the same indirect effects as Alternative 3 because timber salvage and associated activities has the same potential for ground disturbance. However, the comparative benefit is only slight when compared to the Alternative 3.

Alternative 3 – Proposed Action

Direct Effects. Alternative 3 would affect about 17,500 acres. Adequate cultural resource surveys were conducted on 7,160 acres previously and about 10,340 acres will need to be survey for the presence or absence of prehistoric and historic phenomena. A formal agreement has been made with the State Historic Preservation Office, to allow the undertaking to go forward without comment as long as all newly discovered sites are treated as if they are eligible for nomination to the National Register of Historic Places (NRHP). In addition, those previously recorded sites determined significant cultural properties will also be avoided during the development of the proposed timber salvage and its implementation. The avoidance of these cultural resources will result in no direct affects to cultural sites during the implementation of this alternative. There is no difference in direct effects to cultural sites when comparing Alternative 3 to Alternative 2.

Indirect Effects. An indirect effect of implementing Alternative 3 is the same as Alternative 2. However, there would be a higher potential for water and wind erosion and exposure of artifacts and materials than that forecast for Alternative 2. However, because such effects should be slight, the differences among the alternatives when considering indirect effects on significant cultural sites should be negligible.

Cumulative Effects

The Hayman Fire generally burned relatively hot burning the organic layer exposing mineral soil and historic structures made of organic materials and exposing non-organic prehistoric and historic cultural manifestation. Both the known and unknown sites within the Hayman fire are subject to surface collection and erosion due to the decomposed granitics. Erosion caused by ground-disturbing activities under the action alternatives would add to this effect.

Conclusion

Erosion caused by ground-disturbing activities under the action alternatives would have an indirect effect on heritage resources. Alternative 3 has the greatest potential for effects because it would disturb up to seven times more ground than Alternative 2. All known cultural resource sites would be avoided. The action alternatives are consistent with Forest Plan direction for heritage resources.

IMPACTS ON LOCAL AND REGIONAL ECONOMY

Regulatory and Forest Plan Direction

The Forest Plan management goals include:

- Maximize present net value while emphasizing opportunities to improve water, fish and wildlife, outdoor recreation, and other amenity values.
- Manage resources at economically and environmentally feasible levels, consistent with the emphasis on amenity values.
- Provide for increased production and productive use of wood fiber while maintaining or improving other resource values.
- Provide the opportunity for economic growth of industries and communities dependent upon Forest outputs.

The Forest-wide management objectives include:

- Forest-wide standards supplementing National and Regional policies, standards, and guidelines found in Forest Service Manuals, Handbooks, and the Rocky Mountain Region Guide relevant to timber harvesting.
- Providing well designed timber sales to be affordable under average market condition at time of sale.
- Increasing the use of available wood fiber consistent with management objectives and economic principles.

Federal regulations under 36 CFR 219.27 sets forth the minimum specific management requirements for accomplishing goals and objectives for the National Forest System. Those management requirements are addressed as follows:

- Section (b) Vegetative Manipulation: (1) Multiple-use; (3) Not chosen for greatest dollar return; (7) Practical transportation, harvest requirements, and preparation and administration.
- Forest Service policy sets a minimum level of financial analysis for project planning (FSH 1909.17).

Alternative 1 – No Action

Direct and Indirect Effects. Under the no action alternative, all counties within the Hayman Fire area would continue to be somewhat dependent on recreation and tourism. Continued declines in the relative economic contribution of the wood products industry are likely. It is increasingly difficult to find mills in close proximity to timber sources. It is common to transport timber 250 to 300 miles. In the short term, because of the Hayman fire, the economic climate may be altered from the existing condition.

Over the long term, the region as a whole would likely continue to grow with continued emphasis in preserving the integrity of the rural character of the area. General employment levels would continue with population growth. Seasonal fluctuations in the unemployment rate would continue.

With the no action alternative, an estimated volume yield of 6 to 44 million board feet would not be available. There would be no economic benefits associated with the no action alternative. Wood products that represent over 150 years of growth (in the largest diameter trees) would be lost and not contribute to the growing demand for building materials. In addition, the economic benefit to local communities and forest products industry would not be recovered. The employment associated with both logging and milling activities would not occur, although total employment associated with logging is difficult to estimate without more information on what the bid package may be. With the no action alternative, this employment would not occur.

In addition, under the no action alternative, all site preparation costs, restoration, reforestation and future wildland fire costs would have to be incurred by the appropriate resource. Under the no action alternative there would be no costs for sale administration and preparation. Reforestation cost of $725/acre would increase as well, to an additional $394/acre or more for site-prepping the treatment areas for planting. Some standing dead trees would need to be felled, as not to impose a safety hazard for tree planters. Falling and leaving trees could leave in excess 30 tons/acre or more of woody debris. Leaving excess woody debris/acre could render some areas unplantable or require higher site preparation cost due to slash. Leaving excess woody debris/acre may also impede any natural regeneration and slow grass/forbs recovery. It may also increase future wildland fire costs, making it harder to contain or suppress a wildfire in these heavy of fuels. Suppression costs, especially for wildfires, which escape initial attack, are significantly higher (10 times or greater) than prescribed fire costs. Another fire in these heavy of fuels would cause detrimental effects to the soils and destroy any investment in reforestation if they were planted.

There are no financial costs or benefits associated with this alternative, thus Present Net Value is zero for a financial analysis. An economic analysis has the same results. An economic analysis includes benefits and costs besides strictly financial transactions.

There would be no opportunity to provide for economic growth of industries and communities dependent upon Forest outputs. This alternative would not meet the Purpose and Need to recover the economic value of sawtimber.

Effects Common to All Action Alternatives

Direct, Indirect and Cumulative Effects. The Hayman Fire Timber Salvage Project would have a short-term positive effect on the region's wood products industry. The increase in wood products would be beneficial to the wood products industry. According to industry representatives, without public lands, the demand for the limited supply of timber cannot be sustained.

Timing of the project will be very important, with respect to the condition of the wood and the supply of other fire salvage sales. Other National Forests with proposed salvage sales are Arapahoe-Roosevelt, White River, Grand Mesa Uncompaghre, San Juan and Rio Grande. All of these salvage sales will most likely be introduced or bid at the same time as the Hayman fire.

Short-term social effects to residences and businesses, as well as visitors in and around the salvage operation would occur. These effects would be for maximum of one year. If logging occurs during the summer months, businesses and residences around Woodland Park would be affected by logging activity. Effects would include noise from logging equipment, transportation effects related to logging truck traffic, and safety issues associated with transportation and logging activities, and effects to tourism due to the overall activity in the area. Visitors to the area may be affected or choose not to come to the area because of the logging activity. Recreation outfitters may experience short term, negative effects due to logging activities. If salvage activity occurs during the summer months or during the fall there could be short-term effects to these outfitters. Effects that may occur include noise from logging activity, safety issues, as well as the potential for roads to be closed during felling, skidding, or decking. The effects from private and other National Forest Salvage sales may affect the demand for timber from the Hayman Fire project at mills.

Short-term economic effects to residences and businesses in and around the salvage, operation would occur. Many times these non-market values can be estimated by various methods. However, for this project, there is not a practical method to estimate these non-financial transactions. They would be described below, qualitatively. With an estimated volume yield of 6 to 44 million board feet and an addition of 5 to 15 crews operating daily for a twelve-month period would stimulate the local economy and provide jobs for the local unemployment. The individual income associated with logging activities on the Forest could run anywhere between $14,000 and $25,000 per individual, depending on what type of skill level.

The Hayman Fire created enormous acreages of fuel for future fires. There is an opportunity to capture the economic value of the fire-killed timber by selling some of the valuable wood. Capitalizing on this opportunity would accomplish two very important things. It would help to accomplish fuel reduction directly by both removing fuel and converting it to a useable product,

and indirectly by providing revenue returns to reduce total project costs in terms of reforestation and restoration.

Fuel reduction through timber harvest, either using standard timber sale procedures or stewardship contracting is a viable consideration for this project. However, burned timber is subject to rapid deterioration. As time goes on, both volume available for consideration and value of the products will decrease, thereby reducing cost effectiveness or eliminating the opportunity.

About 20 percent of the larger ponderosa pine will have lost its value by 2004. The larger Douglas fir will deteriorate more slowly, but it is estimated that there would be little or no commercial value beyond 2006. Firewood (both personal-use and commercial quantities) and biomass products will hold their value considerably longer than the sawlog material will. Time is an important consideration in the economic analysis of this project.

The salvage operation would have short-term and long-term effects to restoration; reforestation and future wildland fire costs. Salvaging would reduce the cost of site-preparation and the risk or loss of investment for reforestation, provide micro-sites for planting, and encourage the growth of seedlings, grasses and forbs with 10 tons/acre of woody debris or less. Salvaging and reducing the woody debris to 10 tons/acre or less will reduce the cost and effort of wildfire suppression.

Economic Efficiency. Economic efficiency is a comparison of those costs and benefits that can be quantified in terms of actual dollars spent or received within the project area. Present Net Value (PNV) is an indicator of economic efficiency and is one tool used in conjunction with many other factors in the decision-making process.

Economic efficiency considers the benefits and costs associated with implementing each alternative. This analysis will display market costs and benefits, although there are many non-market benefits and costs that will not be assigned dollar values. Examples of non-market benefits that will not be included in this analysis are watershed and wildlife habitat restoration, and activities to reduce the spread of noxious weeds. Examples of non-market costs are erosion, visual quality degradation, and invasion of weeds onto forestlands. This is not to imply that such values are not important, but recognizes that non-market values are difficult to represent with approximate appropriate dollar figures.

Management of the forest is expected to yield positive benefits, but not necessarily financial benefits. Economics are assessed within the managerial context of the Forest Plan and other policy and law, as a part of an integrated approach to multiple-use management. Net public benefits represent the sum of priced outputs (PNV) plus the net benefit of non-priced outcomes. Net public benefits cannot be expressed as a dollar value because many of the outcomes of management are not quantifiable in monetary terms.

Table 19 displays the economic efficiency analysis for quantifiable costs and benefits that charge by alternative. Generally, alternatives with large or yearly harvest show higher costs associated

with preparing the sales or maintenance and mitigation measure as well as higher revenues associated with the harvest level.

TABLE 19: ESTIMATED COSTS AND REVENUE BY ALTERNATIVE

Alternative	Discounted Total Costs	Discounted Total Benefits	Discounted Present Net Value
Alternative 1	$0	$0	$0
Alternative 2	-$188,394	$68,850	-$119,544
Alternative 3	-$1,296,594	$473,850	-$822,744

Alternative 2 – Harvest in Areas Without BAER Treatments

Direct and Indirect Effects. This alternative would have benefits totaling $68,850 from revenues of the timber salvage. Costs to the Forest Service to prepare the salvage sales would run $188,394 leaving a Present Net Value of -$119,544. State and local economies are directly and indirectly affected by the monetary outputs this project represents. Timber products provided to the raw material markets through direct timber sales or stewardship contracts, contribute to the continuing operation of regional lumber mills. This adds directly and indirectly to the local and state economies through employment and tax revenues.

Personal-use and commercial firewood opportunities were not individually analyzed with the alternatives because these small programs could be accomplished within the frameworks of action alternatives that include product removal. The economic effects to PNV and jobs and income are expected to be very small in comparison to the overall project. The opportunities for firewood, small houselog sales, and small sawlog sales are expected to be similar.

Removing timber products under this alternative could help reduce reforestation cost by approximately $985,000 because there would be less site-preparation cost for planting and reduced risk of a reburn or loss of planting investment.

Temporary road costs including obliteration are not a function of economic analysis since the purchaser absorbs the costs. Temporary roads are a function to facilitate better logging practices, such as centralizing landing, reducing number of skidding trails, and reducing skidding distance.

Alternative 3 – Proposed Action

Direct and Indirect Effects. This alternative provides the greatest focus on economic efficiency by treating more acres. This alternative would have benefits totaling $473,850 from revenues of the timber salvage. Costs to the Forest Service to prepare the salvage sales would be $1,296,594 leaving a Present Net Value of -$822,744. State and local economies would be greatly affected by the more acres treated under this alternative and have a longer effect directly and indirectly by the monetary outputs this project represents. Timber products provided to the raw material markets through direct timber sales or stewardship contracts, contribute to the continuing operation of regional lumber mills. This adds directly and indirectly to the local and state economies through employment and tax revenues.

A greater reduction in reforestation cost by approximately $6,914,700 or more by removing timber products because of less site-preparation cost for planting and reduced risk of a reburn or loss of planting investment, and lower suppression cost for wildfire over a greater area.

Temporary road costs are not a function of financial analysis since the purchaser absorbs the costs. Temporary roads are a function to facilitate better logging practices, such as centralizing landing, reducing number of skidding trails, and reducing skidding distance.

Conclusion

The local and regional economy would benefit from timber harvest-related employment and expenditures for about 1 year. Alternative 1 would produce no harvest products or revenues. Alternative 2 would produce an estimated $68,850 in revenues. Alternative 3 would have the greatest economic benefit, with $473,850 in revenues. Present Net Value for Alternative 2 would be -$119,544 and Alternative 3 would be -$822,744. Other beneficial effects include indirect cost savings from increased reforestation and fire-suppression efficiencies. Logging activities may cause recreational users to avoid the area causing minor adverse effects on recreation-related businesses. The action alternatives are consistent with Forest Plan goals, standards and guidelines.

IMPACTS ON RECREATION

Regulatory and Forest Plan Direction

The Forest Plan guidance for management of recreation relevant to the proposed action are:

- 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 (ROS) classes for dispersed recreation.
- 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 People at One Time (PAOT)/acre capacity.
- Manage use of trails in dispersed areas to not exceed the established PAOT/mile of trail guidelines.

The Forest Plan has also assigned Recreational Opportunity Spectrum (ROS) settings to all MAs. The ROS is a planning system developed by the Forest Service that classifies recreation settings on National Forest lands according to their physical, social, and managerial characteristics. These ROS settings are formally applied only to National Forest land and not adjacent private

lands. However, the presence and condition of private lands influences the ROS settings assigned to National Forest lands.

The ROS classes assigned to National Forest lands in the Project Area are: Primitive, Semi-Primitive Non-Motorized, Semi-Primitive Motorized, Roaded-Natural, and Rural. A description of these ROS setting from least developed, to most, is found below:

Primitive (P) – These areas are characterized by an unmodified natural environment, minimal evidence of other uses, and essential freedom from human-induced restrictions. Motorized use is not permitted.

Semi-Primitive Non-Motorized (SPNM) – This area is characterized by an environment that appears predominantly natural. Evidence of other uses is present, but there is little interaction. Motorized use is not permitted. SPNM areas differ from primitive only by the degree and type of recreational experience users enjoy

Semi-Primitive Motorized (SPM) – The character of these areas includes a predominantly natural occurring environment with roaded areas and moderate evidence of other users. Access by motor vehicles is permitted on roads and trails. The area is managed in such a way that minimum on-site controls and restrictions may be present, but are subtle.

Roaded-Natural (RN) – Characteristics of this classification include a natural appearing environment within roaded areas, prevalent evidence of other users, and evidence of past resource management activities. RN areas are predominately natural appearing but are readily accessible to vehicles.

Rural (R) – Natural setting is culturally modified to the point that it is dominant to the sensitive travel route absorber. There is strong evidence of designed roads or highways. A rural setting is easily accessible and structures are readily apparent.

The Roaded-Natural (RN) and Semi-Primitive Motorized (SPM) ROS settings are the most prevalent in the Project Area due in part to the large number of Forest Roads and motorized trails that transect the area, including the Matukat Road (FS211), Cedar Mt. Road (FS360), Wigwam (FS560) and the Signal Butte Multi-Use Trail (FDT717). The ROS designation of Primitive and Semi-Primitive Non-Motorized are found in and near the Lost Creek Wilderness in the western portion of the project area.

The effects of the alternatives are compared by evaluating the change in the recreational experience by forest visitors in both 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 MA and ROS settings is also discussed.

Alternative 1 – No Action

Direct, Indirect, and Cumulative Effects. Demand for recreational activities on the Pike National Forest will continue to increase as the Front Range population increases and pursuit of outdoor recreation continues to rise. This growth will continue to add substantial demand on the existing recreational opportunities and require additional capital improvements to maintain the existing level of service and to meet growing demand.

Under the No-Action, timber salvage in the Hayman Fire area and thus no direct effects on recreation. Rehabilitation of the burned forest would continue based on the Hayman Fire BAER plan as refined by the Hayman Restoration Team.

Hazard trees that are an imminent danger to public safety would be removed along roads, trails and in campgrounds. Standing fire-killed trees along roads, trailheads, trail crossings, and dispersed campsites would increase public safety risks and related government liability, and present continuing maintenance problems.

Closed campgrounds and trails in the project area will remain closed until deemed safe for occupancy and recreational use. Because of the project area proximity to Denver and Colorado Springs metropolitan areas, recreationists would likely pursue similar recreational activities on other nearby public lands, putting additional pressures and demands on those locations.

Some dispersed recreational uses will also be displaced to other areas in the Pike National Forest and adjoining public lands. The types of uses likely to be displaced will be motorcycle and ATV trail riding, sightseeing, driving for pleasure, hiking, camping, and horseback riding. Camping at some dispersed campsites would be hazardous because of soil erosion, flood potential, and hazard trees. Although recreational activities will eventually be allowed in the burn area, area use is likely to decline for some dispersed activities and possibly increase for others, such as hunting, due to improved game habitat.

For many years there will be a public interest in the burned area and the Forest Service intends to provide interpretive signs in various locations to describe what happened, how the forest fire affected the forest ecology, and current forest rehabilitation efforts.

There would be no changes in the current management area prescriptions of the land proposed for the timber salvage. The current ROS classifications would remain the same.

Effects Common to All Action Alternatives

Direct and Indirect Effects. The proposed timber harvest would cause only short-term impacts on recreational resources and activities during the active period of operation between June 2003 and 2004. Potentially, most salvage activity would take place in the fall thus causing more of an impact on hunters who use portions of GMUs 51, 501, and 511 that lie in the burn area. However, because of the short duration of the salvage activity and limited salvage operations on weekends and holidays impacts would be minor.

The proposed timber salvage project would have an impact on a number of dispersed recreational activities in the project area. These activities include motorcycle and ATV trail riding, sightseeing, camping, hunting and fishing, hiking, horseback riding, mountain biking, and rock climbing. The level of impact will depend on whether county and Forest Service roads are closed during salvage activities. It is anticipated that roads will be closed temporarily during certain activities adjacent to the primary roads. The primary log truck hauling roads that would affect recreational access are FDR 211 (Matukat Road), FDR 360 (Cedar Mt. Road), FDR 200 (Trail Creek Road), FDR 340 (Westcreek Cutoff), FDR 210 (Platte Springs) and County Road 68 (Stump Road). Recreation in these areas would be curtailed and/or displaced during the temporary road closures.

For example, periodic road closure on the Matukat Road (FDR 211) from salvage activity would impact many recreationists and outfitters who use the road to access Lost Creek Wilderness trailheads (i.e., Goose Creek and Wigwam), campgrounds, dispersed recreation sites and favorite hunting sites. The primary impacts from salvage activity would be decreased access, displacement, noise from logging activity, visual activity, safety, dust, and logging traffic. However, any closures would be temporary and result in only minor, short-term effects.

In addition to road closures, Hayman Fire area trails not already closed due to hazardous conditions may be temporarily closed during salvage activity. Affected trails include Signal Butte Multi-Use Trail (FDT 717) and the No Name ATV Trail (FDT 725). After treatment, motorcycle and ATV riders using project area trails would observe a more open forest. The treatments would not affect their ability to use the trails or adversely affect their recreational experience. There may be a short-term effect in new motorized use along tracks and paths created by mechanical logging devices (i.e. skidders) which could lead to soil erosion and other adverse conditions.

Recreation displacement is an indirect effect of the proposed timber salvage project that may cause recreationists to visit other facilities outside of the project area. Recreationists using facilities outside the project area could notice more use or crowding, which could negatively affect their recreation experience due to inconvenience or distress. In addition, the potential economic impacts related to hunting and general recreation displacement and loss of revenue for permitted outfitters could be substantial for local businesses and communities.

On a more positive note, increased forage production may increase deer and elk numbers in the burned areas somewhat in the coming years. It is likely that this and the more open nature of the salvage units may increase big game hunting opportunities.

In addition to hunting activity, camping would also be impacted, particularly those campgrounds located in the burn area that would possibly have to be closed during salvage activities. These campgrounds and others in the surrounding area outside of the burn, like those located in Manitou Park and near Deckers, would be indirectly affected by increased noise and traffic.

Dispersed campsites may be established in new locations after the salvage depending on hazard trees left in existing dispersed campsites. As dead trees fall to the ground, some sites could be blocked from use, while other sites would likely be used until revegetation occurs and a forested canopy is reestablished.

There are three proposed salvage units located on the boundary of the Lost Creek Wilderness approximately 200 acres each in size. No direct impacts are expected which could compromise the wilderness character although indirect impacts may include increased mechanical noise, visual activity, and illegal encroachment by motorized or mechanized vehicles into the wilderness due to the open nature of the salvage unit after treatment. These impacts, however, are temporary and can be mitigated.

The alternatives essentially present two differing recreation settings. The action alternatives would produce a 2,500 to 17,500 acre salvaged forest setting spread out across a project area. The no action alternative would produce a setting characterized by a dense stand of dead trees (in the short term), followed by an area of dense downed logs within 15 to 20 years.

There would be no changes in the current management area prescriptions of the land proposed for the timber salvage. The current ROS classification would remain the same.

Alternative 2 – Harvest in Areas Without BAER Treatments

Direct and Indirect Effects. Under Alternative 2, harvest of salvage timber would occur in high and moderate fire intensity areas that were not treated through the BAER process. Approximately 2,500 acres would be salvaged under this alternative resulting in an estimated 1,800 log truck loads hauled on roads previously listed above.

Under this alternative the effects to recreation would be minor. As mentioned earlier, the primary impacts from salvage activity would be decreased access, displacement, noise from logging activity, visual activity, safety, dust, and logging traffic. However, any closures would be temporary and result in only minor, short-term effects.

Alternative 3 – Proposed Action

Direct and Indirect Effects. Under Alternative 3, harvest of salvage timber would occur in high and moderate intensity areas and in areas that may have been treated through the BAER process (except for selected BAER units). Approximately 17,500 acres would be salvaged under this alternative resulting in close to 12,500 log truckloads and approximately 9 miles of temporary road.

Alternative 3 could have a potentially greater impact on recreation because of more salvage units and quantity of salvage timber. The volume of logging traffic would increase substantially on Cedar Mt. Road (FDR360), Matukat Road (FDR211), Trail Creek Road (FDR200), Westcreek Cutoff (FDR340), and Stump Road (County Road 68). Additional Forest Service roads and

trails that would be affected by this alternative include: 9-J Road (FDR523), Signal Butte Road (FDR362), No Name Road (FDR366), Chestnut Road (FDR367), Stoney Pass Road (FDR560), Rule Ridge Road (FDR357), Turkey Track Road (FDR343), Rainbow Falls Road (FDR350), Turkey Creek Trail (FDT731), Beaver Creek Trail (FDT732) and FDT735 and 737.

As mentioned earlier, the primary impacts from salvage activity would be decreased access, displacement, noise from logging activity, visual activity, safety, dust, and logging traffic. However, any closures would be temporary and result in only minor, short-term effects.

Cumulative Effects

The rehabilitation efforts on the Hayman Fire, Buffalo Creek Fire, Schoonover Fire, the Trail Creek timber sale (on private land), and the proposed Trout-West Fuels Reduction Project, combined with the proposed action, would result in a cumulative increase in management activity in the project area. For a period when activities are concurrent, the cumulative effects may increase the feeling of crowding and may have a negative effect on the recreation experience. This effect would be short-term until activities are completed.

The long-term cumulative effect of these combined actions and events would be a reduction in fire risk and, therefore, a reduction in the potential for adverse effects on recreational resources due to a large catastrophic fire.

Conclusion

Salvage operations and increased log truck traffic under the action alternatives will cause minor short-term impacts on recreation. Alternative 3 would have the greatest potential for adverse effects on recreation compared to the other alternatives. The action alternatives are consistent with Forest Plan goals, standards and guidelines.

IMPACTS ON VISUAL RESOURCES

Regulatory and Forest Plan Direction

Forest Plan directions on visual resources are that natural appearing landscapes eventually be restored to pre-fire conditions, without visible man-made impacts from harvesting activity. Scenic integrity shall be restored to a high level.

Alternative 1 – No Action

Direct Effects. The standing dead trees will remain for an indeterminate period. Scenic quality will be affected until the trees fall and natural recovery occurs over a long period of time. This

will be the most natural appearing of the alternatives. There will be no temporary impacts from the salvage activity and no long-term effects from stumps and cut logs.

Indirect Effects. There would be no indirect effects. No logging truck traffic, dust, temporary road construction, or seeding and mulching will be visible except in BAER treatment areas.

Alternative 2 – Harvest in Areas Without BAER Treatments

Direct Effects. This alternative will allow for an additional year of understory growth that would be disturbed and potentially lost under Alternative 3. Because of the terrain in the area, and lack of background and middleground viewing distances, foreground views are critical. Avoidance of the BAER areas provides a one-year advantage over Alternative 3, thereby mitigating visual impacts faster. Due to the lack of vegetative screening and reduced visual absorption capability, all of the logging activities will have short-term visual impacts.

Indirect Effects. Similar to the no-action alternative recreation activity will be reduced and recreation opportunities may be lost.

Alternative 3 – Proposed Action

Direct Effects. This alternative has the greatest potential to affect the scenic views from private in- holdings. There are salvage units visible in foreground of Matukat Road, Highway 67, Trail Creek, Cedar Mountain and Turkey Creek Roads. Many units would be visible in middleground from the Matukat road. Several of the salvage units in the southern portion of the burned area and along the Teller and Park County Line will be visible from the South Platte River, but are outside the Wild and Scenic River ¼ mile from either side of the river corridor. Construction of temporary roads will create soil color contrasts and logging activity will add to the visual impacts from the fire itself. Due to the lack of vegetative screening and reduced visual absorption capability, all logging activities will have short-term visual impacts. Because of the volume, number and acreage of units this Alternative will have a greater impact than Alternative 2.

Indirect Effects. Under this alternative it is estimated that 12,500 loads will be hauled out of the area. The dust created by this volume of traffic will affect scenic quality. Operating equipment noise may temporarily displace wildlife. Visitor opportunities to view scenery will be lost for sometime, but may be replaced by curiosity viewing.

Cumulative Effects

Visual impacts of this fire and other nearby fires are already evident. Allowing only natural regeneration may result in a large area, lacking age class and species diversity.
There are approximately 20,000 acres of other ownership (private, state and Denver Water) within the burn perimeter. Salvage treatments are occurring, or will likely to occur on these lands. The affects of these activities on the scenic quality of the Forest are unknown because the Scenery Management System (SMS) does not control activity on these private lands.

Conclusion

Logging activities under the action alternatives will cause minor short-term impacts on visual resources. Under Alternative 2, salvage activities on 2,500 acres and resulting changes in forest landscape structure would have minor short-term adverse effects on natural views within the Hayman Fire area. Alternative 3 would have similar effects, except a larger area of 17,500 acres would be affected. The action alternatives are consistent with Forest Plan goals, standards and guidelines for visual resources.

IMPACTS ON TRANSPORTATION

Regulatory and Forest Plan Direction

Forest Plan direction on desired conditions for transportation is to "Manage the transportation system (roads and trails) for increased cost effectiveness, efficiency, and utility." Deteriorating roads would be brought up to standard, and segments of roads would be relocated to minimize the effects on water quality and soil or sediment productivity. The roads would be maintained to serve recreation needs as well accomodate the fire, fuels, and timber needs, while being cognizant of the requirements of the wildlife and its habitat. In order to reduce existing and potential future erosion due to introduced roads and trails, opportunities for correcting designs, improving maintenance, or closing unused roads should be sought throughout the restoration area.

The agency may construct temporary roads to facilitate activities, including fire suppression, watershed protection, and timber sales. Such temporary roads are intended to be closed and access eliminated when the particular activity ceases. Road drainage requirements are in R2 supplemental guidance for FSH 2509.25

The Pike National Forest follows the policies in the Natural Resources Agenda, for providing access, restoring/improving needed roads, and decommissioning unneeded roads. The National Forest Transportation System regulations then add construction of roads, maintenance, costs, analysis processes, and relationships to forest planning to the management of the National Forest Transportation System.

Alternative 1 – No Action

Direct Effects. The traffic level would not be changed. No temporary roads would be built. Thus, the sediment risk would not be increased.

Indirect Effects. The system roads would still require some level of maintenance work to bring them up to standard. Funding would be through other Forest Service funds, not through the timber sale.

Alternative 2 – Harvest in Areas Without BAER Treatments

Direct Effects. Approximately one mile of temporary road would be built and obliterated after the sale is completed. Truck and equipment traffic may accelerate wear and tear; may damage rural road systems, may increase sedimentation and erosion, and may temporarily increase traffic conflicts. The salvage sale would provide repair and maintenance of system roads to facilitate timber hauling.

Alternative 2 would require an estimated 1,800 truckloads to transport 6 million board feet of timber from the Project Area. If hauling was distributed uniformly over the life of the project (1 year), the average haul rate would be 7 round trips a day, 5 days a week.

The salvaged material would be trucked from the Project Area using a combination of Forest, State, County, and Federal roadways. If most of the salvaged timber would be transported to western Colorado, the primary haul routes, besides Forest roads, may include Highway 126 and US 285 through Jefferson County, Highway 67 through Douglas County and Teller County, and US 24 through Teller County. Although trucks regularly travel along these routes, adding project-related logging truck traffic represents a small increase in traffic volumes that would likely be noticeable to local residents, as well as people traveling through the Project Area

The presence of log trucks on the haul roads and intersections could affect traffic safety. The loaded log trucks would have slower acceleration characteristics and would require greater stopping distances than the other traffic on the roads. Passing situations would increase because logging truck traffic would likely slow some traffic on steep slopes. On the two lane roads with no passing lanes, traffic may backup behind the slower moving trucks. Efforts would be made to reduce the local transportation effects of logging and other 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.

Indirect Effects. Storm events could have increased impacts because of temporary roads. BMPs would minimize sediment related effects (see ‘Impacts on Soil and Water” section).

Alternative 3 – Proposed Action

Direct Effects. Approximately 9 miles of temporary road would be built and obliterated after the sale is completed. Truck and equipment traffic may accelerate wear and tear, may damage rural road systems, may increase sedimentation and erosion, and may temporarily increase traffic conflicts. The salvage sale would provide repair and maintenance of system roads to facilitate timber hauling.

Traffic and safety impacts would be similar to Alternative 2, except that more truck trips under alternative 3 would have a greater potential for effects. Alternative 3 would require an estimated 12,500 truckloads to transport up to 44 million board feet of timber from the Project Area. If

hauling were distributed uniformly over the life of the project (1 year), the average haul rate would be 48 round trips a day, 5 days a week.

Indirect Effects. Storm events could have increased impacts. BMPs would minimize sediment related effects (see 'Impacts on Soil and Water" section). The salvage sale would provide for road repair, maintenance, obliteration and closure of temporary roads used on this project.

Cumulative Effects

Road maintenance and repairs would occur over a longer period of time as funding allows. Additional temporary roads being built on private, state and Forest Service system lands may temporarily increase erosion and sedimentation.

Conclusion

Under Alternative 2, the 1,800 log truckloads forest could damage roads potentially increasing sedimentation and traffic conflicts along haul routes. The 12,500 truckloads under Alternative 3 would have the greatest potential for road and traffic impacts.

IMPACTS ON FUELS

Regulatory and Forest Plan Direction

Forest Plan direction on desired conditions for fuels are to "maintain fuel conditions which permit fire suppression forces to meet fire protection objectives for the area." In order to meet these fuel condition objectives, large woody fuel loading of 25-30 tons per acre should not be exceeded. Brown and others (2001) indicated that large woody fuel loading of greater than 25 tons per acre can result in high ratings for fire hazard and resistance to control.

The hazard of falling snags would also need to be greatly reduced to allow for safe work by firefighters in the event of an ignition within the analysis area. More than 15 firefighter fatalities can be attributed to falling snags since 1985 (National Wildfire Coordinating Group). After the fire-killed timber falls, the large woody debris would also create a concern for firefighter safety. Construction of a fire line would be more time consuming increasing the exposure time of suppression resources (USDA Forest Service 2002).

A Forest Plan objective is to maintain fuel conditions which permit fire suppression forces to meet fire protection objectives for the area by meeting these standards:

- "Reduce or treat fuels so the potential fireline intensity of an area will not exceed 400 BTUs/sec/ft on 90% of the days during the regular fire season.

- Break up continuous fuel concentrations exceeding the above standard into manageable units with fuel breaks or fire lines.
- Provide additional protection for areas exceeding the above standard when such protection will not be required for more than five years.

Alternative 1 – No Action

Direct and Indirect Effects. Under this alternative, salvage timber harvesting would not occur. In the next five years, dead fuel loading will likely remain minimal because most ground fuels within the project area were consumed during the fire. However, significant increases in dead fuel loading, particularly 1,000 hour and larger time lag fuels, would likely occur in the longer term (ten years and beyond) as the fire-killed trees fall and accumulate on the forest floor (USDA Forest Service 2002a, USDA Forest Service 2002).

With large accumulations of 1,000 hour and larger time lag fuels, an ignition could result in a wildfire that was more difficult to control, increased severity, and increased residence time (USDA Forest Service 2002a). The fuel loading within the analysis area will remain fairly continuous, though dependent on burn severity and size, amount, and type of live fuels present prior to the Hayman Fire.

The fire-killed trees that remain standing will continue to be a hazard to firefighters, Forest Service personnel, contractors, and other Forest users. Falling trees have claimed the lives of many firefighters and are a significant safety hazard (USDA Forest Service 2002). Suppression methods may be altered because of the large number of standing dead trees that will remain in the analysis area to provide for firefighter safety. Significant accumulations of dead and down fuels also impede construction of fire line reducing crew production rates.

Alternative 2 – Harvest in Areas Without BAER Treatments

Direct and Indirect Effects. This alternative provides for approximately 2,500 acres of salvage timber harvesting. These 2,500 acres would serve as patches of heterogeneous fuel loading in reference to the remainder of the burned area. The short-term effect would be an increase in fuel loading from the current post-fire level due to slash created from harvesting activities (McIver and Starr 2000). Slash will be lopped and scattered which will aid in increasing organic matter and soil stabilization.

In the longer term (ten years and beyond), by removing fire-killed trees, larger woody fuel loading would be considerably less compared to the remaining 134,000 acres of the Hayman burned area. McIver and Starr (2000) stated: “removal of merchantable material from a logged post-fire site will be expected to affect habitat for certain species of wildlife and reduce intermediate-term fuel loadings.”

In areas where salvage harvesting occurred, future fire suppression efforts would be eased, if an ignition occurred, by reduction of snag hazard, easier fire line construction and reduced fire intensity (USDA Forest Service 2002).

Alternative 3 – Proposed Action

Direct and Indirect Effects. This alternative involves salvage harvesting on 17,500 acres. The effects would be similar to Alternative 2, except for creating additional patches of fuel loading heterogeneity on the short and long term. Again, slash would need to be managed at acceptable levels (less than 30 tons per acre).

Cumulative Effects

In the long term, full suppression would continue due to a heavy dead and down component that would be conducive to severe and large wildfires (USDA Forest Service 2002; USDA Forest Service 2002a). Currently, another timber harvesting operation is occurring adjacent to the analysis area in the Trout Creek drainage. Additionally the Trout West Fuels Reduction Project is in planning stages with several proposed project areas also adjacent to this analysis area. The salvage harvesting under the action alternatives would augment these projects by reducing the long-term dead fuel loading and increasing forest heterogeneity.

Conclusion

There would be short-term increases in fuel loads on 2,500 acres under Alternative 2 and 12,500 acres under Alternative 3. However, over the long-term fuels would be much less compared to the unharvested surrounding Hayman Fire area.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Soils, once eroded may be considered an irreversible commitment of resources, since it takes so long for soils to develop. The majority of the accelerated erosion is due to the Fire. However, the implementation of either of the action alternatives would result in additional erosion. All action alternatives are associated with an irretrievable loss of nutrients in trees exported off-site.

Fire-killed trees not harvested may be an irreversible commitment of resources because once the tree decays to a point that it is no longer merchantable, there timber product and value is lost.

There may be an irreversible commitment of heritage resources if artifacts are damaged or lost during salvage operations. Implementation of the mitigation measures will eliminate this potential commitment.