

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

This analysis considers in detail a no action alternative, the proposed action, and two additional action alternatives, for a total of four alternatives: Alternative A – No Action; Alternative B – Proposed Action; Alternative C; and Alternative D.

The heart of this chapter is to describe and compare the differences among the alternatives, especially how the environmental effects of each differ. This comparison clearly frames the issues, informs the public, and provides a clear basis for choice among options for the decision maker.

2.1.1 Formulation of Alternatives

Alternatives were formulated based on the purpose of and need for action identified in Chapter 1, the responses to public scoping, and further internal review by the Forest Service to ensure a range of reasonable alternatives was analyzed. The decision maker has the latitude to choose, modify, or combine elements of alternatives in his/her final decision.

Scoping identified issues and concerns associated with the proposed action that were expressed by the public. Issues identified during scoping are addressed in this analysis in the following ways: formulation of alternatives; design criteria for alternatives; mitigation measures applied to alternatives; and analysis of alternatives.

Issues are categorized as key or non-key. Key issues are those that were used during the formulation of alternatives. Key issues are usually addressed by considering alternatives to the proposed action, whether they were considered in detail or dropped from further analysis. Other (non-key) issues represent substantial concerns; however, these issues are usually addressed within the design criteria of the proposed alternatives, mitigation measures, or tracked through the effects analyses. The key issues used in the formulation of alternatives are summarized below.

- **Roadless Areas** – Management activities in inventoried roadless areas should be designed to protect roadless area characteristics.
- **Windthrow Risk** – Management activities should be designed to minimize windthrow risk.
- **Fuels Management and Wildland Fire Hazard** – Management activities should be designed to manage fuel loading to minimize wildland fire hazard. Prescribed burning, especially on steep slopes, should be planned so that it can be done safely and be effective over time. Fuel loading should be considered in designing vegetation treatments.
- **Effectiveness of Silvicultural Treatment** – Management activities should be designed to improve forest health in the long term by modifying forest structure to reduce future susceptibility to mountain pine beetle (MPB), treating stands with localized MPB outbreaks, and reducing hazardous fuels in the Vail Valley while meeting Forest Plan standards.
- **Recreation/Trails** - Recreational use will have to be carefully managed in high-use areas that are in close proximity to planned management activities to assure public safety and minimize impacts on recreation use. Widening and hauling on the Stone Creek trail would disrupt use on the trail.

The interdisciplinary team (IDT) assembled the alternatives and eliminated some from detailed study based on screening criteria. The IDT then developed the alternatives to be considered in detail, including

design criteria, mitigation measures, and monitoring requirements, to respond to the key issues and the purpose and need. The alternatives considered in detail in this analysis represent different ways to achieve the purpose and need while addressing the key issues identified during the scoping process. The key issues, as well as planning and policy guidelines, contributed to the formulation of the screening criteria listed below.

2.1.2 Screening Criteria for Alternatives

The following criteria were used to establish a threshold for developing potential action alternatives to meet both the purpose of and need for the proposed action and Forest Service policy and direction.

1. The alternative must be consistent with the Forest-wide and management area (MA) guidance (standards and guidelines), considering current land allocations and management prescriptions in the Forest Plan.
2. The alternative must respond to the purpose of and need for action, which is to improve forest health in the long term by modifying future MPB risk, enhancing aspen communities, and reducing hazardous fuels in the Vail Valley. (Creating a more open stand structure and establishing younger trees would create a mosaic of age and size classes that would reduce the acreage susceptible to MPB at any one time. Expanding aspen, a species that does not serve as a host for MPB, over time also would reduce the acreage susceptible to MPB.)
3. The alternative must be feasible from a technical and economic standpoint while remaining environmentally responsible.
4. The alternative must be compatible with the policies and regulations of other agencies and jurisdictions.
5. The alternative must be capable of being implemented in a timely manner because the purpose of and need for action is immediate.

2.2 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

Five additional alternatives were identified during the formulation of the proposed action and alternatives. However, based on screening criteria presented above, these additional alternatives were eliminated from detailed consideration in this analysis. The NEPA process requires that alternatives evaluated in detail be reasonable. Reasonable alternatives include those that are practical or feasible from a technical and economic standpoint, and those that use common sense. The theme, a discussion of the alternative, and the rationale for eliminating each of these alternatives are presented below.

Alternative: Windthrow Risk

Theme: Reduce windthrow risk by leaving 70 percent or more of the basal area within all harvest units.

Discussion: An alternative was considered that would remove no more than 30 percent of the lodgepole pine in the lodgepole pine treatment units that are included in the proposed action. This alternative responded to public concerns raised during scoping that removal of more than 30 percent of the lodgepole pine could increase the risk of windthrow (blowdown) in the treatment units. If a blowdown were to occur in a treatment unit, the scenic integrity of the area would be adversely affected. The Forest Service concurs that there is a windthrow risk but this risk cannot be quantified. The silvicultural prescription in the proposed action was specifically formulated to address MPB while mitigating windthrow risk and visual impacts. Current field observations of the 1999 Back Door salvage sale behind

the Holy Cross Ranger District office in Minturn and thinning in Green Bear and Vail ski area were used to develop the prescription parameters. Windthrow has occurred in this salvage sale, which was thinned from above, affecting an estimated 20 to 30 of the larger dominant trees per acre (20 to 25 percent of the leave trees). In stands thinned from below (Green Bear and Vail ski area) windthrow occurred, but affected less than 5 trees per acre.

Rationale: This alternative was dropped because by cutting so few trees it would not be effective in modifying future MPB risk, thus would not respond to the purpose and need. Also, leaving large trees that are dead or dying is not practical as they will eventually die and fall, adding to the fuel load.

Alternative: Increase Thinning and/or Clearcutting

Theme: Increase efforts to modify future MPB risk by including more thinning and/or clearcutting in order to be more effective in meeting the purpose and need. Clearcuts in lodgepole treatment units with high windthrow risk would lessen windthrow risk.

Discussion: An alternative was considered that would include more thinning and/or clearcutting (more treatment units) in order to be more effective in meeting the purpose and need for reducing MPB risk. This alternative responded to public concerns raised during scoping regarding the effectiveness of silvicultural treatments. It was dropped because more clearcutting could affect the existing scenic integrity and recreation setting of the Vail Valley and Eagle River Valley. Significantly more treatment units also would not be feasible due to accessibility and slope constraints.

Rationale: This alternative was dropped because the openings created and the temporary roads required to implement this alternative could affect the existing scenic integrity and recreation setting of the Vail Valley and Eagle River Valley, and therefore, would not be responsive to the identified purpose and need. Forest Plan guidance for scenic resources (scenic integrity objectives) might not be met. The Proposed Action addresses adaptive management of areas of high infestation and damage with the use of sanitation and salvage treatments. This treatment would be the most effective at meeting the MPB portion of the purpose and need.

Alternative: No Lodgepole Pine Treatment Units in MA 5.4

Theme: Eliminate treatments in MA 5.4 because the desired condition of this MA states that insects and disease are generally acceptable unless they threaten ecosystems that are providing important habitat components.

Discussion: An alternative was considered that would drop all treatment units in MA 5.4. This alternative responded to public concerns raised during scoping regarding guidance for MA 5.4. Although endemic populations of MPB are generally acceptable in MA 5.4 (Forest Plan, page 3-55), Forest-wide guidelines for Disturbance Processes (Insects and Disease) described on page 2-29 of the Forest Plan provide additional guidance applicable to outbreaks, high-use recreation areas, wilderness, and project plans. Under Guideline No. 3, treatment activities should be based on the desired condition of the MA, the values of and risks to wildlife habitat, and adjacent private lands as well as public lands, and priority should be given to areas in which values to be protected exceed the cost of protection. It was determined that the purpose and need for the Vail Valley Forest Health (VVFH) Project is compatible with Forest Plan direction for MA 5.4 and Forest-wide guidelines for Disturbance Processes. If these treatment units were dropped, the project objectives would be compromised.

Rationale: This alternative was dropped because it would not respond to the purpose and need. This alternative also does not respond to Forest-wide guidelines for Disturbance Processes (Forest Plan, page 2-29), which guide strategies for addressing outbreaks and considering factors in addition to the desired condition of the MA. The desired condition of MA 5.4 (Forest Plan, page 3-55) includes the general acceptance of insects and disease unless ecosystems that are providing important habitat components are threatened. However, the desired condition for insects and disease in MA 5.4 applies to endemic conditions. Under the current epidemic conditions, the desired condition in MA 5.4 would not apply to management activities planned with consideration for insect and disease outbreaks.

Alternative: Limited Patch Cuts

Theme: Limit patch cuts to 4 acres in size.

Discussion: An alternative was considered that would limit clearcuts or patch cuts to 4 acres in size in response to a public comment received. This limitation is not consistent with existing Forest Plan guidance and would not sufficiently modify MPB activity or enhance aspen stands that serve as natural fuelbreaks. Patch cuts would be the most effective treatment method in modifying MPB activity and should not be limited to a size that would not be effective.

Rationale: This alternative was dropped because it would not be as effective in modifying the MPB risk or enhancing aspen stands as natural fuelbreaks, thus would not respond to the purpose and need.

Alternative: Include Lodgepole Pine Treatment Units 107 through 114 in Proposed Action

Theme: Increase efforts to modify MPB risk by including more thinning and/or patch cuts in lodgepole pine in order to be more effective in meeting the purpose and need.

Discussion: A portion of the proposed action that was included in the project description outlined in the scoping letter would have included the construction of temporary roads on potentially unstable slopes, and was excluded from the proposed action.

Rationale: This portion of the proposed action (195 acres affected by Units 107 through 114) was identified in the scoping letter, but was subsequently dropped because of management concerns that it would not be environmentally responsible based on internal review by the IDT and discussions with Colorado Geological Survey (CGS) staff familiar with slope hazards in the Dowds Junction area. The removal of lodgepole pine by thinning and patch cuts in Units 107 through 114 would require the construction of temporary roads. These roads would be constructed parallel to the slope contours to minimize their visibility to recreation visitors who would be viewing the area from the north. The temporary roads and vegetation removal, when combined, could add water and weight to the slope above two existing active slides that CGS has been studying and monitoring for some time because of their high hazard. The active landslides located below Units 107 through 114 have considerable potential to cause damage or injury along the I-70 corridor if the extent of their mass movement area were to expand in an uphill direction.

2.3 ALTERNATIVES ANALYZED IN DETAIL, INCLUDING THE PROPOSED ACTION AND NO ACTION

2.3.1 Alternative A – No Action

Theme: No Action

Overview: Although the current conditions would change over time under the No Action alternative as natural processes continue to alter the forest, management activities would not be used to change the current conditions.

Components: No vegetation management activities would be included (**Figure 2-1**); however, ongoing activities such as recreation, fire suppression, and road maintenance would continue.

Discussion: The No Action alternative would involve no change to the current management of the project area. MPB risk would not be modified by management activities such as thinning and patch cuts in lodgepole pine. The existing extent and severity of MPB infestation would spread throughout the project area, potentially causing widespread death of lodgepole pine. Over time, the beetle-killed lodgepole pine would accumulate as surface fuels and canopy gaps created by beetle mortality would allow understory trees to become established, creating multistory ladder fuels that are more prone to crown fires. Potential fuel loads would not be reduced by management activities such as prescribed burning or mechanical treatment. Aspen stands would not be enhanced as natural fuelbreaks and vegetation within designated wilderness adjacent to the Vail Valley would continue to trend outside the HRV. Management activities analyzed under other environmental documents may still occur.

Rationale: Regulations require that a No Action alternative be analyzed as a baseline against which the effects of the action alternatives can be measured or compared.

2.3.2 Alternative B – Proposed Action

Theme: Modify the vegetation structure of lodgepole pine stands to remove currently dead and MPB-infested trees, reduce future MPB risk to these stands, enhance aspen communities to provide for natural fuelbreaks and conserve the scenic recreation setting of the Vail Valley, and reduce hazardous fuels near communities while meeting Forest Plan guidance.

Overview: The MPB population in the Vail Valley is currently at epidemic levels. These large beetle populations are responding to the homogenous landscape-level forest conditions and climatic trends. Epidemic MPB populations are a natural component of lodgepole pine dominated ecosystems; however, such high levels can kill 50 to 70 percent of the mature lodgepole pine over vast areas, leaving few lodgepole pine more than 8 inches in diameter. High mortality in the lodgepole pine in the Vail Valley is becoming detrimental to scenic quality, recreational opportunities, and wildlife habitats in this highly valued area. As trees begin to die and fall, the ability to maintain acceptable fuel loads and user safety within the wildland urban interface also would be compromised.

There is a need to reduce the areas infested by MPB and modify the remaining stands' MPB risk in the Vail Valley. Manipulating lodgepole pine stand conditions in critical areas by creating a mosaic of forested ages, a variety of structural stages, and increasing the aspen component would work toward managing future MPB risk and wildland fuel hazard. Sanitation and salvage of stands with high levels of MPB damage would improve forest health by decreasing beetle population density within treated stands. There is also a need to maintain acceptable fuel loads at the wildland urban interface by removing dead, dying, and high-risk trees while they still have some economic value that would offset treatment cost.

Much of the shrublands in the Vail Valley are outside their historic range of variability (HRV) due to fire suppression and past management practices. This has resulted in homogenous, over-mature shrublands that pose a risk of higher intensity fires due to the buildup of hazardous fuels. Creating a mosaic of age and structural classes in the shrublands would reduce the intensity and severity of wildland fires and their detrimental effects to the local mountain communities, such as higher risk to firefighters, loss of homes, and landslides.

Under the Proposed Action, a variety of techniques would be used to reduce natural fuels, improve stand structure, species diversity, and consequently the health of the forest, while protecting the heritage, recreation, scenic, watershed, and wildlife resources.

Components: Vegetation management actions, including green tree removal, sanitation/salvage, felling in place, piling and burning, pruning, chipping, and prescribed burning, would be undertaken to improve forest health and reduce the accumulation of hazardous fuels near communities in the Vail Valley. The Proposed Action consists of lodgepole pine treatment units, aspen treatment units, and fuels treatment units, as shown on (**Figure 2-2**). In all, 3,000 acres of NF administered lands would be treated. However, this acreage estimate may vary by as much as 15 percent, as projects are implemented. It is estimated that 3,000 to 3,450 acres of treatments could be included in the Proposed Action.

Implementation of the management activities described in the Proposed Action must consider site-specific conditions and design criteria that would affect the actual extent of planned treatments. These include the size and distribution of areas that would be thinned, sanitized, salvaged, patch cut, mechanically treated, or burned. **Figure 2-2** shows the generalized boundaries of treatment units, however, the actual acreage treated within those boundaries would vary. Unlike proposed activities that have engineering designs before NEPA analysis occurs, such as ski area facilities, final layout of the management activities included in the Proposed Action must occur on-the ground after NEPA analysis is completed. This ensures that site-specific conditions can be considered and that all design criteria identified for the project can be met. For example, contracts for the sale of timber allow purchasers some flexibility during project implementation to determine the locations of temporary roads, landings, cable corridors, and skid trails, as long as design criteria specified by the Forest Service are met. The locations chosen would only be approved by the Forest Service after a field visit to assure design criteria or mitigations are met. Also, the exact size and configuration of a broadcast burn area cannot be determined before the burn occurs. It is not possible to predict exactly how many acres will be burned, especially for a highly successful burn where fire managers have the opportunity to take advantage of ideal burning conditions. For example, conditions such as fuel moisture or weather conditions may make it possible to treat additional acres while maintaining public safety and meeting project design criteria.

A variety of techniques would be used to improve stand structure and species diversity, and consequently, forest health in the Vail Valley while meeting Forest Plan guidance, including requirements for distribution of late-successional lodgepole pine across the WRNF. The techniques used would provide for the adaptive management of this area, as the MPB epidemic moves across the landscape and conditions change rapidly. The removal of lodgepole pine by thinning, sanitation, salvage, and patch cuts would treat existing areas of high MPB damage, manage future MPB risk, and help reduce fuel loads. Aspen communities would be enhanced by patch cuts, removal of conifers, and clearings along the margins of stands to restore the vigor of these communities and improve their function as natural fuelbreaks. Prescribed broadcast burning, mechanical treatments, and pile burning would reduce potential fuel loads.

Figure 2-1 Alternative A – No Action

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Figure 2-2 Alternative B – Proposed Action

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South of the I-70 corridor, treatments in lodgepole pine and aspen would affect 1,400 acres of NF administered lands. About half of these treatments would involve lodgepole pine near Minturn, which would be thinned, sanitized, salvaged, or patch cut. The remainder of the treatments south of the I-70 corridor would involve the enhancement of aspen in several areas by patch cuts, perimeter treatments, and prescribed burning.

North of the I-70 corridor, about 1,600 acres of shrublands, grasslands, and aspen would be managed to move them toward their HRV. Mechanical vegetation treatments and prescribed fire would be used to create a mosaic of age and structural classes that would reduce the intensity and severity of wildland fires at the wildland urban interface.

Lodgepole pine treatment units would not involve inventoried roadless areas as identified in the Forest Plan. The aspen and fuels treatment units would involve inventoried roadless areas. No permanent or temporary road construction or commercial timber harvest is proposed in inventoried roadless areas.

1. Lodgepole Pine Treatment Units

Treatment Units 101, 102, 103, 104, 105, 106, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, and 129 are described in **Appendix D**.

A portion of the dead, dying, and high-risk lodgepole pine in a limited number of stands (treatment units) that are currently under attack by MPB or are susceptible to infestations of MPB would be thinned, sanitized, salvaged, or patch cut to remove areas of high MPB damage, manage future MPB risk and lower fire hazards by reducing fuel loads. An estimated 750 acres near Minturn would be affected by lodgepole pine treatment activities, including thinning, sanitation, salvage, patch cuts, temporary roads, tractor trails, cable corridors, and landing sites. A commercial timber sale, which would provide for harvesting about 7,900 CCF (hundred cubic feet) of timber, would be planned to remove the trees. For comparison, this would represent 3,800 MBF (thousand board feet) of timber. Estimates of volume removed reflect treatments designed at the time of analysis. Conditions will change by the time of project implementation, especially the extent and damage of MPB. In response to these changing conditions, a larger volume may be removed to meet the purpose and need of the project. A flagger or safety signs would be positioned along roads and trails in the vicinity of treatment units (Grouse, West Grouse, Stone, and Martin) to notify the public of activity. No commercial timber harvest is proposed in the Meadow Mountain B inventoried roadless area. Field monitoring during project implementation would assure that ground fuels, or coarse woody debris (CWD), do not cause excessive fuel loading and are maintained at no more than 25 tons per acre and no less than 5 tons per acre. For comparison, an estimated 20 to 25 tons per acre of CWD (all diameter classes) currently exist, on average, in the proposed treatment areas. Only CWD that is three inches in diameter or less would contribute significantly to the ignition or spread of a wildland fire. This small-diameter CWD currently represents an estimated 30 percent (6 to 8 tons per acres) of the CWD in lodgepole pine treatment units. Monitoring during project implementation would assure that small-diameter CWD does not increase over time.

- Lodgepole pine treatment units would have a component of thinning, sanitation, and salvage treatments. Thinning and patch cuts would be used where live lodgepole pine exist. Where lodgepole pine are dead or dying, sanitation and salvage would be used. Where thinning is used, units would be thinned to leave approximately 50 to 70 percent of the basal area. Basal area is the sum of the cross-sectional areas of the individual trees measured 4.5 feet from the ground, and is described in square feet per acre. This equates to leaving from 150 to 300 trees per acre with a variable spacing of 15 to 30 feet between trees. For comparison, an average density of 432 trees per acre (TPA) would create a spacing of 10 by 10 feet between trees. Thinning would open up

the stands to increased sun and wind that would disrupt the MPB reproductive process. In areas of high MPB damage and mortality, sanitation and salvage treatment would be applied to remove up to 70 percent of the basal area. These treatments would remove the largest, most densely spaced lodgepole pines, the same conditions that favored MPB infestation. An estimated 700 acres near Minturn would be treated.

- In two areas where the DBH (diameter at breast height, 4.5 feet above the ground) of lodgepole pine is 10 to 11 inches or larger, small patch cuts would be made to remove the primary MPB host trees. These small patch cuts could vary from 2 to 10 acres, would be included in Units 104, 105, and 123, and would involve about 12 acres in all.
- Where mortality of lodgepole pine from ongoing MPB activity exceeds 50 percent and may approach 100 percent, additional trees could be identified for sanitation and salvage to improve forest health and fuels reduction. Salvage/sanitation of dead and/or beetle-infested lodgepole pine could occur outside identified treatment units with the following constraints:
 - Harvest would be limited to beetle-infested or dead trees.
 - Salvage/sanitation would only occur within the project area boundary.
 - Salvage/sanitation would not occur within inventoried roadless areas.
 - Only temporary roads, not system roads, would be permitted under adaptive management. Temporary roads for salvage/sanitation would be closed with deep scarification, water drainage, seeding, and slash during the same operating season they are used.
 - The Forest archaeologist will evaluate the need for additional surveys and clearance for areas entered under adaptive management.
- Existing National Forest System Roads (NFSRs) would be reconstructed to accommodate log hauling associated with lodgepole pine treatment units. NFSRs 733.1, 748.1, and 749.1 are authorized for the administration, protection, and utilization of public lands, but are not open for motorized public use in the summer and are managed as trails. During the winter these roads are open to snowmobiles and non-motorized uses. Reconstruction activities for NFSRs 733.1 (0.5 miles), 748.1 (5.5 miles), and 749.1 (1.6 miles) would include grading, upgrading, repairing and armoring water bars and dips, and improvement and installation of corrugated metal pipes at drainages. An estimated 7.6 miles of existing system roads would require reconstruction. An existing, unclassified road extending 1.2 miles beyond the end of NFSR 749.1 would require opening and pre-use maintenance as a temporary road (see below). About 2.2 miles of NFSR 733.1 were reconstructed in 2000 and would require very little additional work. Eagle Bend Drive (county road through Eagle-Vail) also would be used for access.
- An estimated 11 miles of temporary roads would be constructed to access the lodgepole pine treatment units and decommissioned after they are no longer needed. Decommissioning of the temporary roads would involve closure, obliteration, revegetation, visual screening, and drainage structures, as needed, and as specified by the design criteria for the project. No road construction is proposed in inventoried roadless areas. All proposed treatments and activities would follow Forest Plan guidelines for density of open motorized travelways in MAs 5.4 and 5.43.
- The Stone Creek Trail (FDT 2349) would be widened to accommodate log hauling and maintenance standards. This trail would be closed for one logging season (spring through fall) during lodgepole pine treatment activities in Units 101 and 102. The trail would be restored after its use for log hauling is completed.

2. Aspen Treatment Units

Treatment Units 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, and 214 are described in **Appendix D**.

A limited number of aspen stands would be enhanced as natural, forested fuelbreaks and to conserve the scenic recreation setting of the Vail Valley. Patch cuts in aspen would stimulate root growth. Lodgepole pine growing in the aspen stands and around the perimeter of the stands would be cut. The lodgepole pine and aspen that are cut would be bucked, lopped, and scattered in place within 24 inches of the ground surface to reduce the surface fuels near the Forest-urban interface boundary. Field monitoring during project implementation would assure that coarse woody debris (CWD) would not cause excessive fuel loading and would be maintained at no more than 40 tons per acre and no less than 3 tons per acre. Following treatment, CWD would increase in aspen stands in the Game Creek inventoried roadless area near the Vail Intermountain area. To lessen impacts on the roadless area, no trees will be removed, thus increasing CWD to approximately 40 tons per acre. The majority of the CWD would be greater than 3 inches in diameter, and only 30 percent would be less than 3 inches in diameter. Branches and limbs will be cut to create the shortest practical fuel depth. Only CWD that is three inches in diameter or less would contribute significantly to the ignition or spread of a wildland fire. Additionally, the proposed aspen treatment units are on north facing aspects with higher moisture. This will further reduce the risk from added CWD by increasing fuel moisture and increasing decomposition rates. For comparison, an estimated 20 tons per acre of CWD (all diameter classes) currently exist, on average, in the proposed treatment areas. The small-diameter CWD comprises an estimated 30 percent (6 tons per acre) of the CWD in aspen treatment units. Monitoring during project implementation would assure that small-diameter CWD does not increase over time.

Pure aspen stands would receive a series of up to 5- to 10-acre patch-cuts to create clearings and small openings that would stimulate root growth and maintain the aspen in a vigorous, healthy condition. These cuts would have a mix of treatments, from cutting all aspen trees to leaving a variable spacing of 10 to 50 feet between trees. The priority for cutting patches and openings would focus on the current condition of the aspen. Areas where the highest mortality has occurred would be cut first, while sites with healthy aspen and little mortality would not be cut at this time.

The perimeter of the aspen stands would be expanded by cutting up to 40 percent of the live lodgepole pine that are currently shading the ground surface. In mixed lodgepole pine and aspen stands, the live pines would be cut around the perimeter of the aspen patches for a distance of 1 to 2 tree lengths (120 to 160 feet) away from the aspen to allow sunlight to reach the ground to warm the soil and induce aspen suckering.

Treatments to reduce ground fuels would be designed to maintain or change the current fuel conditions to those represented by Fuel Models 1 and 8. Fuel Model 1 (Short Grass) is found in areas that have recently burned (1 to 20 years) or in open aspen stands. This fuel model has moderate flame length and the highest rate of spread of all the fuel models in the project area. However, fire behavior under extreme fire weather conditions is controllable by ground firefighting resources (especially fire engines) because of the relatively low fire intensity and high fireline production rate in this light fuel type. Fuel Model 8 (Short Needle Litter and Hardwood Litter) occurs in lodgepole pine stands and in aspen stands with a closed canopy. This fuel model has the lowest rate of spread and flame length. Fire behavior under extreme fire weather conditions is controllable by ground firefighting resources.

The affected aspen stands in the Vail Intermountain area and near Minturn include about 1,200 acres; however, only 360 acres would receive treatment.

- Aspen would be enhanced as forested fuelbreaks at the wildland urban interface near Vail Intermountain. As part of these treatments, ground fuels would be reduced within 120 to 160 feet of the boundary between private lands and the Game Creek inventoried roadless area on NF administered lands (Units 201, 202, 203, 204, 205, 206, 207, 208, and 209). About 210 acres within an area that encompasses approximately 500 acres would be treated. All work would be done by hand; no skid trails or heavy equipment would be involved. Along the boundary, trees would be pruned 12 feet from the ground and aspen would be enhanced by cutting the pines that are shading their roots. Aspen stand enhancement would involve cutting lodgepole pine within the aspen patches and within 1 to 2 tree lengths (120 to 160 feet) around the patch. Some patch cuts also would occur in aspen. These proposed treatments are within the Game Creek inventoried roadless area. No road construction is proposed and no log hauling would occur.
- In the vicinity of the lodgepole pine treatment units near Minturn, aspen would be enhanced where feasible for forested fuelbreaks (Units 210, 211, 212, 213, and 214). About 160 acres of approximately 700 acres contained in Units 210, 211, 212, 213, and 214 would be treated. Lodgepole pine would be cut from patches of aspen that exist within the larger stands of lodgepole pine. Pine trees would be cut within the aspen patches and within a distance of 120 to 160 feet from the patch to allow sunlight to warm the forest floor and stimulate aspen growth. Some patch cuts also would occur in aspen. Mechanical equipment may be used where road access is available or equipment can be walked across gentle slopes with no adverse effect on slope stability. No road construction is proposed.

3. Fuels Treatment Units

Treatment Units 301, 302, 303, 305, 306, 309, 310, 313, 411, 412, 514, 515, 617, 618, 619, and 620 are described in **Appendix D**.

Shrublands and a limited number of aspen stands would be managed to move them toward their HRV. Using mechanical vegetation treatments and prescribed fire, a mosaic of age and structural classes would be created to reduce the intensity and severity of wildland fires at the wildland urban interface. Treatments would be designed to change current fuel conditions. Approximately 1,900 acres of vegetation management are proposed. No road construction is proposed. About 1,300 acres of proposed treatments would be within inventoried roadless areas (Buffer Mountain, Spraddle Creek B, or Corral Creek). Approximately 500 acres of broadcast burning is proposed within the Eagles Nest Wilderness. The proposed treatments are summarized below:

- Nearly 600 acres of shrublands containing sagebrush, aspen, serviceberry, rabbitbrush, mountain mahogany, conifers, and grasslands would be broadcast burned. This would change existing fuel types, which would reduce potential wildland fire intensity and aid firefighters in wildland fire suppression. Treatments would be designed to change current fuel conditions to those represented by Fuel Models 1, 5 and 8. Fuel Model 1 (Short Grass) is found in areas that have recently burned (1 to 20 years) or in open aspen stands. This fuel model has moderate flame length and the highest rate of spread of all the fuel models in the project area; however, fire behavior under extreme fire weather conditions is controllable by ground firefighting resources (especially fire engines) because of the relatively low fire intensity and high fireline production rate in this light fuel type. Fuel Model 5 (Low Shrubs) is primarily made up of serviceberry/mountain mahogany and has a moderate rate of spread and flame length. Fire behavior under extreme fire weather conditions can make control by ground firefighting resources difficult. Normally, defending structures in the wildland urban interface would be fairly difficult in these fuels; however, because there is more exposed ground in this fuel model, within the project area, structures could be more easily defended. Fuel Model 8 (Short Needle Litter and Hardwood Litter) is the predominant model in lodgepole pine stands and in aspen stands with a closed canopy. This fuel model has the lowest rate

of spread and flame length. Fire behavior under extreme fire weather conditions is controllable by ground firefighting resources.

- Decadent aspen would be broadcast burned in Unit 313 (325 acres) to maintain and improve aspen stands and create a forested fuelbreak between conifer stands and the town of Vail. This proposed treatment is partially within the Game Creek inventoried roadless area. No road construction is proposed.
- Units 411 and 412 (520 acres), located in the Eagles Nest Wilderness and within the wildland urban interface, would be broadcast burned to maintain and improve aspen stands, reducing potential wildland fire intensity and allowing fire to play a more natural role in the future. This would create a forested fuelbreak between conifer stands and the town of Vail. Treatment of these units also would facilitate future wildland fire use; the fuelbreak created might allow forest managers to allow a wildland fire that started in a wilderness area to burn in non-critical, pre-determined areas, while monitoring for unacceptable impacts. No mechanical treatments are proposed within Eagles Nest Wilderness.
- Areas just outside the Eagles Nest Wilderness (Units 514 and 515, 230 acres) and within the wildland urban interface, would be treated to maintain and improve aspen stands, reducing potential wildland fire intensity. Dead trees would be cut, piled, and burned. The area would then be broadcast burned. This would create a forested fuelbreak between conifer stands and the town of Vail that would facilitate future wildland fire use in the wilderness.
- Units 617, 618, 619, and 620 (230 acres) within the wildland urban interface would be treated to maintain and improve aspen stands and reduce fuel loads near private lands, reducing potential wildland fire intensity and rate of spread. Aspen would be patch cut and all conifers would be cut. Trees that are cut within 500 feet of private lands would be piled and burned. This would create a forested fuelbreak between conifer stands and the town of Vail.

4. Proposed Sale Area Improvement Projects

As authorized in the Knutson-Vandenberg Act of 1930 (KV), a portion of the timber receipts from commercial timber harvests would be deposited in a cooperative account for future use in improving existing structures and renewable natural resources within sale boundaries. These proposed projects are listed in order of priority in **Table 2–1**, Sale Area Improvement (KV) Projects. Accomplishment of these projects is dependent upon KV collections and appropriated funding. These projects will be included in the Sale Area Improvement Plan, which is required to receive and disperse KV funds.

Table 2–1 Sale Area Improvement (KV) Projects

Project	Description
1. Regeneration Surveys –1 st , 3 rd , 5 th year	Monitor regeneration survival in treatment units 104, 105 and 123 on the 1 st , 3 rd , and 5 th year after final harvest.
2. Noxious Weed Treatment – 1 st through 3 rd years	
3. Grouse Creek Bank Stabilization/Fish Habitat Enhancement	Construct water bars on the Grouse Creek Trail (FDT 2127) in Section 27 to re-direct flow and sediment away from channel; install log vanes near eroding banks to reduce erosion, re-direct flow, and enhance pool habitat; and revegetate bank areas with willow or other appropriate species. Replace stream crossing in Section 28

Project	Description
	on NFSR 749 to allow fish passage and reduce upstream aggradation and downstream erosion by matching stream bed elevation and gradient with a new crossing. Remove sheet piling from non-functioning wier in Section 27 below trail bridge near confluence of Grouse and West Grouse Creeks.

Discussion: Vegetation structure of lodgepole pine stands would be modified to reduce future MPB risk to these stands by management activities such as thinning, sanitation, salvage, and patch cuts in lodgepole pine. Potential fuel loads would be reduced by management activities such as prescribed burning, salvage, and mechanical treatment. Aspen stands would be enhanced as natural fuelbreaks that also conserve the scenic recreation setting of the Vail Valley.

Rationale: Alternative B fully responds to the purpose of and need for action identified in Chapter 1, to modify MPB activity, enhance aspen communities, and reduce hazardous fuels in the Vail Valley while meeting Forest Plan direction.

2.3.3 Alternative C

Theme: Reduce health and safety risks from smoke and reduce conflicts with recreation use on Stone Creek, Pitkin Creek, and Bighorn Creek trails.

Overview: Alternative C would require special design of the logging system to remove lodgepole pine from above in Units 101 and 102, so that the Stone Creek Trail (FDT 2349) would not be used to haul timber. No prescribed broadcast burning would occur under this alternative. Mechanical treatments and pile burning would be used in treatment units outside designated wilderness to reduce hazardous fuels. No fuels treatments would occur within the Eagles Nest Wilderness. Other components of Alternative C would be the same as Alternative B.

Components: The Stone Creek Trail (FDT 2349) would not be used to haul timber; however, up to an additional 3,600 feet of temporary tractor haul roads (up to 500 feet above Unit 101 and up to 3,100 feet above Unit 102) would be required under Alternative C. No broadcast burning would occur in designated wilderness (Units 411 and 412). Mechanical treatments and pile burning would be used in the following treatment units identified for prescribed broadcast burning under Alternative B (Units 301, 302, 303, 305, 306, 309, 310, and 313). Components of Alternative C are shown in **Figure 2-3** and **Appendix D**.

Discussion: Vegetation structure of lodgepole pine stands would be modified to reduce future MPB risk to these stands by management activities such as thinning, sanitation, salvage, and patch cuts in lodgepole pine; however, removal of lodgepole pine from Units 101 and 102 in the Stone Creek area may not be possible to implement as an economically feasible commercial timber sale, as a cable logging system and an adverse haul (uphill haul) on tractor trails would be required. The Forest Service’s authority for service contracting could be utilized to implement the removal of lodgepole pine from any units where the combined effects of design criteria and mitigation measures would adversely affect the economics of the planned harvest. Potential fuel loads would be reduced by management activities such as pile burning and mechanical treatment instead of prescribed burning in Units 301, 302, 303, 305, 306, 309, 310, and 313. In the vicinity of the Eagles Nest Wilderness, fuels treatments in Units 411 and 412 would be eliminated, and only limited pile burning and mechanical treatments in Units 514 and 515 would be included under Alternative C. Aspen stands would be enhanced as natural fuelbreaks, as Units 617, 618, 619, and 620 would remain unchanged from Alternative B.

Figure 2-3 Alternative C

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Rationale: Alternative C responds to some health and safety aspects of the Fuels Management and Wildland Fire Hazard issue and the use conflicts associated with the Recreation/Trails issue. Alternative C responds, in part, to the purpose of and need for action identified in Chapter 1, to modify vegetation structure of lodgepole pine stands to reduce future MPB risk, enhance aspen communities, and reduce hazardous fuels in the Vail Valley. Alternative C eliminates Units 411 and 412 within the Eagles Nest Wilderness, and would not facilitate wildland fire use (a naturally ignited wildland fire allowed to burn in pre-determined areas, while monitoring for unacceptable impacts.) Without the fuelbreak, a naturally ignited wildland fire within the designated wilderness would be far less likely to be managed as a wildland fire use incident, and the vegetation would continue to trend outside the HRV.

2.3.4 Alternative D

Theme: Reduce visual effects on roadless area characteristics that are associated with the cutting of trees. Potentially affected roadless area characteristics would include: recreation opportunities in the primitive, semi-primitive non-motorized, and semi-primitive motorized classes; reference landscapes; scenic integrity; traditional cultural properties; sacred sites; and other unique characteristics.

Overview: Alternative D differs from Alternative B in that no cutting of trees in inventoried roadless areas would occur beyond a 200-foot buffer along the boundary between NF administered lands and private lands. Other components of Alternative D would be the same as Alternative B.

Components: No trees would be cut in inventoried roadless areas beyond the 200-foot interface between NF administered lands and private lands. This would eliminate aspen enhancement efforts in Units 201, 203, 204, 205, 206, 207, 208, and 209 in the Game Creek inventoried roadless area and Unit 620 in the Buffer Mountain inventoried roadless area. Units 618 and 619 in the Spraddle Creek B inventoried roadless area would be greatly reduced in size. Fuel treatments in Unit 412 (Eagles Nest Wilderness) and Unit 515 (Corral Creek inventoried roadless area) also would be eliminated. The components of Alternative D are shown in **Figure 2-4** and **Appendix D**.

Discussion: Vegetation structure would be modified in lodgepole pine stands by management activities such as thinning, sanitation, salvage, and patch cuts in lodgepole pine to reduce future MPB risk, as lodgepole pine treatment units would not differ from Alternative B. Potential fuel loads would be reduced by management activities, such as prescribed burning and mechanical treatment, as Units 301, 302, 303, 305, 306, 309, 310, and 313 would not differ from Alternative B. Not all treatments proposed under Alternative B would be included in Alternative D. In the vicinity of the Eagles Nest Wilderness and Corral Creek inventoried roadless area, two treatment units would be eliminated (Units 412 and 515) and only two treatment units are proposed (Units 411 and 514). Aspen stands would be enhanced as natural fuelbreaks; however, the cutting of trees within inventoried roadless areas would be limited to a 200-foot wide interface between National Forest administered lands and private lands. Units 201, 203, 204, 205, 206, 207, 208, and 209 in the Vail Intermountain area are located within the Game Creek inventoried roadless area and would be dropped. Units 618D and 619D in the Spraddle Creek B inventoried roadless area would be greatly reduced in size (over Units 618 and 619 under the Alternative B), as all treatment acres more than 200 feet inside the roadless area boundary would be dropped. Unit 620, located within the Buffer Mountain inventoried roadless area, also would be dropped.

Rationale: Alternative D responds to the Roadless Areas issue of cutting trees in inventoried roadless areas; however, it responds only in part to the purpose and need, of modifying future MPB risk and reducing hazardous fuels in the Vail Valley. Although future MPB risk would be modified by management activities, enhancement of aspen stands that provide natural fuelbreaks near the town of Vail would not be very extensive.

2.3.5 Design Criteria

Design criteria are specific project design features that are incorporated within the proposed action and alternatives. They provide specific guidance on project implementation, and become part of the decision made and the project implementation plan. Design criteria for each of the action alternatives are presented in **Appendix D** by alternative, treatment unit type, and resource topic.

2.3.6 Monitoring Requirements

Monitoring would be conducted during project implementation to assure that design criteria are followed and are adequate. The following monitoring requirements would apply to all action alternatives and would support the design criteria listed in the preceding section.

All Treatment Units

1. Disturbed areas will be monitored during reclamation activities to achieve 70 percent cover (as compared with nearby undisturbed areas).
2. Monitoring will be conducted to verify that a buffer of untreated land that is 100 feet wide (or equal to the mean height of mature dominant late-seral vegetation, whichever is more) is maintained on either side of intermittent and perennial drainage channels.
3. Stream health will be monitored in drainages potentially affected by treatments.
4. For a minimum of 3 years, the Forest Service will monitor and treat new infestations of noxious weeds in treatment units and along travel routes.
5. Dead and down lodgepole pine will be monitored for fuel build-up. The vertical arrangement will be reduced, if necessary.
6. A site-specific, project-level monitoring and evaluation plan for scenic integrity will be developed and implemented.

Lodgepole Pine Treatment Units

1. The Forest Soil Scientist will monitor skid trails and landings to determine whether excessive or detrimental soil compaction is occurring, and determine whether these sites should be ripped to a depth of 12 to 18 inches after use.
2. Monitoring will be conducted to verify that construction of landings, temporary roads, and tractor or skid trails is avoided within or within 200 feet up-gradient of existing rotational slumps and landslides and areas identified as high stability hazard areas or prominent landslide features.
3. Monitoring will be conducted to verify that construction of landings, roads, or tractor and skid trails is avoided within 100 feet (or a distance equal to the mean height of mature dominant late-seral vegetation, whichever is more) of perennial seeps, springs, wetlands, and intermittent and perennial drainage channels.

Figure 2-4 Alternative D

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4. Field monitoring during project implementation will assure that ground fuels, or coarse woody debris (CWD), do not cause excessive fuel loading and are maintained at no more than 25 tons per acre and no less than 5 tons per acre. An estimated 20 to 25 tons per acre of CWD (all diameter classes) currently exist, on average, in the proposed lodgepole pine treatment areas. Only CWD that is three inches in diameter or less would contribute significantly to the ignition or spread of a wildland fire. This small-diameter CWD currently represents an estimated 30 percent (6 to 8 tons per acre) of the CWD in lodgepole pine treatment units. Monitoring during project implementation will assure that small-diameter CWD does not increase over time.
5. Treatment units will be monitored for windthrow events and hazards.
6. Monitoring of the success of the proposed prescription will include field evaluations 1 year post-treatment, and then at 5-year intervals. Monitoring items will include evaluation of fuel accumulation, arrangement, and location with respect to standing dead or dying trees and effect of treatments on mountain pine beetle (MPB) activity.
7. Monitoring will be conducted to verify that temporary roads are not constructed within 300 feet of occupied or known historic boreal toad and leopard frog breeding sites to prevent direct mortality and disturbance of adjacent vegetation during construction and trail use.
8. Monitoring will be conducted to verify that temporary roads are not constructed within 150 feet of the edge of the current or historic floodplain to maintain hydrologic function and limit road-related stream sediment.
9. An archaeologist will monitor all mitigation activities and construction activities.
10. Management activities will be monitored to assess potential damage to historical sites 5EA1555 and 5EA2114 from logging traffic.
11. Monitoring will be conducted to verify compliance with design criteria during construction, use, and decommissioning of temporary roads.

Aspen Treatment Units

1. Field monitoring during project implementation will assure that coarse woody debris (CWD) will not cause excessive fuel loading and will be maintained at no more than 40 tons per acre and no less than 3 tons per acre. An estimated 20 tons per acre of CWD (all diameter classes) currently exist, on average, in the proposed aspen treatment areas. Only CWD that is three inches in diameter or less would contribute significantly to the ignition or spread of a wildland fire. This small-diameter CWD currently represents an estimated 30 percent (6 tons per acre) of the CWD in aspen treatment units. Monitoring during project implementation will assure that small-diameter CWD does not increase over time.
2. Field monitoring during project implementation will assure that mechanical equipment can be walked across gentle slopes with no adverse effect on slope stability.
3. Monitoring of the success of the proposed prescription will include field evaluations 1 year post-treatment, and then at 5-year intervals. Monitoring items will include:
 - Evaluation of aspen sprouting and suckering at the expanded perimeter and within aspen clones. Regeneration will be mapped and monitored with permanent photo points.

- Assessment of the effectiveness of using felled trees as a barrier to aspen browse by big game.
- Assessment of conifer regeneration in the aspen-lodgepole pine interface to determine if additional silvicultural treatments targeting conifers will be necessary to maintain a single-story condition.
- Evaluation of fuel accumulation, arrangement, and location with respect to standing dead or dying trees.

Fuels Treatment Units

1. Monitoring of the success of the proposed prescription will include field evaluations 1 year post-treatment, and then at 5-year intervals. Monitoring items will include:
 - Evaluation of aspen sprouting and suckering in aspen patch cuts. Regeneration will be mapped and monitored with permanent photo points.
 - Assessment of the effectiveness of using felled trees as a barrier to aspen browse by big game.
 - Evaluation of fuel accumulation, arrangement, and location with respect to standing dead or dying trees.
 - Assessment of the fuel model (type).

2.3.7 Mitigation Measures

During project implementation, as design criteria are found to be inadequate through monitoring due to incomplete data available when design criteria were developed, changed conditions, or unforeseen circumstances, mitigation measures will be developed and implemented. During the development of the Proposed Action, some concerns were identified that may require mitigation measures during project implementation. These potential mitigation measures would apply to all action alternatives and would support the design criteria and monitoring requirements for project implementation that are listed above.

All Treatment Units

1. Prior to implementation of vegetation treatments, an onsite slope stability exam will be conducted in areas identified as potentially unstable to identify mitigation measures that would apply. Potentially unstable land is described as having a “high” or “very high” instability ranking or classification as “unstable” or “marginally stable.”
2. If effects to MIS or to migratory birds, nests, or eggs are observed during project activities, the Forest Service will be notified and specific mitigation measures directed at that species will be implemented under direction of the Forest Service.
3. Heritage staff will designate protection zones around significant heritage resources within treatment units. All sites eligible for the National Register will require protection and avoidance using a physical boundary of 100 feet or more.
4. Implementation of management activities will include measures to minimize impacts to recreationists, existing special use authorizations/improvements, and existing mining claim corners and workings.

Lodgepole Pine Treatment Units

1. When construction of landings, roads, or tractor and skid trails cannot be avoided within 100 feet (or a distance equal to the mean height of mature dominant late-seral vegetation, whichever is more) of perennial seeps, springs, wetlands, and intermittent and perennial drainage channels, crossings will be constructed and restored to prevent headcutting, gullying, erosion, or sediment transport.
2. Where road drainage is located closer than 100 feet from streams, other mitigation will be used such as surfacing with 1 to 3 inches of gravel, constructing sediment traps, or windrowing slash. If sediment traps are used, they will be keyed into the ground and cleaned out when they are 80 percent full.
3. Mitigation measures for heritage resource sites 5EA1555 and 5EA2114 will include padding the sites with a geotextile cloth overlain with soil.
4. If necessary, dust abatement measures would include application of magnesium chloride in accordance with approved procedures.

Aspen Treatment Units

To prevent excessive fuel loading, implementation of management activities would include measures that establish limitations on CWD in the Vail Intermountain area after aspen treatments.

Fuels Treatment Units

1. To mitigate smoke impacts, implementation of management activities would include signage along I-70, wind direction prescriptions required prior to ignition, and smoke monitors on I-70, as needed.
2. Implementation of management activities will include measures to assure the recovery of burned areas, including scarification, seeding, and sediment structures, if needed.

2.4 RANGE OF ALTERNATIVES

The range of alternatives considered in this analysis was determined from the scope of the proposed project and the purpose of and need for action. The issues described in Chapter 1 largely defined this scope. In addition to the alternatives considered in detail, the alternatives eliminated from further consideration contributed to the reasonable range of alternatives even though they are not analyzed in detail.

A principal influence on the range of alternatives was Forest Plan direction, consisting of goals and objectives, Forest-wide and MA standards and guidelines, and the desired conditions of MAs. Other influences included technical and economic viability, federal laws, regulations, and policies, and the requirements of local jurisdictions. Within these parameters, the alternatives developed by the IDT display a reasonable range of outputs, treatments, costs, management requirements, mitigation measures, and effects on resources.

The NFMA requires National Forests to be managed in accordance with an approved Forest Plan, which must be revised periodically. The Forest Plan for the WRNF was revised in 2002, and contains the management vision and guidance for the Forest. The IDT has modified the proposed action until all guidance contained in the Forest Plan can be met. Other alternatives that are not fully consistent with Forest Plan guidance would not make an additional contribution to the reasonableness of the range of alternatives unless key issues are addressed.

2.5 COMPARISON OF ALTERNATIVES

Comparisons of the proposed activities, achievement of purpose and need, and environmental effects for Alternative A – No Action, Alternative B – Proposed Action, Alternative C, and Alternative D provide an understanding of the similarities and differences that exist among them.

2.5.1 Proposed Activities

Table 2–2 summarizes the activities included in each alternative analyzed in detail.

Table 2–2 Comparison of Activities

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
Lodgepole Pine Treatment Units (100s)				
Lodgepole Pine Treatments (acres)	X	700	700	700
Stone Creek Trail Temporary Road (miles)	X	1.1	X	1.1
Potential Temporary Roads Connecting Unit 101 with Unit 105, and Unit 102 with Unit 104 (miles)	X	X	0.7	X
Other Potential Temporary Roads (miles)	X	10	10	10
Road Reconstruction (all types, in miles)	X	8.8	8.8	8.8
Potential Cable Corridors and Tractor Trails (miles)	X	2.5	4.3	2.5
Potential Landing Sites (number)		10	12	10
Total Acres – Lodgepole Pine Treatment (Including all types of disturbance)	X	750	750	750
Volume Harvested (CCF)	X	7,900	7,900	7,900
Acres Treated in Designated Wilderness	X	0	0	0
Acres Treated in Inventoried Roadless Areas	X	0	0	0
Aspen Treatment Units (200s)				
Patch Cut Aspen and Pine/Leave (acres)	X	160	160	160
Aspen Stand and Perimeter Treatments, Wildland Urban Interface/Leave (acres)	X	210	210	50
Total Acres – Aspen Treatment	X	370	370	210
Acres Treated in Designated Wilderness	X	0	0	0
Acres Treated in Inventoried Roadless Areas		210	210	50
Fuels Treatment Units (300s to 600s)				
Broadcast Burn (shrublands outside wilderness with significant aspen component) (acres)	X	560	X	560
Broadcast Burn (shrublands inside wilderness with significant aspen component) (acres)	X	520	X	120
Broadcast Burn (shrublands outside wilderness with no significant aspen component) (acres)	X	350	X	350
Mechanical Treatments (shrublands outside wilderness with significant aspen component), outside wilderness (acres)	X	X	560	X
Mechanical Treatments (shrublands outside wilderness with no significant aspen component) (acres)	X	X	350	X
Patch Cut Aspen and Pine/Pile and Burn (outside wilderness) (acres)	X	230	460	60
Cut Dead Aspen and Pine/Pile and Burn/Broadcast Burn (outside wilderness) (acres)	X	230	0	60
Acres Treated in Designated Wilderness	X	520	0	120
Acres Treated in Inventoried Roadless Areas	X	1,300	1,300	930
Total Acres – Fuels Treatment	X	1,900	1,400	1,200
Total Acres – All Treatments	0	3,000	2,500	2,200

Notes: X = not included or applicable to an alternative
All acreages are rounded off

2.5.2 Achievement of Purpose and Need

The purpose of and need for action described in Chapter 1 can be summarized by the following comparison elements:

- Modify Forest Structure to Manage Future MPB Risk
- Enhance Aspen Communities to Restore Vigor and Provide for Natural Fuelbreaks
- Reduce Hazardous Fuels Near Communities
- Protect and Conserve Vail Valley Recreation Setting and Its Resources
- Improve Forest Health by Improving Stand Structure and Species Diversity
- Meet All Forest Plan Guidance

The responsiveness of each alternative analyzed in detail to the purpose of and need for action is compared by these elements in **Table 2–3**.

Table 2–3 Achievement of Purpose and Need

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
Modify Forest Structure to Manage Future MPB Risk	0 acres	750 acres	750 acres	750 acres
Enhance Aspen Communities to Restore Vigor and Provide for Natural Fuelbreaks	0 acres	370 acres	370 acres	210 acres
Reduce Hazardous Fuels Near Communities	0 acres	1,900 acres	1,400 acres	1,200 acres
Protect and Conserve Vail Valley Recreation Setting and Its Resources	Yes	Yes	Yes	Yes
Improve Forest Health by Improving Stand Structure and Species Diversity	No	Yes	Yes	Yes
Meet Forest Plan Standards	Yes	Yes	Yes	Yes

2.5.3 Environmental Effects

The environmental effects of each alternative analyzed in detail are summarized in **Table 2–4** in a format that facilitates a comparison among the alternatives.

Table 2-4 Comparison of Environmental Effects

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
THE PHYSICAL ENVIRONMENT				
Air				
Project-related emissions of fine particles, PM ₁₀ and PM _{2.5} (tons) and carbon monoxide	No effect in the absence of a wildland fire; a large stand-replacing wildland fire would contribute considerable emissions of smoke to the local air shed for up to several weeks.	Effects of wildland fire similar to Alternative A, but reduced fuel loads may lessen the severity or extent of the burn. Treats the most acres through prescribed fire and would result in greatest concentrations of air pollutants of the three action alternatives. Prescribed broadcast burns and pile burns would remove additional fuels. Although prescribed fires would generate emissions of air pollutants, these controlled burns would lower the probability of greater emissions from uncontrolled wildland fires.	Effects of wildland fire similar to Alternative A, but reduced fuel loads may lessen the severity or extent of the burn. Prescribed fires would include only pile burns. Pile burns associated with this alternative should have the most effective combustion and air pollutant dispersion.	Second largest acreage of prescribed fires would be conducted as broadcast burns and pile burns. Effects would be similar to those described for Alternative B, with fewer emissions.
Total project-related emissions PM ₁₀ (tons)	0	505.7	194.4	271.3
Annual project-related emissions PM ₁₀ (tons)	0	253	97	135
Total project-related emissions PM _{2.5} (tons)	0	429.3	165.0	230.3
Annual project-related emissions PM _{2.5} (tons)	0	215	83	116
Total project-related emissions Carbon Monoxide (CO)	0	5,562.9	2,117.3	2,969.0

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
Annual project-related emissions Carbon Monoxide (CO)	0	2,782	1,059	1,484
Streams and Watershed				
Effects on connected disturbed areas (CDA)	No effect	No increase in CDA expected due to implementation of best management practices (BMPs) and design criteria.	Same as Alternative B with the potential to affect an additional 2 acres in the Stone Creek area.	Same as Alternative B except fewer acres in aspen and fuels units would be treated.
Effects on stream network expansion (SNE)	No effect	SNE in Grouse Creek watershed would increase by 1 percent due to the construction of a temporary road above West Grouse Creek to reach Unit 116. Effects would be short term because the road would be decommissioned following use.	Same as Alternative B with the potential to affect an additional 2 acres in the Stone Creek area; BMPs and design criteria would prevent any increase in SNE above 1 percent.	Same as Alternative B except fewer acres in aspen and fuels units would be treated.
Long term effects on stream health class	In the absence of a wildland fire, the factors affecting stream health class would not change over the short-term. A high-intensity fire in the water influence zone (WIZ) would increase the transportation of sediments, adversely affecting stream health. MPB mortality of 30 to 70 percent or more would increase sediment yield.	Effects of wildland fire similar to Alternative A, but reduced fuel loads may lessen the severity or extent of the burn. Effects of MPB mortality would be reduced if future risk of outbreak is reduced. No effect on stream health class expected due to implementation of best management practices (BMPs) and design criteria.	Same as Alternative B with the potential to affect an additional 2 acres in the Stone Creek area; BMPs and design criteria would prevent any additional effects to stream health class.	Same as Alternative B except fewer acres in aspen and fuels units would be treated.
Geology and Soils				
Potential soil disturbance during project (acres)	0	3,000	2,500	2,200
Soil disturbance 20 years post-treatment (acres)	0	0	0	0

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
Effects on Slope Hazard Areas and Existing Landslide Areas	No short-term effect in the absence of a wildland fire; over long-term, aging lodgepole pine stands could increase the frequency or magnitude of slope failures by increasing soil saturation and runoff on slopes.	Proposed treatments could activate or contribute to the activation of new or existing landslides, damaging property, structures, and the I-70 corridor. Most treatment units are located upslope or adjacent to medium and high slope hazard areas. Design criteria would minimize slope movements that could be related to implementation of the proposed project. Landslides and high slope hazard areas would be avoided. Treatments would not occur within 200 feet upgradient of existing rotational slumps and landslides, areas classified as high slope stability hazards, or prominent landslide features. These measures should reduce the likelihood of slope movements caused by project activities.	Same as Alternative B	Same as Alternative B
Treatments in existing landslide areas (acres)	0	Lodgepole Pine Units – 1 Aspen Units – 90 Fuels Units – 0	Same as Alternative B	Lodgepole Pine Units – 1 Aspen Units – 40 Fuels Units – 0
Treatments in moderate slope hazard areas (acres)	0	Lodgepole Pine Units – 360 Aspen Units – 120 Fuels Units – 1,600	Lodgepole Pine Units - 360 Aspen Units – 120 Fuels Units – 1,200	Lodgepole Pine Units – 360 Aspen Units – 60 Fuels Units – 1,000
Treatments in high slope hazard areas (acres)	0	Lodgepole Pine Units – 10 Aspen Units – 200 Fuels Units – 170	Lodgepole Pine Units – 10 Aspen Units – 200 Fuels Units – 100	Lodgepole Pine Units – 10 Aspen Units – 100 Fuels Units – 100
Treatments in sensitive soil areas (acres)	0	2,295	1,800	1,585

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
<p>Effects on erosion and sedimentation</p>	<p>No effect on soil erosion or soil compaction. A large wildland fire covering 24,000 acres could produce 9 tons per acre per year (or 200,000 tons or more) of sediment in the first year following the fire.</p> <p>Soil erosion could initially be very high after a stand-replacing wildland fire.</p> <p>Runoff could increase due to the exposure of mineral soils to erosion, and the formation of hydrophobic (water-repellent) soils. Precipitation events following fires also can result in severe soil erosion.</p> <p>Wildland fire would temporarily increase soil nitrogen and phosphorus. A severe fire would remove soil organic matter and would likely reduce CWD and the overall nutrient status of the soil in the long-term.</p>	<p>Effects of wildland fire similar to Alternative A, but reduced fuel loads may lessen the severity or extent of the burn, reducing soil loss.</p> <p>Effects from treatments would be relatively localized and short-term (e.g. less than 3 years in the case of erosion). Design criteria would reduce short-term and long-term effects.</p> <p>Lodgepole pine treatments would accelerate erosion, cause compaction, modify surface drainage patterns, and disrupt vegetation, surface litter, and soil organic matter. These effects would be relatively localized and short-term.</p> <p>Aspen treatments could disturb potentially unstable slopes. Use of machinery in treatment units near Minturn could compact soil or cause erosion.</p>	<p>Same as Alternative B, with the following exception. No broadcast burning would be involved.</p> <p>Use of machinery to conduct mechanized treatments, such as pruning chipping, or piling, could compact soil or cause erosion in areas disturbed during project activities.</p>	<p>Same as Alternative B</p>

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
Effects on erosion and sedimentation (cont.)		Pile burning and broadcast burning associated with fuels treatments could create isolated pockets of detrimental burning, which would remove the majority of the vegetation and soil organic matter and may increase water repellency of soils, thereby increasing runoff and erosion potential. Prescribed burns conducted so that organic matter on the forest floor is not fully consumed would result in minimal nutrient loss.		
Soil erosion from treatment units, post-treatment (tons per acre per year)	0.04	3.7	2.9	2.8
Soil erosion from treatment units, 20 years post-treatment (tons per acre per year)	0.04	0.5	0.4	0.3
BIOLOGICAL ENVIRONMENT				
Biodiversity				
Effects on species mix of animals and plants	Biodiversity would change over time as natural processes, ongoing activities, and fire suppression influence species composition and presence or absence in the project area. Natural ecological disturbances would continue be the dominant agent of change affecting biodiversity.	Alternative B would affect a wide range of species and habitats. Portions of communities would be removed by thinning or burning; however, permanent conversion of any community type would not occur. Wildlife sensitive to disturbance would be displaced, but would return following project activities.	Same as Alternative B except would eliminate fuels reduction in the Eagles Nest Wilderness.	Same as Alternative B, except that the number of acres of aspen enhancement would be greatly reduced. As a result, natural succession of aspen stands to conifers would become more prevalent in the Vail Intermountain area over the long-term.

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
Effects on species mix of animals and plants (cont.)		<p>Enhancement of aspen as natural fuelbreaks would renew aspen stands and limit the invasion of conifers, which would contribute to the biodiversity of the area by retaining aspen stands that are characteristic of the historic range of variability (HRV).</p>	<p>Fuels would be reduced by mechanical treatments and pile burning, which would not simulate natural disturbance by wildland fire, and therefore, would not move treatment units toward desired conditions.</p> <p>Use of mechanical treatments would prevent adverse effects on wildlife unable to escape broadcast burns and those sensitive to heat or smoke.</p> <p>Mechanical fuel reduction would require a longer human presence in the treatment units than would broadcast burning.</p>	
Effects on retention of snags, woody debris and snag recruitment	<p>Snags caused by MPB infestation would remain and deteriorate naturally. Continued MPB activity would add to the snag density over time.</p>	<p>Merchantable snags greater than 9 inches DBH and less than 15 years old would be salvaged from all lodgepole pine and aspen treatment units.</p> <p>The largest, live, green trees would be retained for future snag recruitment to maintain habitat diversity. Endemic MPB would create snags as infestations progress. Excessive ground fuels (downed woody debris) would be removed from lodgepole pine stands to reduce potential fire intensity.</p> <p>Aspen treatments in the Vail Intermountain area would leave all cut trees in the stands to lessen effect on roadless characteristics.</p>	<p>Same as Alternative B</p>	<p>Same as Alternative B except that trees would not be cut within inventoried roadless areas, except along boundaries. Natural succession of aspen stands to conifers would become more prevalent and fuel loads would increase over time.</p>

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
Effects on late successional and old growth components	<p>Would not alter the distribution of late successional habitats. Late successional areas would not significantly change without a disturbance such as wildland fire, blow down, or insect outbreak.</p> <p>There are no identified old growth components in the project area.</p>	<p>Thinning treatments would reduce some stands from habitat structural stage (HSS) 4C to 4B, but not to 4A or below. The proportion of late successional area within each LSAA in the project area would not change.</p> <p>Patch cuts would result in more early successional aspen and lodgepole pine. Vegetation management would simulate natural disturbances, provide adequate late successional structure in stands, and would maintain fire-dependent ecosystems over the long-term.</p>	Same as Alternative B	Same as Alternative B
Effects on ecosystem health	<p>MPB would continue to impact currently infested lodgepole pine stands, and likely would spread to uninfested stands. There would be no reduction of fuels or enhancement of fuelbreaks. Wildland fire hazards would increase over time as fuel levels increase.</p>	<p>Thinning would hinder MPB spread within a stand, reducing the severity of future infestations. Removal of accumulated fuels in a controlled manner by prescribed burning and mechanical treatment would preserve desired ecosystem components and sensitive areas.</p> <p>Fuel reduction in sagebrush- and rabbit-brush dominated communities would remove successional pressure from western juniper and allow sagebrush to maintain dominance.</p>	Same as Alternative B	Same as Alternative B except that aspen stands would not be enhanced within inventoried roadless areas. As a result, natural succession of aspen stands to conifers would become more prevalent over time.
Vegetation				
Change in forested cover types	Succession of aspen stands to conifers would become more prevalent over time.	Treatments would not alter species diversity, but would result in a more disturbance-resistant stand structure by decreasing tree density. Aspen treatments would positively affect forest cover types by improving aspen stand health.	Same as Alternative B	Same as Alternative B except that fewer aspen stands would be enhanced within inventoried roadless areas. As a result, natural succession of aspen stands to conifers would become more prevalent over time.

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
Effects on habitat structural stages (HSS)	No effect to the current distribution of HSS. Natural processes would dictate HSS. Mature stands would graduate into higher HSS stages. Younger stages would mature into higher stages as trees grow and the canopy closes. Other than those created by localized, severe MPB damage, forest openings would neither be created nor maintained.	160 acres of aspen would be patch cut within lodgepole pine units and would be converted to HSS 2, the shrub and seedling stage. The remaining 210 acres of aspen would be significantly opened, decreasing the acreage in 4C over a 20-year projection. This enhancement would enable the aspen to retain dominance by removing pine encroachment, allowing these areas to serve as forested fuelbreaks. 113 acres of lodgepole pine would be converted from HSS 4C to 4B.	Same as Alternative B	Same as Alternative B except would affect 210 acres of aspen, 160 less acres than Alternative B.
Aspen HSS Distribution – 20-year projection	3C - 0 acre 4C – 210 acres 160 acres to be patch cut would remain in their current HSS, and mature naturally	2 – 160 acres 3C - 139 acres 4C – 71 acres	Same as Alternative B	Would affect 210 acres of aspen, 160 less acres than Alternative B. 2 – 160 acres 3C - 53 acres 4C – 157 acres
Aspen enhancement	Successional pressure from encroaching pines would continue to hinder aspen recruitment and impact aspen vigor. In the absence of fire, lodgepole pine and other conifers would replace aspen. The functionality of the aspen-dominated stands as fuelbreaks would decline.	Aspen stands in poor health under pressure from encroaching lodgepole pine would be enhanced.	Same as Alternative B	Same as Alternative B except aspen treatments would be reduced by 160 acres.
MPB risk	No treatment would occur to alter MPB activity. Lodgepole pine currently infested by MPB would continue to decline in health, and eventually die, adding to fuel loads. Pine trees would continue to grow larger and denser, increasing the likelihood of outbreaks.	In the short term, thinned stands will continue to experience yearly infestations of MPB, but with lower damage than adjacent, untreated stands. Thinning from below would reduce stand density, enabling remaining trees to better resist MPB attack. Sanitation/salvage would cut heavily damaged and dead lodgepole pine, improving forest health.	Same as Alternative B	Same as Alternative B

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
MPB risk – 20 year projections	Low – 434 acres Moderate - 262 acres High – 0 acres	Low - 546 acres Moderate - 150 acres High – 0 acres	Same as Alternative B	Same as Alternative B
Effects on threatened and endangered (T&E) plants	No effect; none identified in the project area	Same as Alternative A	Same as Alternative A	Same as Alternative A
Effects on Forest Service sensitive species of plants	No effect	Three of four sensitive species of plants would not be affected; Harrington’s beardtongue occurs in sagebrush habitats and may be affected.	Same as Alternative B except mechanical fuel treatments would potentially cause more harm to Harrington’s beardtongue because these treatments would involve more surface disturbance.	Same as Alternative B
Effects on plant species of viability concern	No effect; none identified	Same as Alternative A	Same as Alternative A	Same as Alternative A
Effects on wetland and riparian areas	Increased vegetation due to the absence of cutting and burning could result in increased water uptake over the short term. This could decrease surface water and reductions in wetlands. Over the long-term, aging lodgepole pine stands would have reduced water uptake, which could increase soil saturation, springs, seeps, and wet areas. Areas with high mortality also may experience reduced uptake before new vegetation establishes.	Many small water features exist within the proposed treatment units. All project activities would avoid wetlands and other water features.	Same as Alternative B	Same as Alternative B except potentially fewer wetlands would be affected due to reduced acreage of aspen treatments in the Vail Intermountain area.
Effects on rangeland resources	No effect	Proposed treatments in the two grazing allotments within the project area would have no noticeable effect on the grazing of sheep. Prescribed burns would likely occur in the spring before sheep are turned out, or in the fall after sheep have left.	Same as Alternative B	Same as Alternative B

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
Effects on areas susceptible to noxious weed infestation	Approximately 1,350 acres within the project area are infested with noxious weeds. Most of the infestations are south of I-70 along U.S. 24. Areas within ½ mile of these infestations are potentially susceptible to colonization. Treatment of noxious weeds receives high emphasis in management activities. This emphasis would continue.	Approximately 800 acres within one-half mile of treatment areas are infested with noxious weeds. Areas near these infestations are particularly vulnerable to colonization. Surface disturbance exposing mineral soil would create potential for new infestations. The treatment units north of I-70 currently show no significant noxious weed populations, and burning would increase an area’s susceptibility to colonization by noxious weeds.	Same as Alternative B	Same as Alternative B
Available corridors for seed transport along roads and trails (miles)	No effect	Alternative B involves the construction of 11.1 miles of temporary roads and some trail use. The revegetation of roads and trails will help to reduce the risk of noxious weed spread. Proposed temporary roads constructed within 1 mile of U.S. 24 have the potential to act as corridors for the spread of noxious weeds due to the existing infestations within this area. Travel between and through these known infestations will comply with weed management guidelines in order to avoid the spread of weeds into unaffected sites.	Same as Alternative B except that Alternative C includes an additional 0.7 mile of temporary road and 1.8 miles of potential cable corridors and tractor trails, but does not include widening of the Stone Creek Trail (FDT 2349) as a temporary road, which would affect 1.1 miles.	Same as Alternative B
Proximity of treatments to inventoried weed population	No effect	Approximately 800 acres within one-half mile of treatment areas are infested with noxious weeds.	Same as Alternative B, except the removal of Units 411 and 412, located near known noxious weed infestations, would reduce the risk of noxious weed spread.	Same as Alternative B, except the removal of Units 412 and 515, located near known noxious weed infestations, would reduce the risk of noxious weed spread.

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
Fire and Fuels				
Change in fuel loading	Fire and fuels conditions would be unchanged in the short term. Over time, fuels buildup would continue, increasing fire hazard in the wildland urban interface.	Standing dead trees and trees declining in health and adding to the fuel load would be removed. Reducing the current population of MPB would reduce fuels created by overstory mortality. Most fuels treatment units would be changed from Fuel Model 2 to a mix of Fuel Models 1 and 8. Fire under extreme weather conditions would be controllable in these light fuel types.	Same as Alternative B, except acres treated for fuel reduction would decrease by 520 acres within the Eagles Nest Wilderness.	Same as Alternative B, except fewer treated acres because no trees would be cut within inventoried roadless areas except along the NF boundary.
Broadcast burns for fuels reduction (acres)	0	1,660	0	1,090
Mechanical fuels reduction/pile and burn (acres)	0	230	1,400	60
Change in predicted fire behavior	The 20-year modeling predictions show an increase in hazardous fire behavior. Areas likely to carry passive crown fires increase in size over time. Should the current MPB infestation spread, these areas are likely to increase in size.	Treatments are not projected to alter fire behavior in lodgepole pine because they would not significantly affect the fuel models used as input data for fire behavior modeling. An increase in the acreage likely to carry passive crown fire is projected for the lodgepole pine treatment units in 2024. Regeneration following thinning would add ladder fuels, aiding the transition of a surface fire to the canopy. Aspen treatments in the Vail Intermountain area would enhance their function as forested fuelbreaks. Model projections of aspen treatments do not show any measurable effect on surface fire behavior.	Same as Alternative B except mechanical treatments would require more time to complete.	Same as Alternative B except fewer treated acres.

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
Change in predicted fire behavior (cont.)		Fuel treatments are projected to alter fire behavior. Wildland fires would spread quickly in lighter fuel types, but would be more controllable under extreme conditions with ground firefighting resources.		
Change in predicted flame length	Without treatment, areas likely to carry fires with 4- to 6-foot flame lengths increase in size over time.	Treatments would move more acres to conditions supporting shorter flame lengths in both 2014 and 2024.	Same as Alternative B except that fewer fuel treatment acres would change to conditions supporting shorter flame lengths in both 2014 and 2024.	Same as Alternative B except that the smallest number of fuel treatment acres would change to conditions supporting shorter flame lengths in both 2014 and 2024.
Change in predicted rate of spread	No effect	Treatments would move more acres to conditions supporting higher rates of spread in both 2014 and 2024 reflecting the grass-dominated fuel types expected to regenerate following the fuel reduction treatments. Shrubs and trees that provided sheltering and wind interruption, slowing an advancing fire, would be removed, thus increasing the potential rate of spread. These conditions are more favorable to firefighting than slower rates of spread in shrubs and trees.	Same as Alternative B except that fewer fuel treatment acres would change to conditions supporting higher rates of spread in both 2014 and 2024.	Same as Alternative B except that the smallest number of fuel treatment acres would change to conditions supporting higher rates of spread in both 2014 and 2024.
Aspen fuelbreak (acres treated)	No effect. Aspen patches and aspen fuelbreaks would continue their succession toward pine, lessening their ability to act as fuelbreaks.	370	370	210
Wildland urban interface fuelbreak (total acres modeled, acres not rounded)	0	1,884	1,363	1,147

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
Wildlife				
Effects on federally listed species	No effect on Canada lynx, the only federally listed terrestrial species addressed; a wildland fire could affect lynx habitat.	<p>Effects of wildland fire similar to Alternative A, but reduced fuel loads may lessen the severity or extent of the burn, reducing effects on lynx habitat.</p> <p>Direct effects to the lynx are not expected based on the lack of documented lynx occurrence in the project area and indication from recent studies that denning habitat may not represent suitable denning habitat within the project area.</p>	Same as Alternative B	Same as Alternative B
Effects on suitability of lynx habitats	No effect	<p>Availability and condition of existing vegetation and downed-woody debris would be altered, affecting the suitability of some lynx habitats. No more than 2 percent of suitable lynx habitats within each LAU would be directly affected. Currently, much less than 30 percent of lynx habitats in the affected LAUs are in unsuitable condition. Potential conversion of suitable lynx habitats to unsuitable also would be well below the 15 percent threshold for change to unsuitable habitat over a 10-year period. Field studies indicate that much of the denning habitat that is mapped in the project area and surrounding LAUs lacks appropriate understory cover and downed-woody debris to qualify as suitable denning habitat. Even considering the habitat characterization as mapped, the acres that would be disturbed do not exceed established lynx habitat thresholds.</p>	Same as Alternative B	Same as Alternative B

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
Effects on lynx denning habitats	No effect	When analyzed across the project area, 6 percent (533 acres) of the available denning habitat on NF administered lands would be disturbed. In the Eagle Valley LAU, proposed disturbance to lynx denning habitats would be less than 1 percent of existing habitat. In the Holy Cross LAU, proposed activities would disturb less than 2 percent of the available denning habitat in the LAU.	Same as Alternative B	Similar to Alternative B; 501 acres (6 percent) would be disturbed.
Changes in winter snow compaction in lynx habitats (acres)	No effect; no increase in acres affected by snow compaction from roads or trails.	Use of temporary roads potentially may affect 32 acres; however, with adequate road closures snow compaction likely would affect less acreage.	33 acres	32 acres
Determinations of effect for proposed, threatened, and endangered species	No effect	Implementation may affect, but is not likely to adversely affect the Canada lynx.	Same as Alternative B	Same as Alternative B
Compliance with appropriate Forest Plan standards	Yes	Yes. Project activities would not change more than 15 percent of lynx habitat to unsuitable, and acreage potentially disturbed in each LAU is below the 10 percent threshold for existing denning habitat.	Same as Alternative B	Same as Alternative B
Effects on Forest Service sensitive species	No effect. In the event of a wildland fire, there could be impacts to habitat for the American three-toed woodpecker and olive-sided flycatcher. These species rely on tree-boring insects and occur in habitats that have been infested by insects or burned.	Potential habitats (3,000 acres) may be affected and individuals may be injured, killed, or displaced. Species particularly susceptible include the marten, pygmy shrew, and boreal toad. Nests and dens may also be disturbed or destroyed during project implementation, causing injury or mortality to eggs and young. These potential effects are not expected to diminish individual survivorship or threaten populations Forest-wide.	Same as Alternative B, except that 2,500 acres of potential habitats could be affected.	Same as Alternative B, except that 2,200 acres of potential habitat could be affected

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
Determinations of effect for Forest Service sensitive species	No effect. The American three-toed woodpecker and the olive-sided flycatcher would benefit as stand conditions become more suitable for wood-boring insects.	The habitat determination is may adversely affect individuals (MAII) for the American marten, pygmy shrew, northern goshawk, American peregrine falcon, boreal owl, American three-toed woodpecker, olive-sided flycatcher, sage sparrow, Brewer’s sparrow, and boreal toad.	Same as Alternative B	Same as Alternative B
Compliance with appropriate Forest Plan standards	Yes	Yes. Treatments have been designed to minimize effects on sensitive species and avoid disturbance that would result in a trend toward federal listing or a loss of viability.	Same as Alternative B	Same as Alternative B
Effects on habitat capability for MIS	No effect. In the event of a wildland fire, habitats for elk, snowshoe hare, and MacGillivray’s warbler could be affected.	Effects of wildland fire similar to Alternative A, but reduced fuel loads may lessen the severity or extent of the burn. 3,000 acres of potential habitat disturbance for elk; 750 acres of potential habitat disturbance for snowshoe hare; 209 acres of potential habitat disturbance for MacGillivray’s warbler.	Same as Alternative B except 2,500 acres of potential habitat disturbance for elk.	Same as Alternative B except 2,200 acres of potential habitat disturbance for elk.
Effects on MIS	No effect	May cause direct injury or mortality to individuals unable to avoid activities. Increased human activity may disrupt the behavior or displace individuals from otherwise suitable habitats. The effectiveness of elk habitats would be slightly reduced in the short term. In the long-term, regeneration of lodgepole pine stands would provide improved cover for elk. Aspen enhancement would increase elk habitat quality by providing good	Same as Alternative B.	Same as Alternative B.

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
Effects on MIS (cont.)		<p>cover and forage sources. Treated sagebrush would provide high quality winter forage for elk.</p> <p>Increased activity may disrupt some habitat use by snowshoe hare, displacing individuals to unaffected habitats. Regeneration of lodgepole pine and aspen would provide winter forage. Potential effects would not threaten its population status within the project area or the Forest.</p> <p>Treatments in mature sagebrush would encourage regeneration with inclusions of grass and forb microhabitats. This would provide new foraging and nesting habitat for the MacGillivray’s warbler.</p>		
Compliance with appropriate Forest Plan standards and MA guidance	Yes	Project activities would not measurably lower the current effectiveness indexes for DAUs 12 and 16.	Same as Alternative B	Same as Alternative B
Effects on species of concern	No effect on mule deer, bighorn sheep, and peregrine falcon.	Mule deer would likely be temporarily displaced from suitable sagebrush foraging habitats. In the long term, treatments would benefit deer by replacing decadent plants with younger, more productive plants. Activities in forested habitats may displace deer to undisturbed habitats, which would not be detrimental to individual health or population status because of the availability and condition of other suitable habitats. Burning of sagebrush stands would likely create a mosaic of decadent sagebrush, young, succulent	Same as Alternative B	Same as Alternative B

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
Effects on species of concern (cont.)		sagebrush, and new patches of grasses and forbs. This diversity would increase and improve forage for deer and sheep. Treatments are proposed for habitats that peregrine falcons do not normally hunt. Treatments in sagebrush and shrublands are beyond the typical 10-mile hunting radius from a known nest on private land.		
Compliance with Forest Plan MA guidance	Yes	Project activities would not further reduce the elk habitat effectiveness index for any affected DAU.	Same as Alternative B	Same as Alternative B
Effects on species of viability concern	No effect	Canada lynx are addressed as a federally listed species. Brewer's sparrow and boreal toad are addressed as Forest Service sensitive.	Same as Alternative B	Same as Alternative B
Aquatic Life				
Effects on federally listed species	No effect; Four endangered fish species occur in the Colorado River Basin outside the project area.	No identified species in the project area. Since no water depletion would occur under the proposed project, there would be no effect on endangered Colorado River Basin species.	Same as Alternative B	Same as Alternative B
Effects on Forest Service sensitive species	No effect on Colorado River cutthroat trout (CRCT). In the event of a wildland fire, sedimentation could affect aquatic habitat.	Effects of wildland fire similar to Alternative A, but reduced fuel loads may lessen severity or extent of burn. No direct effects to aquatic habitats that support conservation populations of CRCT. Design criteria and mitigation measures would minimize sedimentation.	Same as Alternative B	Same as Alternative B
Effects on MIS	No effect. In the event of a wildland fire, sedimentation could affect aquatic habitat.	Effects of wildland fire similar to Alternative A, but reduced fuel loads may lessen severity or extent of burn.	Same as Alternative B	Same as Alternative B

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
Effects on MIS (cont.)		<p>A temporary road in the Grouse Creek watershed would increase the stream network by 1 percent, potentially affecting waters supporting trout and macroinvertebrates.</p> <p>No water depletions would occur. Implementation of design criteria would minimize potential sedimentation of local streams. Winter and spring flows would not be affected, thus avoiding impacts to spawning periods for the brown and brook trout. Reconstruction of existing roads may improve existing stream conditions at two crossings, making them more suitable for resident trout. Although individuals may be impacted, these effects would not threaten the status of trout and macroinvertebrate populations in the project area or within the Forest.</p>		
Effects on species of viability concern	No effect. In the event of a wildland fire, sedimentation could affect aquatic habitat.	CRCT are addressed as a Forest Service sensitive species. No other species of viability concern were addressed.	Same as Alternative B	Same as Alternative B

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
THE HUMAN ENVIRONMENT				
Heritage Resources				
Effects on heritage resources	Low probability of disturbance to heritage resources. In the event of a wildland fire, extreme heat could cause substantial impacts to heritage resources.	Effects of wildland fire similar to Alternative A, but reduced fuel loads may lessen the severity or extent of the burn. There is a low potential to impact heritage resources over the short-term because increase of traffic and equipment use in the project area.	Same as Alternative B	Same as Alternative B
Effects on eligible sites	Continued use of roads by small vehicles; one crosses a portion of eligible site 5EA1555 and one leads to eligible site 5EA2114.	Temporarily increased use of road that crosses a portion of eligible site 5EA1555. Improvement of the road that leads to eligible site 5EA2114 would result in use by logging trucks and equipment.	Same as Alternative B	Same as Alternative B
Effects on unknown sites	Stand-replacing wildland fire could destroy evidence of unknown sites	Effects of wildland fire similar to Alternative A, but reduced fuel loads may lessen the severity or extent of the burn. Low potential to identify unknown sites in treatment unit areas.	Same as Alternative B	Same as Alternative B
Lands and Minerals				
Effects on lands and minerals activities (number, type, acres affected)	No effect	Several active placer mining claims are located within one-half mile of Units 618 and 619. Some non-recreation special use permits would require review to determine if treatment would affect an authorized use or occupancy.	Same as Alternative B	Same as Alternative B

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
Effects on landline locations (miles of survey needed)	No effect. In the event of a wildland fire, there is the potential for loss of existing landline locations when historic markers or fence lines are destroyed.	Effects of wildland fire similar to Alternative A, but reduced fuel loads may lessen severity or extent of burn. An estimated 15 miles of landline locations could require survey.	Same as Alternative B	Same as Alternative B
Recreation				
Effects on roadless area characteristics of inventoried roadless areas	No short-term effect, however, continued increase in dead and down material, continued decline of aspen stands, and increased hazards for severe stand-replacing wildland fire would contribute to a decline in scenic values. There would be a long-term decline in scenic integrity and attractiveness, which would affect roadless areas characteristics.	Four of the seven inventoried roadless areas within the project area contain treatment units. No road construction or commercial timber harvest is proposed in these areas. Cutting and leaving trees would alter the scenic integrity and naturalness of the affected areas, as tree stumps and boles would reduce the intactness or wholeness of the landscape character. Prescribed burning is expected to have a short-term effect. Recreation opportunities and scenic integrity would degrade during project implementation. However, over the long-term, roadless area characteristics such as biodiversity, habitat, and scenic integrity, would be enhanced as the overall health of the forest improves.	Same as Alternative B, with the following exceptions. Mechanical treatments and pile burning would occur instead of broadcast burning in Units 301, 302, 303, 305, 306, 309, 310, and 313. Extensive cutting or pruning of vegetation would alter naturalness, as the intactness or wholeness of the landscape character would be reduced as long as cut vegetation is evident. Characteristics related to recreation activities and scenic integrity would be degraded during project implementation, which would occur over a longer period of time.	Same as Alternative B, with the following exceptions. No trees would be cut in inventoried roadless areas beyond the 200-foot interface between NFS and private lands. As a result, effects of cutting on scenic integrity would be reduced. Treatments in aspen stands within inventoried roadless areas would be dropped, contributing to the decline of aspen stands. The decline of aspen stands would affect scenic integrity, a roadless area characteristic.
Effects on characteristics of designated wildernesses	No effect	Prescribed burning would affect wilderness characteristics in the short-term. The area's natural appearance and solitude would degrade during project implementation. Over the long-term, these characteristics would improve with overall health of the ecosystems.	Same as Alternative B, but no treatments would occur in Units 411 and 412 within the Eagles Nest Wilderness. This would reduce the short-term impacts of smoke and activities in the wilderness.	Same as Alternative B, with the following exception. No fuels treatments would occur in Unit 412 within the Eagles Nest Wilderness. This would reduce the short-term impacts on wilderness.

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
Effects on determining factors for ROS class	No effect	Prescribed burn fuels treatments in Units 411, 412, 514, and 515 would affect the unmodified natural environment of the Primitive ROS Class during project implementation. The majority of fuel treatments would be implemented during the snow-free season in the Semi-primitive Non-motorized ROS Class. Temporary roads and vegetation treatments would affect the natural-appearing environment and introduce vehicles along temporary roads. Project activities could also increase the interaction between users.	Same as Alternative B, with the following exceptions. No fuels treatments would occur in Units 411 and 412, reducing effects on the unmodified natural environment of the Primitive ROS Class. In the Semi-Primitive Non-Motorized ROS Class, an additional 3,600 feet of temporary tractor haul road would be added above Units 101 and 102. Mechanical treatments instead of broadcast burning would occur in Units 301, 302, 303, 305, 306, 309, 310, 313, 514, and 515. This would increase the duration of project activities in these areas.	Same as Alternative B, with the following exception. Treatments would not occur in Units 412 or 515, reducing effects on unmodified natural environment of the Primitive ROS Class. Units 201, 203, 204, 205, 206, 207, 208, 209, 515, and 620 would be eliminated, reducing effects of treatments within the Semi-Primitive Non-Motorized ROS Class.
Displacement of recreation activities	No effect	There would be some short-term displacement of dispersed recreation within and adjacent to treatment units. Most limitations or closures would last for a period of several days to a few weeks. The Stone Creek Trail (FDT 2349) would be closed for one logging season. Project activities would affect the recreation experience for short periods over the duration of project implementation, up to several years. Machinery used for thinning and harvesting would increase noise and dust in the treatment units and the immediate surroundings. Blackened vegetation and smoke from prescribed burns would detract from	Same as Alternative B with the following exception: No broadcast burning would occur in Units 411 and 412 in the Eagles Nest Wilderness. This would reduce the short-term impacts of smoke and activity in this wilderness area.	Same as Alternative B, but Units 412 and 515 would be eliminated, reducing broadcast burning acreage in the Eagles Nest Wilderness. With the elimination of Units 201, 203, 204, 205, 206, 207, 208, 209, 515, and 620, there would be relatively less impact to recreationists. The temporary trail closures identified for Alternative B would all remain for other treatment units.

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
Displacement of recreation activities (cont.)		<p>the recreation experience. The potential displacement of game animals by treatment activities would affect hunting. Recreationists could also be affected by safety precautions.</p> <p>Broadcast burning in the Eagles Nest Wilderness would encompass 520 acres, and 230 adjacent acres would be treated with both pile burning and broadcast burning. During fuels treatment, there would be increased activity and visible smoke effects in the Eagles Nest Wilderness.</p>		
Effects on recreational use of roads, trails, and other facilities	No effect	<p>Six trails that lead into inventoried roadless areas would experience temporary closures during project implementation.</p> <p>Five trails leading into the Holy Cross Wilderness and the Eagles Nest Wilderness would be closed during project activities.</p> <p>Eight trails outside these areas would experience temporary closures. (Five trails overlap with those closed above).</p> <p>The Stone Creek Trail (FDT 2349) would be widened to accommodate timber hauling and rehabilitated after project completion. It would be closed for one logging season.</p> <p>Two trails leading into the adjacent ski areas would be temporarily closed during project activities.</p>	<p>Same as Alternative B with the following exceptions. Temporary trail closures in the Buck Creek area, if needed, could occur over a longer period of time due to the duration of mechanized treatments and pile burning activities.</p> <p>The Stone Creek Trail (FDT 2349) would not be used for timber hauling, and it would remain in its current condition.</p>	<p>Same as Alternative B with the following exception. The elimination of Units 412 and 515 would eliminate remove the need for temporary closure of the Gore Creek Trail.</p>

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
Effects on existing recreation facilities (campgrounds, trailheads, other facilities)	No effect	Unit 412 would be located along the east side of Gore Creek Campground. Campground activities would be temporarily disrupted by the sights and sounds of the prescribed burn and fuel treatment activities.	No effect; Unit 412 is not included in Alternative C.	No effect; Unit 412 is not included in Alternative D.
Effects on recreation special uses	No effect	<p>Special use activities could be restricted or displaced by temporary trail closures. None of the special uses are limited to a trail or trails that would be closed temporarily.</p> <p>The easternmost portion of Unit 313 lies within the Vail ski resort permit boundary. During burning, smoke would be visible to hikers and mountain bikers at the Vail ski resort. In addition, the Game Creek trail is adjacent to this unit and would be temporarily closed during burning.</p> <p>Units 101 through 106 are located east of Beaver Creek ski resort. Effects during one logging season would be the closure of Stone Creek Trail (FDT 2349), degradation of recreation along the Paulie's Plunge - Stone Creek trails that lead to the resort, and possible temporary displacement of recreationists.</p>	Same as Alternative B except no broadcast burn would occur in Unit 313, and the quality of the recreation experience would not be degraded for one logging season along the Paulie's Plunge - Stone Creek trails that lead to the Beaver Creek resort.	Same as Alternative B
Transportation				
Changes to road transportation system	No change	Short-term addition of an estimated 11.1 miles of temporary roads in MAs 5.4 and 5.43, including use of Stone Creek Trail (FDT 2349) as a temporary road.	Short-term addition of an estimated 10.7 miles of temporary roads in MAs 5.4 and 5.43. Stone Creek Trail (FDT 2349) would not be used as a temporary road.	Same as Alternative B

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
Density of open travelways	No effect on existing densities of 1 mile per square mile in MA 5.4 and 0 mile per square mile in MA 5.43.	Short-term increase in density of open travelways during project activities. In MA 5.4, the road density would increase to 1.7 miles per square mile. In MA 5.43 the density of 0.9 miles per square mile would not meet Forest Plan guidelines during elk calving, requiring closure from May 15 to June 20.	Same as Alternative B except density in MA 5.43 would be 0.8 miles per square mile.	Same as Alternative B
Scenic Resources				
Effects on existing scenic integrity (ESI), scenic attractiveness (SA), scenic class (SC), and visibility	Existing scenic integrity would continue in the short term. Additional MPB outbreaks, aging stands, and human influence could contribute to a long-term decline in scenic integrity and attractiveness.	Existing scenic integrity would continue. Risk of future MPB outbreaks would decrease, visual diversity of aging lodgepole pine stands would be enhanced, decline in aspen stands would be reduced, which would contribute to maintaining scenic integrity and attractiveness over the long-term. Units 411, 412, 514, and 515 would be visible in foreground views of I-70. Units 128 and 129 would be visible from U.S. 24. Unit 619 would be visible to other motorists. Many treatment units are visible from trails.	Same as Alternative B except for the following. Units 411 and 412 would be dropped, causing less visible smoke effects. Piles from mechanical treatments present for 1 to 2 years before burning would create a noticeable visual impact of short-term duration. Visual impacts of mechanical treatments would contribute to a decline in scenic integrity.	Same as Alternative B except the decline of aspen stands would affect scenic integrity and attractiveness in inventoried roadless areas, as treatments in aspen stands located within inventoried roadless areas would be dropped. Units 412 and 515 also would be dropped, reducing visibility of treatments in foreground views of I-70.
Scenic integrity objectives (SIOs) met or not met	Continued increase in dead and down material, unhealthy timber stands, continued decline of aspen stands, and increased hazards for severe stand-replacing wildland fire would contribute to a decline in scenic values. SIOs may not be met over the long-term.	Effects of wildland fire similar to Alternative A, but reduced fuel loads may lessen the severity or extent of burns, conserving scenic values. Would meet all SIOs adopted for the project area over the short- and long-term where no more than 50 percent of the basal area is removed. In areas where active MPB infestations are causing high mortality of lodgepole	Same as Alternative B except SIOs of High to Very High in the foreground zones of trails along Gore and Deluge Creeks likely would not be met. SIOs of Moderate to Very High in the Game Creek, Corral Creek, and Buffer Mountain inventoried roadless areas and the Eagles Nest Wilderness may not be met in the long-term. Mechanical treatments	Same as Alternative B except SIOs of Moderate to Very High in the Game Creek, Corral Creek, and Buffer Mountain inventoried roadless areas and Eagles Nest Wilderness may not be met in the long-term. Conifers eventually would replace aspen in the Vail Intermountain area, reducing visual diversity and scenic integrity in the Game Creek

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
Scenic integrity objectives (SIOs) met or not met (cont.)		pine, and stands are managed adaptively, removal of up to 70 percent of the basal area may affect whether SIO guidelines are met. High mortality of lodgepole pine from MPB infestation also would alter scenic values in these areas and would affect whether existing SIO guidelines need to be adapted as conditions change.	would meet the SIO of Moderate.	inventoried roadless area.
Intensity of mitigation needed to meet the SIO	Mitigation is not applicable when no action is taken.	Comprehensive design criteria, monitoring, and mitigation measures presented in this chapter and Appendix D are used to mitigate the effects of proposed project.	Same as Alternative B	Same as Alternative B
Social and Economic Resources				
Effects on employment, wages, housing, and community infrastructure	No effect in the absence of a wildland fire; a stand-replacing wildland fire would have a significant effect, from seasonal and permanent residents leaving the area and a decline in tourism.	Effects of wildland fire similar to Alternative A, but reduced fuel loads may lessen the severity or extent of the burn, which may lessen effects on tourism and communities. Modest opportunities for logging/merchant service contracts that may be operated by local wood products companies would be associated with proposed vegetation treatments.	Same as Alternative B	Same as Alternative B
Relative costs of planned treatments as cost per acre, total cost, cost per year	No cost in the absence of a wildland fire; potential costs of a 24,000-acre wildland fire could be \$4,800 per acre or \$115 million.	Effects of wildland fire similar to Alternative A, but reduced fuel loads may lessen the severity or extent of the burn reducing costs of a wildland fire.	Least cost-effective alternative per acre; it involves more costly treatments and treats fewer acres. Units 101 and 102 would use a cable system and would require an adverse haul on tractor trails. Mechanical treatments and pile burning are not as cost-effective as broadcast burning.	Overall, the least expensive alternative because it is similar to Alternative B in cost-effectiveness, but treats fewer acres.

Comparison Element	Alternative A	Alternative B	Alternative C	Alternative D
Relative costs of planned treatments as cost per acre, total cost, cost per year (cont.)		Most cost-effective alternative per acre to implement; treats the most acres and involves the most broadcast burning. Broadcast burning is a cost-effective treatment method that is also long-lasting when compared with mechanical treatment methods. Also, the most cost-effective access to units 101 and 102 would be used.		
Socioeconomic effects of projected MPB activity (from tree mortality and scenery changes)	Current MPB outbreak could kill up to 50 to 70 percent or more of lodgepole pine, which would affect scenic values and recreation setting.	Risk of future MPB outbreaks would be reduced, mitigating potential impacts to scenic values and the recreation setting.	Same as Alternative B	Same as Alternative B
Socioeconomic effects of treatments	No effect	Displacement of any recreational activity and any resulting economic effect would be short-term.	Same as Alternative B	Same as Alternative B

2.6 IDENTIFICATION OF THE PREFERRED ALTERNATIVE

The Forest Service has identified Alternative B as the preferred alternative with the following exception. Most likely no log hauling would occur on the Stone Creek Trail (FDT 2349).