CHAPTER 1 – PROPOSED ACTION PURPOSE AND NEED

Introduction

This Environmental Assessment (EA) addresses proposed salvage harvest, commercial live tree thinning, reforestation and related management activities in two separate areas that were burned in the summer of 2002. These are the Burn Canyon Fire, and the Bucktail Fire. Map A of the Maps is a vicinity Map, which shows where each of these is located in relation to the town of Norwood, Colorado. Although these are two separate project proposals, one for each fire, they are packaged and presented in this document as a matter of efficiency on the part of the agency, and to facilitate public understanding of these similar proposals on the Norwood District. We have attempted to organize each discussion so the reader may understand which is being discussed at each point in the EA.

This Environmental Assessment is being prepared in compliance with the National Environmental Policy Act (NEPA), Council on Environmental Quality Regulations for implementing NEPA found at 40 CFR 1500, and Forest Service Direction for implementing NEPA found in Forest Service Handbook 1909.15.

The Interdisciplinary (ID) Team conducted a preliminary assessment of the potential significance of the effects of the proposed action in terms of issues raised and resources affected. Each was considered against criteria established at 40 CFR 1508.27 for determining significance of an action.

It is our conclusion at this time that no resource effect anticipated, either individually or cumulatively, would trigger significance. We are not assessing the impacts of the fires themselves. We are assessing the incremental effect of taking the actions listed under the proposed action (or alternatives) on the environment. While burned areas have suffered considerable impact, we do not believe that the additional impact of salvage harvesting, planting, and travel management activities would be significant, in terms of environmental effects under NEPA.

Hence, we have prepared this EA. The purposes of an EA are to further the purposes of NEPA in terms of informing the public and decision maker of consequences of possible decisions, and to determine if an Environmental Impact Statement would need to be prepared to comply with NEPA. Following public review and comment on the EA, if we continue to believe that an EIS is not required, we will prepare a written Decision Notice and Finding of No Significant Impact, and mail it to parties who wish to receive it. These documents will also be available on the Web. If we determine though this analysis that an EIS is required we will publish a notice of intent to prepare an EIS in the Federal Register and initiate another formal scoping period.

Response to Beschta Report: In 1995 a number of prominent scientists collaborated in preparing what has come to be known as the Beschta Report (see full citation in

literature cited). The report offers opinions regarding effects of post fire management of wildlands. Throughout this EA, we refer to positions taken in the Beschta Report and offer our response.

Burn Canyon: The Burn Canyon Fire burn area is located on National Forest System lands in McKee, Callan, and Mud Springs Draws, about seven miles southwest of Norwood in San Miguel County and three miles north of Miramonte Reservoir (see Map A). Burn Canyon is the prominent existing feature in the area for which this fire was named. It is incidental that the name for the fire has the term "burn" in it. This fire occurred in July of 2002. The total burned area is about 31,616 acres, of which 10,982 acres are within the National Forest boundary. Table 1 below shows the burn acreage distribution by fire severity class, as Mapped by the Burned Area Rehabilitation (BAER) Team, and by post-fire vegetation condition. Fire severity Mapping is based on the effects of fire on soil characteristics. There are three fire-severity levels for the Burn Canyon burn: High, Moderate, and Low. Map C shows the BAER-Mapped fire severity. Post-fire vegetation condition reflects fire effects on vegetation cover. There are three categories: All Dead, All Live, and Mosaic. The first two categories are self-explanatory. Mosaic refers to areas in which fire only partially consumed the major vegetation components. Map B shows post-fire vegetation condition.

About 4,576 acres of ponderosa pine forest were burned hot enough to kill most trees in the stand. A burn of this type is called a "stand replacement burn". Almost all of the commercially valuable trees in the Burn Canyon burn are ponderosa pine. Because of the activity of wood-boring insects and decay fungi, there is a limited period during which these fire-killed trees maintain their commercial value. Salvage harvest of these trees would need to occur by the end of winter of 2003 to capture their commercial value. In this Environmental Assessment (EA), about 2,016 acres are considered for salvage harvest followed by planting; an additional 2,116 acres located outside of salvage areas but within the Burn Canyon fire perimeter are considered for planting; and about 344 acres of live ponderosa pine stands are considered for thinning.

Map D shows the activities proposed for the Burn Canyon area.

Bucktail: The Bucktail Fire burn area is located about 17 miles north-northwest of Norwood on the southwest flank of the Uncompahgre Plateau in the Big Bucktail watershed (see Map A). The total burn area is 2,244 acres, all of which are National Forest land. This fire occurred in May of 2002. Table 1 below shows the acreage distribution for the burn by fire severity class and by post-fire vegetation condition. Map B shows the post-fire vegetation condition, Map C shows the BAER-Mapped fire severity. While almost all of the pinyon/juniper vegetation type was completely consumed by fire, less than 20 percent of the ponderosa pine was completely killed. It appears that when the fire, which started in the pinyon/juniper type, reached the pine stands that had previously undergone thinning and prescribed burning, burn intensity diminished (Figures 2a and 2b).

Of the 2,244 total burn acres, about 189 acres are considered in this EA for salvage harvest followed by reforestation; an additional 216 acres outside of salvage areas but

within the burn perimeter are considered for planting; and about 296 acres of live ponderosa pine stands within the burn perimeter are considered for thinning. Timber in the Bucktail area is almost entirely ponderosa pine. As with the Burn Canyon fire, the commercial value of the Bucktail timber is diminishing with time, and will essentially be lost if trees are not harvested by winter of 2003.

Map D shows the activities proposed for the Bucktail area.

Table 1.1
Acres by Fire Severity
And Post-Fire Stand Vegetation Condition

		Post-Fire Vegetation Condition			
Fire Name	Severity	All Dead	Mosaic	All Live	**Total**
Bucktail	High	855	254	9	1118
	Other	243	169	714	1126
	Total	**1098**	**423**	**722**	**2244**
Burn Canyon	High	146		2	149
	Low	2100	294	1218	3611
	Moderate	6912	212	99	7222
	Total	**9158**	**505**	**1319**	**10982**

Proposed Action

The Forest Service proposal involves the removal in a salvage harvest of fire-killed and severely-fire-damaged live trees that still have commercial value as well as the thinning of stands of live trees within the fire perimeter. The proposal also includes the planting of native tree species on suitable timberland that was deforested by fire. The replanting of the area may take place even if no salvage harvest occurs, but would be required by the National Forest Management Act and its implementing regulations where salvage harvest does occur.

Salvage logging is being proposed only in low slope gradient areas with good soil productivity, low potential for soil erosion, and with existing road access. No new road construction, no road reconstruction, and no temporary road construction are proposed.

In addition to salvage harvest of dead trees, the Forest Service is also proposing to commercially thin selected stands of residual live trees within the fire perimeter. There are stands of live trees that were being considered for thinning before the fires occurred. In order to retain diversity and wildlife hiding cover, however, not all stands would be thinned.

Total salvage harvest volume from Burn Canyon would be about 4.0 to 6.0-mmbf (four to six million board-feet) from 2,016 acres. Volume from thinning is estimated at about 0.250-mmbf (two-hundred fifty thousand board-feet) from about 344 acres.

Total salvage harvest volume from Bucktail would be about 0.150-mmbf (one-hundred fifty thousand board-feet) from about 189 acres. Volume from thinning is estimated at about 0.200-mmbf (two-hundred thousand board-feet) from about 296 acres.

Where they exist, standing dead trees, referred to as snags, for cavity-dependent species would be retained within the salvage units. Additionally, standing and down dead trees would be left to provide shade for regeneration.

Site preparation for planting would consist of the falling of some dead trees to provide seedling shade and to reduce ground-level wind speed. Falling would be done by machine or by hand. Reforestation of salvage-harvested stands would be accomplished through hand planting of ponderosa pine seedlings and would occur within five years after salvage harvest. Reforestation of fire-killed ponderosa pine stands located on suitable timberland that are not salvaged would occur within the next ten years, provided funding is available.

Also proposed are projects for watershed and wildlife improvements. These specifically include: 1. Reconstruction of the riparian exclosure on Upper McKee Draw 2. Channel stabilization and restoration work on McKee Draw and Mud Springs Draw.

Also proposed are the site-specific measures needed to implement decisions made in the March 2002 Uncompahgre Travel Management Decision, following harvest and planting activities. This includes the decommissioning of 28 miles of route by means of ripping/scarifying soils, seeding to native species of grass and shrubs, and barricading access using either native materials, posts, or gates.

For areas not already addressed in hazard tree removal emergency actions, also included in these proposals is the cutting of hazard trees along system roads, including sale and removal of those trees that have commercial value.

Purpose & Need for Action

The primary purposes of and need for the project are:

- Recovery of potential commercial value of fire killed timber for wood products
- Sale of wood products to local industry
- To promote re-forestation of non-stocked burned areas in a manner that facilitates the development of sustainable forest conditions.
- To improve residual stands of ponderosa pine through thinning, consistent with silvicultural objectives prior to the fire, but consistent with prudent management after the fire.

Additional purposes met by the proposed action include wildlife and watershed improvements using KV or appropriated funds, removal of hazardous conditions to

human use of the areas through removal of trees that may fall onto roads, and the implementation of decisions made in the Uncompahgre Travel Plan.

This action responds to the goals and objectives for the Forest as established by the Grand Mesa, Uncompahgre and Gunnison National Forests Land and Resource Management Plan (1991, as amended) as follows:

> Page III-2: Vegetation Manage vegetation in a manner to provide and maintain a healthy and vigorous ecosystem resistant to insects, diseases, and other natural and human causes. This will be done primarily through the commercial sale program for tree species located on lands suited for timber production.
>
> Page III-3. Timber Provide commercial forest products to local dependent industries at a level commensurate with adhering to the Forest and Management Areas Direction and in harmony with the other Plan goals.

The proposed action also responds to Forest Service Manual 2435 (Salvage Sale Program) by:

- Responding "quickly to potentially serious catastrophes such as wildfire, windthrow, or hurricane, to avoid unnecessary loss of value and volume"
- Assisting with "restoration of the forest resource when a catastrophe causes damage"
- Providing for "the removal of damaged or dead timber, as soon as practicable following a catastrophic event".

This action helps move the project area towards desired conditions described in the Forest Plan. The Burn Canyon and Bucktail burn areas are both located within Management Areas 6B (emphasis on livestock grazing), and 7A (emphasis on wood fiber production) in the Forest Plan. There is very limited 9A (Riparian) area along stream courses.

Decisions to Be Made

Decisions to be made using the information generated through this analysis include:

- Whether or not to salvage harvest and reforest all or part of the burned areas on Burn Canyon and Bucktail fires;
- Whether to, and if so, to what extent to, thin residual stands of living trees within the fire perimeter;
- Whether to reforest stands of fire-killed trees located on suitable timberland on which salvage harvest does not occur. (If the area is salvage harvested, the agency is required to reforest.)

- How to effect closure of roads located within the fire perimeters that have been identified for closure in the Uncompahgre Travel Plan.

- Which wildlife and watershed improvements to implement.

Public Involvement

The NEPA process and the associated Forest Service implementing regulations provide for an open public involvement process. The NEPA phase of a proposal begins with public and agency scoping. Scoping is the process used to identify major issues and to determine the extent of environmental analysis necessary for an informed decision to be made concerning a proposed action. Issues are identified, alternatives are developed, and the environmental analysis is conducted and documented.

The proposed action was described in a scoping packet that that was mailed to the public and other agencies for comment on November 8, 2002. The packet was sent to a mailing list of interested parties. The proposal was also listed in the Schedule of Proposed Actions published on October 15, 2002. In addition, as part of the public involvement process, the agency conducted an open house at the Norwood District office on the evening of November 20, 2002.

Contact regarding the proposals within the salvage area was initiated with Northern Ute and Mountain Ute Indian Tribes initially on November 8, 2002 as part of scoping.

Issues

The first step in the environmental analysis process is to determine what needs to be analyzed. "Scoping" (refer to 40 CFR 1501.7) is an open process designed to determine the potential issues associated with a proposed action and then from this list further identify those issues that are significant to the decision.

Issues are points of discussion, debate, or dispute about environmental effects that may occur as a result of the proposed action or an alternative. It is these potential environmental effects, particularly potential negative effects, which provide focus for analysis, influence alternative development, and lead to development of mitigation measures. Issues are used to display differing effects between the proposed action and the alternatives regarding specific resource elements.

A list of potential issues was developed by the Project ID Team on the basis of their knowledge of the proposed action and the area affected, and on the basis of public comment during scoping. These "potential issues" are reviewed by the ID Team to determine: a) the significant issues to be analyzed in depth, and b) issues which are not significant or which have been covered by prior environmental review and, therefore should be eliminated from detailed analysis.

SIGNIFICANT ISSUES: The following issues were identified to be significant issues to be carried through the analysis. These become the basis for the organization of Chapter 3.

- Fire ecology/Fuels Management; Concern has been raised about the rehabilitation and natural succession that may be expected to take place within the burn areas. In a report prepared by a number of interested scientists, commonly called the Beschta Report, questions are raised about the need or even the appropriateness of salvage harvest and planting. There is question as to whether the natural healing following fires such as Burn Canyon and Bucktail is aided or hampered by activities proposed. There are further questions regarding management of future fuels loading within the burn areas. It has been suggested that surface fuels resulting from falling snags in the higher stand densities should also be considered in planning post-fire management of pine stands. Others view this as a part of natural ecological processes at work. The question was also raised, and is part of Beschta Report concerns, that salvage harvest may create warmer and drier microsites, increasing the potential for future fires.

- Plant revegetation/forest regeneration (regeneration success/protection of regeneration from browse damage): In addition to ecological processes from above, concern has been raised regarding the successful regeneration of pine stands in areas where cattle and elk graze. Also the specific question was raised, "How will reforestation be accomplished and what are the targets for the future stand characteristics?" There is also concern regarding the direct site impact of proposed activities of salvage harvest on successful establishment of grass and low vegetation following the fire.

- Timing of salvage (before lost to insect damage): Concern has been raised that the agents of insect and disease are at work on fire killed trees, and that if not removed before winter of 2003 these trees will have no commercial value.

- Noxious weeds: Exposure of bare mineral soil by fire may accelerate invasion of noxious weeds. Natural and human-caused seed dispersal (wind, birds, and mammals, as well as wheeled vehicles and equipment) will result in unwanted invasion of weed species in areas had minimal infestations of these weeds before the fire. This has implications for management of proposed activities. This is also being addressed in other management actions, independent of the proposal to harvest and plant.

- Insects and diseases: Concern has been raised as to whether post fire treatment is necessary to prevent spread of insect or disease problems, both within the burned areas, and outside the burned areas.

- Soil movement and compaction: Erosion and soil loss are primary concerns in any management activity such as timber harvest. In the case of burned areas, soils are already denuded and exposed. The Beschta report and others express

the concern that proposed actions may further disturb soils and possibly worsen the impacts of the fires themselves. Also, in any area-wide disturbance with large equipment, there is a concern regarding the effects of soil compaction on the long-term health and productivity of the site. This is not unlike other timber sale proposals. The is also concern regarding soils impacts of thinning of stands, and of road decommissioning that are part of the proposed action.

- Nutrient cycles, water quality and quantity: There is concern over whether harvesting and planting activities will further interfere with the maintenance of nutrients on site. There is also concern regarding effects on water quality; timing and duration of runoff, as a result of timber salvage operations? Will those operations contribute to a further alteration, beyond the fire affects, in sediment and nutrient delivery to receiving waters? Will any increases have a significant adverse impact on the beneficial uses of water or increase the operation/maintenance cost of water use facilities and/or drainage structures (stream crossings) both within the project area and downstream?

- Riparian/Wetlands: The potential does exist for some limited riparian areas to exist within areas proposed for treatment. However, those areas will be excluded and protected from any disturbance associated with proposed harvest activities. In accordance with FSM 2526.03, we will delineate riparian areas prior to implementing any project activity. A copy of the riparian map will be included within the project record.

- Fisheries: Related to water quality, concern has been raised regarded potential downstream effects to native fish fauna and game fish located in Naturita Creek.

- Wildlife: Effects of proposals on wildlife are of concern. This includes effects on Threatened Endangered or Sensitive species of wildlife, management indicator species, and other wildlife that are associated with the burn areas, especially the ponderosa pine forest habitat. The primary issues are 1) the retention of live trees within the burn areas for cover and habitat diversity, 2) the retention of dead standing trees and down logs for nesting and/or den sites, and 3) the effective closure and management of existing roads and public travel to restore habitat effectiveness.

- Road access: Concerns were raised as to whether new road access would be required to undertake proposed harvesting.

- Visual impacts: A question to be answered through this analysis is whether proposed removal of fire killed trees and replanting will have an adverse effect on the appearance of the burn areas. This would address the appearance for travelers passing through the burn areas on developed roads, as well as the general public traveling in the area of the burned areas but not directly through them.

- Heritage resources: All proposed projects on National Forest System lands much be conducted in manner to protect cultural sites and heritage resources. All areas to be treated are surveyed and mitigation measures prescribed. Any effects to these sites are of concern for this analysis.

- Impacts to recreation: Both burn areas area used for dispersed recreation. Standing dead trees that were burned during the fires pose a safety risk to recreationists, particularly along roads. Ponderosa pine trees pose a greater safety risk than pinyon or juniper trees due to their larger size. . The bases of many trees are burned nearly through, and trees are already beginning to fall unpredictably. Such trees have the potential to fall on people and vehicles and to block roads and trails. As fire killed trees began to fall this hazard will increase. Decisions to undertake certain management measures decided upon in the Uncompahgre Travel process require site specific proposal and analysis. This relates primarily to the decommissioning of unwanted/unneeded routes. Specific proposals for route decommissioning are made as part of this EA.

- Log haul routes: There is local interest in what routes the harvest logs would be hauled. Truck traffic generates concerns regarding public safety, and road maintenance.

- Economics: Concern has been raised regarding the cost of these proposals, compared to the return to the government.

- Local economy: Concern has also been raised regarding the effect this harvest could have in terms of local employment and support to local timber industry.

- Cumulative effects: Specific issue was raised regarding the full consideration of cumulative effects of proposed actions considered together with other activities and circumstances in the area of the burn areas. It was suggested in response to scoping that actions such as those proposed may not individually be significant, but when considered with other past present and reasonably foreseeable actions may have cumulatively significant effects.

ISSUES NOT CONSIDERED SIGNIFICANT: The following are issues identified during scoping which are not ***considered*** significant in terms of the location of proposed actions or in terms of effects. Also included is the basis for this determination.

- Harvest opening size. Openings created by fire are exempt from opening size restrictions. The Forest Plan at page III-43 states:

  `05 The maximum size of opening crated by the application of even-aged silviculture will be 40 acres regardless of forest cover type. Exceptions are"

  a. Proposals for larger openings are subject to a 60 day public review and are approve by the Regional Forester;

  b. Larger openings are the result of natural catastrophic conditions of fire, insect or disease attack: windstorm; or

c. The area does not meet the definition of created openings.

The openings of concern have been created by the fires themselves, and will not be made larger by the removal of salvage material. Residual site conditions will be modified to some degree by the removal of fire killed trees, rather that allowing them to remain on site and, over time fall and decay. However, the openings created by the fires will exist regardless of whether fire killed trees are removed or not.

- DOC and drinking water: The issue of dissolved organic carbon (DOC) was raised specifically in relation to activities in the Goat Creek/West Beaver fire area. The reader is referred to those analyses for more detail. In the instance of Burn Canyon and Bucktail areas, these are not source watersheds for drinking water for specific communities. The towns of Nucla and Naturita are far enough down stream that water coming from these fire areas is substantially diluted by other waters before reaching treatment facilities. In addition, the charcoal left on the sites of these burned areas actually has a filtering effect on organic carbon, and reduces its delivery to downstream systems. In addition, the charcoal left on the sites of these burned areas will likely reduce the export of carbon below pre-fire levels, due to its ability to filter organic compounds contained in solution. There will be no effects to drinking water supplies from proposed actions considered here.

- Air Quality: While there were significant short term increases in airborne particulates associated with the smoke, ash and dust resulting from the wildfires, there is not expected to be any observable or measurable increases in particulate emissions associated with any future timber salvage operations. Harvesting activities, and log hauling over gravel roads may generate temporary dust, but in the perspective of normal use of the area, and of these roads, this is insignificant. Therefore, this is judged to be a non-significant issue and is dismissed from further analysis.

- Supply demand: Supply and demand for timber from the National Forest is beyond the scope of this analysis. This was addressed in the Forest Plan, last amended in 1991. Review of the Plan is currently under way.

- Cost/below cost sale: This issue is also more appropriately addressed at the Forest Plan scale. Present value analysis of alternatives presented under economics addresses this to some degree, but the broader issue is beyond the scope of this analysis. Sale of timber at prices less than total production costs is an issued addressed in policy formulated well above the Forest level and beyond the scope of this EA.

- Old growth retention and recruitment: It was suggested that existing and potential old growth stands be identified within the burn areas and retained. The proposal being considered for salvage is the removal of dead trees. There is no potential for these to contribute in any way to old growth. Thinning of living trees

within the fire area does not remove old growth, but rather promotes healthier, larger old trees which would contribute to old growth potentials.

- Make these burn areas part of long-term Research and Monitoring: These areas are within the National Forest Management Areas (Forest Plan) designated for active management for wood fiber production. Post-fire treatment has been extensively researched through the research arm of the Forest Service as well as through academic study. There are numerous areas affected by the fire seasons of 2001 and 2002. We see no distinguishing characteristics of the Burn Canyon or the Bucktail areas that would warrant special attention in terms of research or long-term study.

CHAPTER 2 - ALTERNATIVES, INCLUDING THE PROPOSED ACTION

This chapter describes and compares the proposed action and alternatives to the proposed action to be considered in this analysis. It includes a description and Map of each alternative considered. This section also presents a summary comparison of the effects of the alternatives in relation to the issues, defining the differences between each alternative and providing a basis for choice among options by the decision maker and the public.

Alternatives were developed to respond to the purpose and need. All alternatives are fully compliant with the Forest Plan.

The ID Team developed alternatives for both burn areas. These are summarized below in Tables 2.1 and 2.2. Following Table 2.2, the specifics of how these alternatives would translate on the ground in each burn area are presented.

Alternatives Considered in Detail

Table 2.1: **Alternatives for Burn Canyon**

Elements\Alternative	1 No Action	2 Proposed Action	Alternative 3
Salvage harvest	None	2,016 acres	2,016 acres
Commercial Thinning/Underburn	None	344 acres	None
Soil Productivity/Suitable for Timber harvest (NFMA)		Suitable lands only, but all soils	
Slope Class		<= 15% where fire severity High or Moderate; <= 25% elsewhere	<= 15% where fire severity High or Moderate; <= 25% elsewhere
Road Accessibility		No new construction; use only existing road templates	No new construction; use only existing road templates
Regeneration	Restocking through natural processes would take over a century	Plant about 2,016 acres in 5-years; 2,116 acres “other reforestation.” Restocked stands within 10 years.	Plant about 2,016 acres in 5-years (salvage); 2,116 acres “other reforestation.” Restocked stands within 10 years.
Riparian/channel restoration		yes	Yes
Travel Management	Decommission according to travel plan following treatment	Decommission according to travel plan following treatment	Decommission according to travel plan following treatment
Water development		yes	Yes
Hazard Tree Removal along developed roads		yes	Yes
Site Preparation by falling		In all areas receiving	In all areas receiving

some residual dead trees		salvage cutting	salvage cutting
Noxious weed mgt		yes	Yes
Plantation fencing		Where necessary	Where necessary
Snag retention	Manage post-fire public fuelwood harvest to retain dead standing trees.	Retain snags and patches of dead standing trees within salvage/regeneration areas at Forest Plan standards.	Retain additional snags and patches of dead standing trees within salvage/ regeneration areas above Forest Plan standards.
Wildlife projects	Yes but KV funds will not be available	Yes but KV funds may not be available	Yes but KV funds may not be available

Table 2.2: Comparison of Alternatives for the Bucktail Burn

Elements\Alternative	**1 No Action**	**2 Proposed Action**	**Alternative 3**
Salvage harvest	None	189 acres	189acres
Commercial Thinning	None	296 acres	None
Soil Productivity/Suitable for Timber harvest (NFMA)		Suitable lands only, but all soils	
Slope Class		<= 15% where fire severity High or Moderate; <= 25% elsewhere	<= 15% where fire severity High or Moderate; <= 25% elsewhere
Road Accessibility		No new construction; use only existing road templates	No new construction; use only existing road templates
Regeneration	Restocking through natural processes within several decades	Plant about 189 acres in 5-years; 216 acres “other reforestation” Restocked stands within 10 years.	Plant about 189acres in 5-years (salvage); 216 acres “other reforestation.” Restocked stands within 10 years.
Riparian/channel restoration		yes	Yes
Post sale road treatment		Decommission according to travel plan following treatment	Decommission according to travel plan following treatment
Water development		yes	Yes
Hazard Tree Removal along developed roads		yes	Yes
Site Preparation by falling some residual dead trees		In all areas receiving salvage cutting	In all areas receiving salvage cutting
Noxious weed mgt		yes	Yes
Plantation fencing		If necessary	If necessary
Snag retention	Exceed minimum standards	Exceed minimum standards	Exceed minimum standards
Wildlife projects	Yes but KV funds will not be available	Yes but KV funds may not be available	Yes but KV funds may not be available

Alternative 1 (No Action)

Under the No Action alternative, no salvage, green stand treatments, planting or other activities would occur. Current ongoing management practices (i.e. road maintenance, fire suppression, personal use firewood cutting, grazing, etc.) would continue with the selection of this alternative. Other fire recovery projects, including riparian/channel restoration, travel management, noxious weed management, and wildlife projects, may or may not occur independent of this decision to salvage harvest and reforest these areas.

Aspects of all alternatives unique to Burn Canyon

The Burn Canyon Fire occurred entirely within the West Naturita C&H allotment. The allotment is managed on a deferred rotation system. Under a deferred rotation system, the entry date into individual pastures changes every year, and the prescribed sequence of use of each pasture also changes every year. An administrative decision to postpone grazing on the West Naturita allotment during the 2003-2004 grazing seasons has been made. Additionally, a proposal to use the current permit holder's livestock for rehabilitation is being developed. Although there are no details at this time, the proposal is likely to focus on working native perennial seed into the soil through livestock hoof action, and could be attempted with temporary fencing in place.

During the recovery period for both burn areas, grazing management techniques to achieve desired use levels could include adjusting location and timing of livestock turnout, reduced livestock numbers; shorter prescribed grazing periods within and adjacent to the burned areas; installation of temporary fencing; salting, riding, or other management practices that would promote use by livestock in those portions of the pastures away from the fire. Specific grazing management adjustments would be developed on an annual basis in coordination with the allotment permittee(s) and incorporated into the annual operating instructions.

Aspects of all alternatives unique to Bucktail

The Bucktail Fire occurred within parts of 2 pastures within the Basin C&H allotment. The allotment is managed on a deferred grazing system. Under this type of management, the pastures are grazed successively at the same time of year, each year, starting with the low elevation pastures and moving to the higher elevation pastures as plant development progresses.

During the recovery period for both burn areas, grazing management techniques to achieve desired use levels could include adjusting location of livestock turnout, placement of salt blocks or other management practices that would promote use by livestock in those portions of the pasture away from the fire. Specific grazing management adjustments would be developed on an annual basis in coordination with the allotment permittee and incorporated into the operating plan.

Other fire recovery projects, including may or may not occur independent of this decision to salvage harvest and reforest these areas.

Alternative 2 (Proposed Action)

Under Alternative 2, areas of commercial-size fire-killed and severely fire-damaged live trees would be harvested (Map D). Harvest would be confined to low-gradient slopes. Where fire severity was high or moderate, as Mapped by the BAER Team, harvest would occur on slopes of 15 percent or less, except for short pitches up to 25 percent slope. Outside of high- and moderate-severity fire areas, harvest would be restricted to slopes 25 percent or less. Only existing roads would be used to access timber.

Salvage harvest would not result in the complete removal of all dead trees. In addition to trees left for wildlife habitat needs, about 5 to 10 tons-per-acre of standing and down-dead material six inches or greater in diameter would be left as site preparation for planting. Trees needed to achieve the down woody material requirement would be felled by hand or machine. The material would provide shade and reduce the speed of ground-level, drying winds, which would reduce moisture stress in planted trees and increase the probability of seedling survival (Figures 1a and 1b). Also, the "jack-straw" arrangement of down material would inhibit use of the area by domestic livestock, providing seedling protection from browse damage.

Figure1a *Natural regeneration growing in the protection of down woody material in Northfork Fire of 1994, Norwood District.*

Figure 1b *Small diameter down and standing dead trees help to reduce moisture stress in ponderosa pine seedlings growing after the 1994 Northfork Fire.*

As shown on Map D and in Tables 2.1 and 2.2, Alternative 2 also involves the thinning and underburning of stands of live trees within the fire perimeters. Thinning and underburning is proposed in areas that were being considered for treatment prior to the occurrence of the Bucktail and Burn Canyon fires. By reducing live tree stocking,

thinning and underburning would result in stands of trees more resistant to future high-severity fire damage, more resistant to attack by bark beetles, and more resilient to other types of stand disturbances. Thinning would be subject to the same slope limitations previously described for salvage harvest. Thinning would not occur concurrently with salvage harvest, but would follow about three years after salvage cutting. Within five years of completion of thinning, thinned stands would be burned in a prescribed fire.

Figure 2a: *High-severity burn in Bucktail ponderosa pine stand with no previous management history.*

Figure 2b: *Area inside Bucktail fire with apparent moderate burn intensity in ponderosa pine stand that had been previously thinned and underburned.*

Reforestation is another component of Alternative 2. There are two reforestation categories discussed in this EA. The first, called "5-year reforestation," involves planting in stands where salvage harvest occurs. Hand tree planting would be the means by which reforestation would occur. By law, the Forest Service is required to assure adequate restocking within 5 years of fire salvage. Reforestation is not required or desired in stands proposed for thinning because these stands are already well-stocked with trees. The second reforestation category stems from the obligation to "maintain in appropriate forest cover … all forested lands in the National Forest System." (National Forest Management Act) This requirement applies to areas suitable for timber production located outside of proposed salvage harvest and thinning areas and is referred to as "other reforestation" in this document. A specific time period within which reforestation is to occur is not prescribed by law or regulation. The ability of the Forest Service to accomplish reforestation needs in this category is dependent on funding availability and would be accomplished as financing permits. However, the Forest Service believes that reforestation under this category would occur within the next ten years.

Ponderosa pine is the species native to the burn areas and is the only species that would be used in reforestation activities. Tree seedlings would be grown from seed that meets Forest Service policy regarding genetic diversity and site adaptation.

If use of planted areas by domestic livestock is not sufficiently reduced by the presence of down trees, as described above, and if funds are available, the Forest Service would fence plantations to exclude livestock.

Winter operations, including log haul, would be allowed under this alternative.

Other fire recovery projects, including riparian/channel restoration, travel management, water developments, noxious weed management, and wildlife projects, are components of Alternative 2. It is not likely that sufficient KV funds would be generated under this alternative to cover identified work, in which case alternate funding sources would need to be obtained.

Another component of this alternative would be the decommissioning of existing roads/or trails consistent with the Travel Plan. Specific routes and actions are listed below.

Aspects of Alternative 2 Unique to Burn Canyon

About 2,016 acres of salvage would occur in Burn Canyon under this alternative. This would result in about 4 to 6 million board-feet of timber salvage. Additionally, about 344 acres of live stands of ponderosa pine are proposed for thining, which would result in about 0.250 mmbf of timber products. As Map D shows, most of the proposed harvest is located on the mesa tops between canyons. The area is well-roaded and is characterized by low slope gradients.

Possible log haul routes from Burn Canyon include: 1) southeast on National Forest System Road (NFSR) 608 past Miramonte Reservoir to the Dolores/Norwood road, NFSR 610, then north to State Highway 145; 2) southeast on NFSR 608 past Miramonte Reservoir to the Dolores/Norwood road, then south on the Dolores/Norwood road to Dolores, Colorado; 3) northwest from the Burn Canyon area on NFSR 607 to the Hamilton Creek road, then north into Redvale; 4) southeast on NFSR 608 to Miramonte Reservoir, then west on the Nelson Creek road to Highway 141, then north to Highway 145.

Decommissioning of roads would include the re-establishment of vegetation through ripping, plowing, or scarifying the road surface in preparation for seeding. Ditches will be filled and contoured to match existing terrain. All cross drainage structures are to be removed and filled to match existing contour.

Aspects of Alternative 2 unique to Bucktail

About 189 acres of salvage would occur in Bucktail under this alternative, which would result in about 0.150-mmbf. Volume from thinning is estimated at about 0.200-mmbf from about 296 acres.

Possible log haul routes from Bucktail include: 1) north on NFSR 503, the Delta-Nucla road, to Delta; 2) east on NFSR 603, the Hauser road, to NFSR 402, the Divide road, to NFSR 540, Old Highway 90, to Montrose; 3) north on NFSR 503 to Columbine pass, then east on the Divide road to Old Highway 90, then to Montrose; 4) south on the Delta/Nucla road to Naturita.

Decommissioning of roads would include: ripping road surfaces with a catapillar tractor/ripper, removing all cross drains and fillingin ditches, planting to locally used grass seed mixture to establish vegegation, and barricading access through either gates, or placement of native material to prevent further use. Routes to be decommissioned in the area, in accordance with the Travel Plan Decision of 2001 are detailed in Maps in the project file for this EA, but include the following Table 2.3:

Table 2.3
Routes to be Decommissioned

Route	Miles	Route	Miles
595.2A	.31	W5607.2a4	1.59
595.2B	.25	W5607.2a5	.30
596.1A	.83	W5607.3	1.20
597.1A	.78	W5607.3a	.30
607.2C	3.1	W5607.3b	.22
607.2E	2.24	W5607.4	.93
607.2F	.3	W5607.4a	1.87
607.2G	.5	W5607.4b	.25
634	.25	W5607.4c	.21
651	.58	W5607.5	.88
W5595.1	1.18	W5610.1	.75
W5595.1a	.28	W5634.1	.62
W5595.1b	.34	W5634.2	.25
W5595.2	.51	W5634.3	.37
W5595.3	.26	W5651.21	1.28
W5597.1	.49	W596.1a1	.83
W5607.1	.29	W607.2b	.18
W5607.2	.36	W607.2f1	.47
W5607.21a	.92	W607.2f2	.45
W5607.2a2	.36		

Alternative 3

This alternative is the same as Alternative 2, except that thinning of live stands of commercial-size ponderosa pine would not occur. See Map E.

It is not likely that sufficient KV funds would be generated under this alternative to cover identified work, in which case alternate funding sources would need to be obtained.

Mitigation Measures Common to All Action Alternatives

In response to public and internal comments on the proposal, mitigation measures were developed to ease some of the potential impacts on soils, wildlife, cultural resources, noxious weed control and recreation the various alternatives may cause. The mitigation measures will be applied to any of the action alternatives.

1. The best management practices contained in the Rocky Mountain Region's Soil and Water Conservation Practices Handbook (FSH 2509.25) apply to all action alternatives. Additional, project-specific measures are detailed in the Chapter 3 soil and water discussions.
2. For the management of noxious weeds:
    - Education on the identification of noxious weeds to Forest Service personnel will continue. This applies specifically to (but is not limited to): pre-sale layout crews and sale administrators.
    - Use timber sale contract provisions for requiring all off road logging and construction equipment to be free of noxious weeds when moving onto the sale area and/or moving between units on the sale area that are known to contain noxious weeds. Specifically, Use CT6.35 - Equipment Cleaning (7/01). In this provision the purchaser has to certify that his equipment is weed free. The Forest Service would reserve the right of inspections prior to the equipment's use and to verify that each piece operating in the woods is clean.
    - Annual monitoring of the burned and harvested area will continue for a minimum of 4 years following activity.
    - On-going noxious weed treatment will continue to receive high priority in close proximity to this area.
3. Beyond the evaluations and determinations being completed to comply with Section 106 of the National Historic Preservation Act (see chapter 3), if cultural resources are found during the implementation of proposed activities, project activity will stop in the immediate area while a plan to mitigate the effects is formulated. Once the mitigation work is completed and resources are protected, project activity would proceed.

4. Beyond the evaluations and determinations being completed to comply with Section 7 of the Endangered Species Act, should any endangered, threatened, or sensitive species be found during project activities within, adjacent, or near enough to the project that activities could create a disturbance, activities will be halted until their effects can be determined and their significance assessed.
5. If harvest activities occur in the winter, snowmobile route use on the Delta-Nucla road will be coordinated between the purchaser, the Forest Service and snowmobilers.
6. Silvicultural prescriptions will address the need for measures to protect plantations from livestock damage during the regeneration period.
7. Structural wildlife habitat specifications for timber salvage:
    - Retain 90-225 snags per 100 acres 10" dbh or greater. Snags can be retained as individual trees or in groups or patches.
    - Retain an average length per acre of down-dead logs which are at least 12" diameter of 50 linear feet per acre.
8. Structural wildlife habitat specifications for thinning/burning of live trees:
    a. To provide habitat for the Abert squirrel, nesting habitat will be retained at all existing nest tree sites. This includes the nest tree and all mature trees associated with the nest tree. In addition, retain a minimum of one group of 3-5 mature trees with interlocking crowns per 5 acres within the remaining thinning area for nesting habitat.
    b. Maintain existing big game hiding cover on at least 60% of each arterial and collector road.
    c. Limit spring burning to 50% of the affected treatment area each year to alleviate impacts to ground-nesting birds such as the Merriams turkey.
9. Existing snags and other wildlife trees within burning units will be protected through pre-burn site preparation and ignition techniques.

Alternatives Eliminated from Detailed Study

Only alternatives or specific design elements that were responsive to purpose and need were fully developed and analyzed. Alternatives or design elements that were considered but not fully developed or included in alternatives included the following:

No Salvage/Plant Only Alternative – This alternative was considered by the IDTeam, however it was not fully developed because it would not have met purpose and need in regard to recovery of commercial value, nor would it have facilitated the long-term development of sustainable ponderosa pine stands on suitable lands within management prescriptions calling for a management emphasis on wood-fiber production.

In addition, application of prescribed fire is an important tool in the development of sustainable stands. In general it is possible to begin applying prescribed fire in stands of ponderosa pine trees that are at least 25 to 30 years old, without sustaining unacceptable levels of mortality. With a no salvage/plant only alternative the re-introduction of prescribed fire would likely be delayed for many decades beyond the 25 to 30 year timeframe. This is because the condition in 25 to 30 years would likely be characterized by young ponderosa pine trees growing within a dense matrix of fallen fire killed trees. Fuel loadings would be prohibit application of prescribed fire. This resultant fuel loading would also be conducive to fire that would be destructive to pine stands established by planting, if a fire should occur in the future.

In addition, soils and water resources would not be better protected from adverse effects by this alternative. The harvest of remaining standing dead trees using low ground pressure equipment is not expected to have effects which warrant their exclusion. In fact, some ground disturbance such as is caused by rubber tiered skidders is considered beneficial on the hydrophobic condition of these soils following the fire. Breaking up the surface armor of these soils results in better infiltration of water and quicker rehabilitation of vegetation on the area. See soils and water discussions in Chapter 3.

Restoration-only (natural processes-oriented) Alternative based on Beschta – An alternative emphasizing natural disturbance processes based on "Beschta Report" recommendations was considered by the IDTeam. This alternative was not fully developed because it also would not meet purpose and need in regard to facilitating the long-term development of sustainable ponderosa pine stands on suitable lands within management prescriptions calling for a management emphasis on wood-fiber production. Nor would it meet purpose and need in regard to recovery of commercial value. This alternative would be very similar to the No Action Alternative (Alternative 1) with the exception of recommended monitoring and remedial actions.

The Beschta recommendation to replant only after several years of evidence that natural regeneration has not occurred would not meet purpose and need pertaining to the long-term development of sustainable forest conditions. The EA discusses the expected successional vegetation development pathways that would likely occur without the planting of ponderosa pine seedlings. Natural regeneration would not result in the establishment of the desired first step in the long-term development of a sustainable ponderosa pine forest in the burned area. The distribution of live ponderosa pine trees within many areas of the two burns is poor, especially in the Burn Canyon burn. Some burned areas are over a mile from a suitable ponderosa pine seed source. Because most seed falls within about 120 feet of a seed-bearing tree, the natural re-establishment of a ponderosa pine forest within these burns could take well over a century.

The recommendation to leave 50% of the standing dead trees is presented in Beschta et al (1995) (include citation in the appendix) without specific rationale

as to why the 50% level was selected. In the site-specific planning for this project, alternatives are the product of a range of possible responses to site-specific issues. Snag retention options contained in all alternatives are from the GMUG Forest Plan standards that are designed to provide for 100% of potential population levels of primary cavity excavators.

The Beschta recommendation to determine the need to undertake road maintenance, improvement or obliteration is essentially incorporated into all action alternatives.

No site-specific factors for prohibiting yarding systems that rely on tractors and skidders were presented to, or determined by, the ID Team during the analysis. The primary factors considered in the determination to not apply the broad-brush Beschta recommendations on this topic, were site-specific terrain and soils factors and the objective of using low ground pressure equipment. The terrain within the fire perimeter is gentle. Specific areas that were too rocky or too steep to allow prudent use of ground-based equipment were excluded from all action alternatives. Existing condition monitoring within the project area, including areas of past activities, determined that the area exhibits a low amount of adverse compaction. See also discussion just above (under the alternative eliminated with the heading "No Salvage/Plant Only Alternative".

Cumulative Actions Considered in the Analysis

Cumulative actions are those past, present and reasonably foreseeable activities in or near the project areas that may not individually, but may cumulatively result in effects of concern. Consideration of these actions aids in the understanding of the context of the proposed action within the broader setting, and is important in determining whether "significant effect to the quality of the human environment" may occur as result of the propose action or alternatives.

Cumulative actions considered include the following:

BAER (Burned Area Emergency Restoration) treatments on the Bucktail and Burn Canyon fires were initiated in the fall of 2002. Projects that were completed are:

- Seeding of approximately 575 acres on the Bucktail Fire. Seeding was completed in early January 2003, using native perennial grass species.
- Seeding of approximately 3500 acres of NFS lands on the Burn Canyon fire, and 10335 acres on BLM lands. Seeding was completed in early January 2003, using a mix of native species that included grasses, forbs, and shrubs.
- Seeding of approximately 6000 acres on private lands within the perimeter of the Burn Canyon fire.

- Mechanical treatments (roller chopping and hydro-axing) are being used on BLM and private lands this winter (Burn Canyon Fire)

- Construction of 3 16' by 16' x 54" tall exclosures on the Bucktail Fire. The exclosures were designed to help us monitor vegetation recovery. Additional exclosures may be installed in 2003.

- Monitoring of approximately 2000 acres on the Burn Canyon and Bucktail Fires in fall 2003 for vegetation recovery and invasive plants. The monitoring was focused on roads and other areas adjacent to or near known infestations that were identified prior to the fires.

- Cleanout of 2 ponds on the Burn Canyon fire, (NFS) so that they can serve as sediment traps in Mud Springs Draw. Additional cleanout work for these 2 ponds is anticipated to occur spring and fall 2003, and again fall 2004.

Other activities completed or anticipated as a result of the fire:

- Reconstruction of existing boundary and interior fence on the Burn Canyon fire is planned for 2003-2005. Construction of some new fence is planned; removal of some existing fence is also planned.

- Reconstruction and cleaning of additional existing ponds within the perimeter of the Burn Canyon fire.

- Reconstruction of an interior fence in the Bucktail fire was completed June 2002.

- Noxious weed monitoring is scheduled to occur in early summer and again in the fall of 2003. Noxious weed treatment will also be a priority

- Wildlife habitat and range improvement projects within and outside fire perimeter:

    - Chaining was utilized as a tool for rangeland improvement in much of the Pinyon/Juniper woodland in and around the fires during the 1960's and 1970's. Most of the old chainings were seeded with crested wheatgrass to provide spring cattle forage. Agency records do not accurately document the total acres of treatment but it was fairly extensive on public and private lands. Almost all of these old treatment areas have regenerated to mid-seral stands of P/J woodland.

    - Within the last ten years, roller chopping has been used as a tool for big game winter range improvement on USFS and BLM lands near the Bucktail Fire area. Lower elevation Pinyon/Juniper woodlands have been the focus of these vegetation treatments. Native seed mixes are applied during the roller chopping to restore desirable plant species. Most of the treatments occurred within the old chainings. Approximately 400 acres have been treated on BLM lands in Coal Canyon, and 290 acres on USFS lands in Coal Canyon and Big Bucktail Creek.

Prescribed burning has also been utilized for big game winter range improvement on BLM and USFS lands near the Bucktail Fire. Old chainings within the lower elevation P/J woodland and Gambel oak brush fields were the focus of these treatments. Within the last 15 years, approximately 1,800 acres have been burned in the Pinto Mesa and Big Bucktail Creek areas.

- The BLM is utilizing a hydro-axe and roller chopper to help rehabilitate portions of the Burn Canyon Fire. Specifically the area being treated is to the west of the area considered in the Burn Canyon Salvage EA. Currently 200 acres of the most severely impacted soils adjacent to drainages have been hydro-axed to 1)break up hydrophobic soils with the rubber tired machine, and 2)add woody debris to the surface to create microsites for grasses and forbs and to slow water movement and erosion. In addition 1,100 additional acres are being treated with a roller chopper with similar objectives. With current/ongoing treatments 1,300 acres, or 13% of BLM lands burned would be treated. In the future 1,500 acres of additional roller chopping or hydro-axing could occur on BLM lands for a total mechanically treated area of up 2, 800 acres, or 28% of the BLM lands burned.

- Timber harvest has occurred in the Burn Canyon area, both within and outside the fire boundary, for many years. Between 1977 and 1983 about 1,750 acres were thinned in commercial harvests, mostly across Naturita canyon outside the fire perimeter. This same area was roller chopped for site preparation for natural regeneration. Also, there were about 300 acres of precommercial thinning that occurred in 1985 and1986. Most recently, the Busted Arm and Bull Pond sales occurred east of the burn across Naturita canyon. These sales were ponderosa pine commercial thinning harvests that were completed in 2001 and 1999 respectively. Busted Arm amounted to 310 acres of commercial thinning and Bull Pond totaled about 541 acres.

- Thinning has occurred in the upper end of the Big Bucktail Creek watershed for many years. In the mid-1980's, bark beetles caused considerable mortality in the ponderosa pine forest type in upper Bucktail Creek. Salvage of beetle-killed trees occurred on about 1800 acres. Additionally, commercial thinning occurred in the early 1990's on about 1500 acres. Some of this thinning occurred on the same area that had been salvaged during the earlier bark beetle infestation. Between 1996 and 2002, all of the Glencoe Ridge area was underburned following the thinning activity.

- Other fire salvage: in addition to the commercial salvage opportunities discussed in this document, there will be demand for personal use products by the general public in both burns. These products include firewood, posts, and poles.

Table 2.4

Alternative Comparison

Issue	Alternative 1	Alternative 2	Alternative 3
Fire ecology/Fuels Management			
Plant revegetation/forest regeneration	Over 100 years before restocking with p. pine.	Restocking of salvage in 5 years; Restocking of non-salvage in 10 Years.	Restocking of salvage in 5 years; Restocking of non-salvage in 10 Years.
Timing of salvage (before lost to insect damage):	No salvage of commercial timber.	Salvage of commercial timber before unsuitable degradation of product quality/quantity.	Salvage of commercial timber before unsuitable degradation of product quality/quantity.
Noxious weeds			
Insect and disease	No expected increase in mortality-causing insects or diseases.	No expected increase in mortality-causing insects or diseases.	No expected increase in mortality-causing insects or diseases.
Soil movement and compaction			
Nutrient cycles, water quality and quantity	No effects beyond the fire. Sediment recovery will take upwards of 5 years and nutrient export will recover in 3 to 5 year. Reduced evapo-transpiration rates will persist for decades.	Some localized effects of sediment production and nutrient flush. Expected to be negligible compared to levels generated by the fire. Some temporary delay in site restoration due to logging disturbances. Reforestation will accelerate conversion back to timber and increase water demands by trees.	Very little difference from Alternative 2
Fisheries	No fish species within analysis area. Potential short-term effects from fire to downstream fisheries Suspension of livestock use and post-fire erosion control would help reduce fire impacts	No fish species within analysis area. Minimal indirect impacts above post-fire effects to FS sensitive fish species and MIS fish species.	No fish species within analysis area. Very little difference from Alternative 2
Wildlife:	No adverse effect to TES, MIS, or other species beyond the fire events. Long-term, extensive	No adverse effect to TES species beyond the fire events. Adverse effects to habitat capability for some MIS on the Burn Canyon fire.	No adverse effect to TES, MIS, or other species beyond the fire events. Successful reforestation initiates recovery of ponderosa

	loss of ponderosa pine habitat within the Burn Canyon Fire. No effect to remaining live trees and associated cover and habitat capability. Maximum snag/down log habitat retained. Post-fire habitat effectiveness improved through implementation of travel plan on both fires. KV funding not available for wildlife projects.	Successful reforestation initiates recovery of ponderosa pine habitat, especially on Burn Canyon. Proposed treatment of live trees further reduces limited cover and habitat capability within Burn Canyon fire. Same treatments within Bucktail fire will not adversely affect habitat capability. Required mitigation retains snags/down logs within treatment areas at Forest Plan standards. Post-fire habitat effectiveness improved through implementation of travel plan on both fires. KV funding possibly available for wildlife projects.	pine habitat, especially on Burn Canyon. No effect to remaining live trees and associated cover and habitat capability. Required mitigation retains snags/down logs within treatment areas at levels above Forest Plan standards. Post-fire habitat effectiveness improved through implementation of travel plan on both fires. KV funding possibly available for wildlife projects.
Road access	No new road construction. Continued normal road maintenance.	No new road construction. Increased road maintenance to maintain current road standards.	No new road construction. Increased road maintenance to maintain current road standards.
Visual impacts	Landscape character will be restored naturally over time, but take longer than Alts 2 & 3.	Reforestation will accelerate the restoration of the landscape character	Reforestation will accelerate the restoration of the landscape character
Heritage resources			
Impacts to recreation	Hazard trees along developed roads will pose a safety hazard to recreationists	Hazard trees to be removed along developed roads	Hazard trees to be removed along developed roads
Travel management	No changes are required to the Travel Management Decision.	No changes are required to the Travel Management Decision.	No changes are required to the Travel Management Decision.
Log haul routes:	None	See Discussion	See Discussion
Economics	N/A	Benefit/Cost = 0.09 PNV = -$1,557,469	Benefit/Cost = 0.04 PNV = -$1,623,401
Local economy	None	Short-term, local benefits	Short-term, local benefits

Forest Plan Compliance

No Forest Plan amendment, site-specific or otherwise, would be required for implementation of any of the action alternatives considered in this EA. All are complaint with the Forest Direction and Management Area standards and guidelines of the Plan. Salvage of commercially valuable products and reforestation with native (Ponderosa pine) species of trees implements specific objectives set forth for the 7a Management Area in the Forest Plan, and is not inconsistent with direction for Management Area 6b.

CHAPTER 3 - ENVIRONMENTAL CONSEQUENCES AND ALTERNATIVE COMPARISON

INTRODUCTION

This chapter describes the environment being affected by the alternatives discussed in Chapter 2 and forms the scientific and analytic basis for the comparisons made between these alternatives. It also considers past, present, and reasonably foreseeable future activities listed in Chapter 2 in the cumulative effects analysis. The impacts for each alternative are discussed for those issues identified during scoping and considered to be factors in the decision being made. For each issue, this chapter addresses: a) the affected environment, b) direct and indirect effects, c) cumulative effects and d) other applicable laws, regulations, policies, and other direction.

The two separate project areas addressed in this EA (Burn Canyon and Bucktail) are addressed in separate sections of this chapter. See titles of sections as well as footers at the bottom of each page to keep track. Effects are addressed in the same order and organization as suggested by the issues listed in Chapter 1.

It should be noted that the effects of the fires themselves were substantial. The change in the landscape caused by the fires is reflected in descriptions of the exiting condition statements below. The incremental effects of proposed actions of harvest, planting and etc from above are then described under environmental consequences of alternatives.

EXISTING CONDTION AND ENVIRONMENTAL CONSEQUENCES

Note: Some sections that follow discuss on burn area at a time, while others combine both burn areas under one discussion.

Fire Ecology/Burn Canyon

Existing Condition/Cumulative Actions Considered:

The Burn Canyon Fire burned through several vegetative types on National Forest lands, with over 50% of the fire burning in ponderosa pine stands. The fire in much of the ponderosa pine stands burned with unnatural intensity as a stand replacement burn; over 3,000 acres, or 57%, of the ponderosa pine, was impacted by this stand replacement burn. In addition 3,531 acres, or 96%, of pinyon/juniper on National Forest lands were burned in a stand replacement manner. When these large percentages are set within the larger context of the entire Burn Canyon Fire, which burned over 31,000 acres of Forest Service, BLM, and private lands, much of it with high intensity, it becomes apparent that the event had a substantial impact on vegetation.

Under natural conditions ponderosa pine typically burns under a fire regime of frequent, low intensity surface fires. The frequency can range anywhere from 2-40 years with low to moderate intensity, depending largely on the amount of surface fuel and understory vegetation which has accumulated since the previous fire. In the Burn Canyon area natural fire frequency was probably more precisely in the 10-40 year range (studies are currently underway on the adjacent Uncompahgre Plateau to develop a more site specific fire history). Due to nearly a century of fire exclusion in these fire dependent ponderosa pine stands, the accumulation of surface litter, the increase in understory vegetation, and the changes in stand structure supported an unnatural, high intensity fire, which in turn has significantly altered the ponderosa pine stands and subsequently the overall fire regime in the area. As part of the emergency rehabilitation/soil stabilization approximately 1,000 acres of the ponderosa pine on the most susceptible soils and all of the most severely impacted pinyon/juniper on adjacent Forest lands, BLM lands, and private lands have already been seeded with various grass/forb/shrub seed mixes to reduce the potential for soil erosion and/or begin restoring these areas.

Local issues that have been raised specific to ecology and fire ecology, with the ID teams responses to each, are included below.

1) Will salvage logging aid or hamper the 'natural healing' process folliowing the fires? Due to the intensity of the fire, and subsequent severity in some locations, the process of salvage logging will help to break up hydrophobic soils, increasing infiltration and possibly allowing both natural and artificial regeneration to proceed more rapidly. In addition the ponderosa pine stands consumed during the fire were unnaturally dense, which will eventually result in unnaturally heavy fuel loadings on the surface. This heavy loading of woody debris could cause scattered soil impacts if a future fire burns though it.

2) How will salvage logging, or the lack of, affect fuel loadings in the future? Salvage logging will result in an immediate increase in fine fuels as remaining needles and branchwood are moved to the surface. This debris will deteriorate within 5-10 years. By removing a portion of the large woody material through salvage logging the long-term build up of large woody debris will be reduced. Without salvage logging, long-term build up of large woody debris will occur, possibly resulting in additional soil damage as future fires smolder within the logs and debris.

3) Will salvage harvest create drier and warmer mircosites, increasing the potential for future fires? Only a portion of the dead material will be removed through salvage logging. The remaining material will be either be felled by hand or machine or allowed to fall to the surface over the next 5-10 years, providing substantial microsites for grass, forb, shrub, and tree species to regenerate. The long-term impacts to fire behavior from 'drier and warmer microsites' will be compensated for by increased soil and plant moisture due to reduced competition from pre-fire conditions.

In addition issues related to ecology and fire ecology which have been raised in the 'Beschta Report' (Beschta, 1995), with ID team responses to each, follow:

4) Native species are adapted to natural disturbances and therefore preventing additional human disturbance will provide the path to ecological recovery. Portions of the fires burned within fuels that were largely unnatural in density, continuity and composition. Soil impacts in many locations were severe and very little mosaic was created on the landscape, causing residual seed sources to be rare. Without human intervention at some level soil erosion would be expected to be unnaturally high over an unnaturally large area while vegetation response will be reduced due to lack of seed sources. Human intervention is desirable because the fires were unnatural in both intensity and scale.

5) Natural fires reset temporal patterns and processes, including biodiversity and patchiness, which subsequently contribute to ecological health. Again, the fires were unnatural in intensity and scale due to unnatural fuel conditions. The temporal patterns and processes were therefore unnatural and subsequent biodiversity and patchiness will also be unnatural to a degree. Ecological health may best be maintained by helping to establish native ground cover (to reduce erosion and maintain soil productivity) and by planting native tree species (to improve patchiness, as well as meet resource objectives).

6) Increased severity of fires due to fire suppression does not exist equally across the landscape. Although not all of the fire areas were unnaturally impacted several areas within both fires had severe soil impacts due to unnaturally heavy fuel loadings/stand densities.

7) There is no ecological need for immediate intervention on the post-fire landscape. There is need for intevention in the post-fire landscape because the fire event was not completely natural in scale or intensity. Revegetation using grass/forb/shrub species was needed immediately to prevent soil loss. In the long run patchiness, wildlife habitat, and existing resource objectives may best be restored by planting native tree species on the landscape.

8) Natural recovery should be allowed on the post-fire landscape. Natural recovery which will meet existing resource objectives for certain portions of the fire areas in an acceptable time frame is unlikley. Pre-fire seed sources for desired species were minimal in some locations and have been removed by the fire in other locations. Carefully analyzed human intervention can speed the natural recovery to meet existing resource objectives.

9) Artificial regeneration is often not needed from an ecological perspective. Artificial regeneration of grass, forb, shrub, and some tree species may well be needed on portions of these fires due to the limited seed source of some species prior to the fire and because the extent and continuity of the fire removed adjacent seed sources from many areas of the fire.

10) Building of new roads in a burned landscape should be prohibited. As part of this proposal no new roads will be constructed. Only existing roads will be used to implement the proposed alternatives. In fact, the GMUG National Forest is utilizing

this opportunity to implement road closures in the burned area that were previously recommended in the Uncompahgre Travel Management Plan.

11) Re-burn potential is not significant after a wildfire because fine fuels have been removed and large woody debris generally does not carry a fire. After analyzing the existing situation and observing wildfires which burned into previous wildfires (the 47 Fire stopped just inside of the 8 year old North Fork Fire in 2002) it appears that the liklihood of a re-burn in these fires is unlikely until fine fuels rebuild over the next 10-15 years. At that time some negative soil impacts could occur where accumulating large woody debris smolders for longer periods of time.

Cumulative actions considered for the fire ecology portion of this analysis include:

Roller chopping on Forest Service and private lands adjacent to the burn area (both Burn Canyon and Bucktail Fires)

Thinning projects (Bucktail Fire)

Seeding for emergency fire rehabilitation (both Burn Canyon and Bucktail Fires)

BLM roller chopping in burned pinyon/juniper stands as part of fire rehabilitation (Burn Canyon Fire)

The Burn Canyon and Bucktail Fires themselves (both Burn Canyon and Bucktail Fires)

Fire suppression (both Burn Canyon and Bucktail Fires)

Post fire treatments on private lands (Burn Canyon Fire)

Past fires in the area (both Burn Canyon and Bucktail Fires)

Grazing use and rest (both Burn Canyon and Bucktail Fires)

Direct Impacts of the No Action Alternative:

In the near future as the fire-killed trees begin to fall there will be an increase in woody debris on the surface. Observation of ten year old fires in similar ponderosa pine stands show that the majority of dead trees fall within the first five to ten years (Grother, personal communication). The resulting woody debris is typically dominated by large diameter material (logs and large branches), with lesser amounts of small diameter material (needles and small branches) since the smaller material was either consumed by the fire or deteriorated rapidly as it fell to the surface (Duncan, 2002). Due to the rapid deterioration of the fine material a re-burn of the accumulated debris would not be likely unless enough fine fuel accumulated on the surface rapidly, perhaps through a blow down event, or unless enough fine regrowth such as grass and small shrubs, becomes present to support fire spread. A future fire burning through this grass and woody debris fuel complex would have low intensity in most locations with potenial for

higher intensity and longer residence times where large logs and branches have fallen. Soil impacts would be minimal where grass is the dominant fire carrier but could be substantial and long-term where the fire burns and smolders in logs and large debris.

Indirect/Cumulative Impacts of the No Action Alternative:

The indirect/cumulative impacts of the No Action Alternative over several decades to a century, include the possible persistance of a large, continuous grassland over a significant portion of the landscape previously dominated by ponderosa pine, pinyon pine, and juniper. Due to the competitive advantage of the previously seeded grass/forb/shrub species the natural succession to woody species, primarily ponderosa pine, pinyon, and juniper, may be slowed. Considering that the majority of the Burn Canyon fire burned with high intensity and was seeded, and that areas of private land to the west have been roller chopped, a large portion of this landscape may be in an early (grassland) and early-mid (grass/shrub) seral stages for a long period of time. There is also potential for large areas of these grass and grass/shrub seral stages to support low intensity grass fires, which would further delay succession to woody species. Depending on the long-term success of the emergency rehabilitation seeding, the emphasis of future fire suppression/management within and adjacent to the burn area, and the subsequent ability of woody species to recolonize the area various mosaics and fire regimes could result across this landscape. Under the No Action Alternative, several decades to a century from now, potential mosaics could include, and range between, 1) a large, continuous, and persistant grassland (fairly likely), 2) a grassland broken up by various sized patches of recolonizing ponderosa pine, pinyon, and juniper (fairly likely), and 3) a landscape dominated by woody species with occassional pockets of grassland scattered throughout (unlikely).

Various resource objectives could be met through each of these mosaics. Given the Forest Plan management emphasis for the Burn Canyon area (livestock grazing and wood fiber production) managing the landscape toward a specific mosaic designed to achieve those management objectives would be more consistent with the Plan than managing under the No Action Alternative.

Direct Impacts of Alternative 2 (Proposed Action):

Direct impacts of the Proposed Action include the removal of a portion of the fire-killed trees and the re-planting of ponderosa pine within those areas capable of producing wood fiber. In areas where salvage logging does not occur re-planting of ponderosa pine may still occur. (Thinning of residual ponderosa pine stands within the Burn Canyon Fire area will not occur due to the limited number and small size of the residual stands.) With the removal of the salvaged trees in specific locations the buildup of large woody debris (logs and large branches) would not be as great, instead the salvage logging would rapidly relocate the smaller diameter debris (remaining needles and small branches) to the surface where, in the short term, it might contribute to very spotty fire spread, but over 5-10 years would quickly decompose. In areas where

ponderosa pine are planted a ponderosa pine fire regime would be expected to occur and will need to be managed for.

Indirect Impacts of Alternative 2 (Proposed Action): Cumulative Impacts of Alternative 2 (Proposed Action):

Indirect impacts to the fire ecology of the Burn Canyon area from the Proposed Action include an overall reduction of large woody debris and an immediate build up of finer material in specific locations where salvage logging occurs. 2,700 acres are being considered for salvage logging with only a percentage of the dead trees at any location to be removed. The residual dead standing trees will serve as habitat for cavity nesting species, as shading for regeneration, and as future large woody debris, and mircrosites, as they begin to fall (McIver, 2001). Removing a portion of the large woody debris through salvage logging reduces the threat of soil impacts during future fires. With the immediate build up of finer materials through salvage logging there is limited potential for discontinuous fire spread through those areas, however, this small diameter debris, once on the ground, will deteriorate rapidly. As the planted ponderosa pine seedlings become established and reach sapling size they will begin to produce needle litter. Grass/forb/shrub establishment in the area will simultaneously add to the horizontal continuity to the fuel complex, enabling low intensity surface fires (prescribed burns or wildfires) to eventually play a very natural role in maintaining the newly established ponderosa pine stand. In areas where salvage logging does not occur but re-planting with ponderosa pine does occur there is potential that future fires, burning with increased intensity in the accumulating woody debris, will negatively impact some of the planted ponderosa pine.

Cumulative impacts of the Proposed Action, when combined with the existing impacts of the Burn Canyon Fire to adjacent stands of pinyon/juniper, the emergency rehabilitation seeding, roller chopping on the BLM portion of the fire, rollerchopping on private lands, and future fire management, will create a landscape consisting of young ponderosa pine stands within a matrix of grassland and various sized patches of young pinyon and juniper. The fire ecology of this type of mosaic will consist of a variety of fire regimes; including frequent, low intensity fires in the grassland areas and ponderosa pine understories, and eventually infrequent, high intensity fires in the pinyon/juniper patches; in the future high intensity pinyon/juniper crown fires should be less extensive and become lower intensity surface fires when they reach grasslands and ponderosa pine stands. This type of fire regime allows fire managers to manage wildfires with a variety of strategies while also making prescribed fire a readily usable tool. The opportunity is present over the next several decades to create a fire regime and ecosystem that, based on the current state of knowledge, is relatively natural, and at the same time is manageable and produces desired outputs (livestock forage and wood fiber).

Direct/Indirect/Cumulative Impacts of Alternative 3:

Because no thinning of dense, residual stands of ponderosa pine is proposed for the Burn Canyon Fire area the actions proposed in Alternative 3 are identical to those of Alternative 2 and subsequently the impacts of Alternative 3 are identical to the impacts of Alternative 2 above. (The differences between Alternative 2 and 3 are specific only to the Bucktail Fire.)

Fire Ecology/Bucktail

Existing Condition/Cumulative Actions Considered

The Bucktail Fire burned primarily through pinyon and juniper stands at lower elevations and both untreated and treated stands of ponderosa pine at the higher elevations. 42%, or 959 acres, of the Bucktail Fire burned in ponderosa pine. Of those 959 acres 35%, or 336 acres, were severely impacted by the fire. Generally the 336 acres of ponderosa pine which were severely impacted were untreated and unnaturally dense with a thick, continuous understory of oakbrush while the 623 acres of ponderosa pine not significantly impacted by the Bucktail Fire were part of the larger Glencoe treatment area, which had been thinned and understory burned during the early and late 1990's. The fires behavior, severe fire effects, and resistance to control were significantly reduced in these treated ponderosa pine stands.

The 336 acres of severely impacted ponderosa pine were unnaturally dense due primarily to fire exclusion over the past century and secondarily because thinning and prescribed burn projects had not yet been carried out in them. Because of fire exclusion stand structure consisted of numerous dense young ponderosa pine under an overstory of older trees, dense, tall, and continuous oakbrush in the understory, and heavy surface fuel loadings. Much of the Bucktail Fire has already been seeded with a grass/forb/shrub seed mix to reduce the potential for soil erosion. Oakbrush throughout the severely burned area was healthy prior to the fire and is resprouting vigorously.

Local issues that have been raised specific to ecology and fire ecology, with the ID teams responses to each, can be found under the Burn Canyon Fire Ecology section above.

Cumulative Actions Considered in the Bucktail Fire area are listed under the Burn Canyon Fire Ecology section above.

Direct Effects of the No Action Alternative

Direct effects of the No Action Alternative include the long-term persistance of oakbrush and the seeded grass, forb, and shrub species. Oakbrush has resprouted vigourously on the Bucktail Fire and by the Fall of 2002 sprouts were 12-18" tall over a substantial portion of the ponderosa pine stand replacement burn. This oakbrush, combined with the seeded, grass, forb, and shrub species, may well preclude the natural regeneration

of ponderosa pine in many areas, essentially converting a ponderosa pine forest into an oak shrub field (FEIS).

As fire-killed ponderosa pine begin to decay and fall there will be an increase in woody debris on the surface. Observation of ten year old fires in similar ponderosa pine stands show that the majority of dead trees fall within the first five to ten years (Grother , personal communication). The resulting woody debris is typically dominated by large diameter material (logs and large branches), with less small diameter material (needles and small branches) since the smaller material was either consumed by the fire or deteriorated rapidly after it fell to the ground. A re-burn of the accumulated debris would not be likely until enough fine fuel, such as grass and small shrubs, is present to support fire spread. A fire burning through this grass and woody debris fuel complex would have low intensity in most locations with potenial for higher intensity where large logs and branches have fallen. Soil impacts would be minimal where grass is the dominant fire carrier but could be substantial and long-term where the fire burns and smolders in logs and large debris.

Indirect/Cumulative Effects of the No Action Alternative

Potential indirect effects of the No Action Alternative include a change in natural fire regime from frequent, low intensity fires in the ponderosa understory to infrequent, high intensity fires in the newly established oakbrush that would remove woody species other than oakbrush and regenerate quickly back to oakbrush. This scenario would make the natural re-establishment of ponderosa pine unlikely. In addition as dead trees begin to fall over the next 5-10 years there will be increased potential for negative soil impacts with future fires. Cumulative effects over the next several decades, when the No Action Alternative is coupled with seeding for soil stabilization, thinning and prescribed burning in adjacent stands, adjacent wildfires, and adjacent roller chopping, include a shift in the ratio of ponderosa pine/oakbrush/pinyon-juniper on the landscape. Ponderosa pine is limited in this area primarily by moisture and soils and may be less extensive then in the past due to logging and long-term climatic warming and drying trends, while pinyon-juniper and oakbrush appear to be increasing in density and range under the current management regime and long-term climatic conditions.

Direct Effects of Alternative 2 (Proposed Action):

Direct effects of the Proposed Action include the removal of a portion of the potential woody debris. The logs, or large woody debris, that are salvaged would reduce the potential for buildup of heavy fuels on the surface while the salvage operation would immediately add finer fuels (needles and branches) to the fuels complex. A large amount of these finer fuels would deteriorate within 5-10 years of the salvage operation (Duncan, 2002). During this 10 year post-salvage time period there is very limited potential for fire to spread through the area regardless of whether salvage harvest occurs or not; the 2002 ’47’ Fire had significantly reduced intensity as it entered, and quickly stopped as it burned into, the unsalvaged 1994 North Fork Fire.

The thinning of minimally impacted ponderosa pine stands under the Proposed Action would also create a short term increase in fine fuels on the surface under these stands but this would be remedied by prescribed burning, as has been done in the adjacent Glencoe thinning units, and/or by deterioration of the fine fuels over time.

Planting ponderosa pine in those areas with potential for wood fiber production may allow ponderosa pine the opportunity to dominate the oakbrush in the future.

Indirect/Cumulative Effects of Alternative 2 (Proposed Action)

Indirect effects of removing a portion of the dead trees from the area through salvage logging include a reduction in the future amount of woody debris on the surface. Subsequent fires burning through the area will have less impact on soils since there will be less woody debris in which to smolder and transmit heat to the soils.

The stands proposed for thinning have previously been thinned to both directly control mountain pine beetle infestations (mid 1980's) and to protect the stands from future pine beetle infestations (early 1990's). In addition these stands have been understory burned to reduce the activity fuel loading and to reduce the extent and height of the oakbrush (late 1990's). Indirect effects of additional thinning include a further reduction in crown fire potential, and increased surface fire potential as understory fuels accumulate and become established. Over time these stands will become more resistant to fire and natural fires may be allowed to burn through them, reducing suppression costs and helping to maintain the stand.

Indirect effects of planting ponderosa pine in this area include the creation of a frequent, low intensity fire regime (ponderosa pine) from a fire regime that might otherwise be one of infrequent, high intensity fires (oak). This would increase the ability of fire mangers to manage fire in this area under a variety of relatively safe and effective strategies.

The cumulative effects of the proposed salvage, planting, and thinning treatments over the next several decades, when coupled with adjacent rollerchop treatments in pinyon/juniper stands, previous thinning and prescribed burning in adjacent ponderosa pine stands, seeding for soil stabilization, and the Bucktail Fire and other wildfires in the area, include a landscape in which the mosaic, based on the best available science, more closely resembles a healthy, functioning landscape. Given that overall fuels complex throughout this diverse landscape wildfires have been modified by each of these treatements/fires, future fires can more readily be managed as a natural process in the ecosystem while prescribed fire can be utilized more efficiently and safely to maintain and manage the landscape.

Direct Effects of Alternative 3:

The direct effects of Alternative 3 are similar to those of Alternative 2 (Proposed Action) except that thinning of the minimally impacted stands of ponderosa pine would not occur and the effects of that thinning would also not occur.

Indirect/Cumulative Effects of Alternative 3:

The indirect/cumulative effects of Alternative 3 are similar to those of Alternative 2 (Proposed Action) except that thinning of the minimally impacted stands of ponderosa pine would not occur. However, because these stands have been previously thinned and understory burned the effect, from a fire ecology perspective, of not thinning them again will not be substantial; the Bucktail Fire did little damage to them in their current condition.

Plant Revegetation/Burn Canyon and Bucktail

Revegetation seeding occurred on approximately 3500 acres of National Forest System (NFS) lands, and approximately 10300 acres of adjacent BLM lands within the fire perimeter, using seed mixes that included native grasses, forbs, and shrubs. The primary objectives of the seeding were to minimize soil movement and loss on steep slopes, minimize the establishment of noxious weeds by providing alternative ground cover, and improving wildlife habitat. Beschta, et al. suggests that "active seeding and replanting should be conducted only under limited conditions". He specifies that these practices should only occur where natural regeneration has not occurred over a period of several years, but could be used where enhancing the "fire resistance" of a site was an objective. Because of the aggressive and adaptive nature of many noxious/invasive weed species, including those found in and adjacent to the Burn Canyon fire, his suggestions seem to be without merit in this case. (See discussion under noxious weeds, soil movement and compaction, and wildlife.)

Beschta also suggests that "post-fire livestock grazing should be altered or eliminated to allow natural recovery processes to occur". This concern was identified prior to our review of Beschta and in response to this concern cattle have been taken off of the burned areas and will not be allowed to return for a period of two grazing seasons. Beschta also seems to suggest that livestock grazing would hinder natural recovery processes, while grazing by big game species would not. We believe that any grazing animal can damage young seedling plants permanently if the root system is not well-established. However we have also observed that trampling, or hoof action, of grazers, whether wildlife or domestic stock does in some cases help to create soil conditions conducive to plant establishment by breaking down crusty (hydrophobic) topsoil layers created by the fire.

Forest Regeneration (Regen Success/Protection Of Regeneration From Browse Damage/Burn Canyon

Existing Condition

The National Forest portion of Burn Canyon is characterized by low-slope-gradient mesa tops dissected by steep canyons. Elevation ranges from about 7100 to about 8000 feet. About 60 percent of the burn is on slopes of 20 percent or less.

Timber harvest first occurred in the Burn Canyon area as early a 1917 when a sawmill was set up at Sawmill Spring. At one time, there were three mills operating in the Burn Canyon area. In the late 1960's, a mountain pine beetle outbreak resulted in considerable ponderosa pine mortality. The outbreak was followed by salvage logging in the early 1970's. Historical harvest usually consisted of the removal of the oldest, largest trees and the retention of the younger-age trees. As a consequence, forest structure has been considerably altered from its historic condition. For example, the average age of the pre-fire ponderosa pine stands was about 82 years.

Between 1977 and 1983, about 1,750 acres were thinned in commercial harvests, mostly across Naturita canyon outside the fire perimeter. Also, there were about 300 acres of precommercial thinning that occurred in 1985 and1986, also outside the fire perimeter. Most recently, the Busted Arm and Bull Pond sales occurred east of the burn across Naturita canyon. These sales were ponderosa pine commercial thinning harvests that were completed in 2001 and 1999 respectively. Busted Arm amounted to 310 acres of commercial thinning and Bull Pond totaled about 541 acres.

Map B shows the distribution of the ponderosa pine type and the post-fire vegetation condition. Table 3.1 below displays the distribution of pre-burn vegetation cover type acres by post-fire stand condition. Before the fire, the Burn Canyon area was dominated by forest vegetation. Ponderosa pine and pinyon/juniper types comprised 50 and 33 percent respectively of the National Forest area. Ponderosa pine occupied the mesa tops while pinyon/juniper forest was confined primarily to the canyon slopes. Most (about 78 percent) of the ponderosa pine is located on slopes of 20 percent or less (Table 3.2).

Both overstory and understory vegetation on 83 percent of the area was completely consumed ("All Dead" in Table 3.1) by fire. Fire effects were somewhat less on about 5 percent of the area where fire killed only part of the vegetation, burning in a mosaic pattern. Fire had relatively little impact on overstory vegetation ("All Live" in Table 3.1) on about 12 percent of the area.

Table 3.1: **Acres by Vegetation Cover Type and Post-Fire Vegetation Condition for Burn Canyon**

	Post-Fire Vegetation Condition			
Vegetation Cover Type	**All Dead**	**Mosaic**	**All Live**	**ALL**
Forbs	367.5	10.0	87.1	464.6
Bluegrass Scabland	76.3		4.2	80.5
Grass	154.7	0.6	63.4	218.6
Gambel Oak	737.7	49.3	19.5	806.4
Douglas-fir	131.3	18.9	88.7	238.9
Pinyon/Juniper	3531.2	9.3	127.3	3667.9
Ponderosa Pine	4159.4	417.0	928.7	5505.1
ALL	**9158.1**	**505.1**	**1318.9**	**10982.0**

Table 3.2: **National Forest Acres of Ponderosa Pine Vegetation by Slope Class**

Fire Name	Slope Class (Percent Slope)	Acres
Burn Canyon	0-5	2246
	5-10	1047
	10-15	554
	15-20	437
	20-25	333
	25-30	264
	30-35	230
	35-40	162
	>40	233
Burn Canyon Total		**5506**

The Burn Canyon fire resulted in a substantial impact to the post-fire distribution of live ponderosa pine forest stands. Complete vegetation kill exists on about 83 percent of National Forest land. As shown on Map B, the surviving ponderosa pine stands ("All Live") are scattered as remnant "islands" in a "sea" of otherwise dead pine forest. Some fire-killed stands are over a mile from a ponderosa pine seed source.

In the moderate- and low-severity areas of the burn, understory vegetation began to re-establish itself within a couple of months of the fire. Grasses, forbs, and especially Gambel oak were evident in the fall of 2002, indicating that plant root crowns are relatively intact after fire and capable of sprouting.

Effects of Alternatives

Under Alternative 1, salvage harvest, thinning, or reforestation would not occur on the Burn Canyon fire. Shrubs, grasses, and forbs would continue recolonization of the the burn area, but the reintroduction of pinyon, juniper, and ponderosa pine, as well as other species dependant on seed dispersal for reproduction, would occur very slowly. Because most seed falls within about 120 feet of a seed-bearing tree (Schubert, 1974), the natural re-establishment of a ponderosa pine forest within the Burn Canyon burn would occur very slowly in human terms, taking well over a century. Eventually, however, ponderosa pine would naturally re-establish itself across much of this burned-over landscape and, absent future large-scale fire, forest conditions would slowly return to the Burn Canyon area.

Under Alternatives 2 and 3, areas receiving salvage harvest would be planted with ponderosa pine seedlings within 5 years of harvest. Seedlings would be grown from seed adapted to the Burn Canyon area. The retention of dead standing and down trees would help create conditions, such as shade and reduced groundlevel windspeed, that would improve seedling survival. The "jackstraw" arrangement of down dead trees

would help reduce utilization of the area by livestock by serving as physical barriers to travel. Browse damage to planted seedlings would consequently be minimized. Stands classified as suitable for timber production but not salvage harvested would be planted within about ten years with ponderosa pine seedlings, provided that appropriated funds are available. Under Alternatives 2 and 3, the re-establishment of ponderosa pine tree cover through planting would occur in years rather than in the many decades it would take for natural regeneration under Alternative 1.

Forest Regeneration (Regen Success/Protection Of Regeneration From Browse Damage/Bucktail

Existing Condition

The northern 1/3 of the Bucktail Burn is a low-slope-gradient bench situated between Tabeguache and Big Bucktail Creeks. South of this bench, the landform breaks sharply into the Big Bucktail drainage. Below the break, slopes average 10 to15 percent. Elevation in the burn ranges from about 6500 feet to about 8000 feet.

As is the case with most of the Uncompahgre Plateau, timber harvest in the Bucktail area, both within and beyond the fire perimeter, began shortly after the turn of the last century. Historical harvest tended to result in the removal of the largest and oldest trees, leaving the younger understory to develop into today's forest. In the mid-1980's, a wide-spread mountain pine beetle outbreak resulted in considerable mortality in the Bucktail area. Beetle-killed trees were removed on over 1,800 acres between 1986 and 1993. Additionally, to improve tree vigor and reduce susceptibility to future bark beetle attack, commercial thinning followed by prescribed fire occurred concurrently with salvage in 1991 and 1992 on about 1,500 acres.

Map B shows the distribution of ponderosa pine and the post-fire vegetation condition. Table 3.3 below displays the distribution of vegetation cover type acres by post-fire vegetation condition within the Bucktail burn. Before the fire, Bucktail was dominated by forest vegetation. Ponderosa pine comprised about 43 percent of the burn area. Most (73 percent) of the ponderosa pine type is located on slopes of 20 percent or less (Table 3.4), primarily on the bench in the upper portion of the burn. Pinyon/juniper woodland comprised about 27 percent of the total burn area, mainly occupying the slopes below the break.

The effect of the Bucktail fire on vegetation was not as great as the Burn Canyon fire. Only about 49 percent of overstory and understory vegetation was completely consumed by fire ("All Dead" in Table 3.3), as opposed to 83 percent in Burn Canyon. Bucktail fire effects were somewhat less on about 19 percent of the area where fire killed only part of the vegetation, burning in a mosaic pattern. A considerably greater area of the Bucktail burn, about 32 percent, was only lightly impacted ("All Live").

The Bucktail fire was much smaller in scale than Burn Canyon and affected the post-fire distribution of live ponderosa pine to a lesser extent than did the Burn Canyon fire.

While the Burn Canyon fire created widely scattered islands of live remnant ponderosa pine, the Bucktail fire merely scalloped the lower edge of a continuous band of ponderosa pine forest that stretches along the south rim of the Tabeguache basin. The fire did therefore not alter the distribution of ponderosa pine substantially.

Table 3.3: **Acres by Vegetation Cover Type and Post-Fire Vegetation Condition for Bucktail Fire**

	Post-Fire Vegetation Condition			
Vegetation Cover Type	All Dead	Mosaic	All Live	ALL
Grass	17.4		35.5	52.8
Gambel Oak	302.5	82.0	206.1	590.6
Shrub			31.2	31.2
Pinyon/Juniper	592.8	16.3	0.6	609.7
Ponderosa Pine	185.8	325.0	448.9	959.7
ALL	**1098.5**	**423.3**	**722.2**	**2244.1**

Table 3.4: **National Forest Acres of Ponderosa Pine Vegetation by Slope Class**

Fire Name	Slope Class (Percent Slope)	Acres
Bucktail	0-5	219
	5-10	162
	10-15	160
	15-20	159
	20-25	101
	25-30	61
	30-35	42
	35-40	29
	>40	26
Bucktail Total		**959**

As occurred in the Burn Canyon burn, understory vegetation in the Bucktail burn, outside of the high-severity area, began to re-establish itself soon after the fire. Grasses, forbs, and especially oak were evident in mid-summer of 2002, indicating that plant root crowns were relatively intact after the fire and capable of sprouting.

Effects of Alternatives

Under Alternative 1, salvage harvest, thinning, or reforestation would not occur on the Bucktail fire. Shrubs, grasses, and forbs would continue recolonization of the the burn area, but the reintroduction of pinyon, juniper and ponderosa pine, as well as other species dependent on seed dispersal for reporduction, would occur more slowly.

Bucktail differs from Burn Canyon in that most of the burned ponderosa pine areas are generally located within about 1,000 feet of a seed source. Although natural restocking of burned pine stands would be achieved only after many decades, it would occur considerably sooner than in the Burn Canyon fire.

Under Alternatives 2 and 3, areas receiving salvage harvest would be planted with ponderosa pine seedlings within 5 years of harvest. Seedlings would be grown from seed adapted to the Bucktail area. The retention of dead standing and down trees would help create conditions, such as shade and reduced groundlevel windspeed, that would improve seedling survival. The "jackstraw" arrangement of felled dead trees would help reduce utilization of the area by livestock by serving as a physical barrier to animal travel. Browse damage to planted trees would consequently be minimized. Additionally, stands classified as suitable for timber production but not salvage harvested would be planted with ponderosa pine seedlings, provided that appropriated funds are available. Under Alternatives 2 and 3, the re-establishment of ponderosa pine tree cover would occur in years rather than in the many decades it would take under Alternative 1.

Noxious weeds/Burn Canyon

Existing Condition

Noxious weeds that exist within and adjacent to the Burn Canyon fire area are: Canada thistle, Russian knapweed, scentless chamomile, cheatgrass, musk thistle, and whitetop. Russian knapweed poses the most serious threat to NFS lands within the Burn Canyon fire, as there are large infestations along the Hamilton Mesa road (Forest development 607) and on adjacent private lands. The infestations are mostly small, less than 1/10th acre, occuring primarily along existing system roads on NFS lands. There is one large infestation of whitetop in McKee Draw that is approximately 1 acre in size. Treatment of weed infestations with herbicide has been occuring for several years, followed by handpicking seedheads, if found, on late blooming plants.

Beschta, et al, suggests that the use of pesticides, herbicides, and fertilizers "should generally be prohibited". He also suggests that hand application for the removal of exotic plants may "occasionally be considered if there is evidence that such action is likely to lead to long term reclamation of the site." Because of the aggressive and adaptable nature of many noxious weeds, including those that exist within the analysis area, his suggestions appear to be without merit in this case. Long-term reclamation of the ecosystems within the Bucktail fire must include noxious weed treatments if our desired objective is to favor native vegetation. Although it appears that the root crowns of many herbaceous plants were not killed during the fire, the litter and duff layer was burned away, leaving bare soil that lends itself to the introduction and establishment of invasive and noxious species. The increased availability of nutrients may be one reason that the density of weedy plants increases as the intensity of disturbances increases (Jenson 1995). Many noxious weed species are early successional species that colonize recently disturbed sites (Baker 1986, from Biology and Management of

Noxious Rangeland Weeds). Canada thistle, which can propagate sexually and asexually, has a distinct competitive advantage over many annual or biennial species. (Biology and management of Noxious Rangeland Weeds, pg 164) Russian knapweed is allelopathic, very competitive and continuously fills in as other plants are overgrazed or eliminated by disturbances. (Bottoms and Whitson 1997, as quoted in Biology and Management of Noxious Rangeland Weeds, pg 315). Successful long-term control of canada thistle, as well as other weed species such as russian knapweed require an integrated management program, including the judicious use of the appropriate herbicides, and reseeding with competitive native perennial species.

Monitoring following the Burn Canyon Fire in late summer and fall of 2002 showed some new growth and regrowth of existing vegetation (both desirable and undesirable) on NFS lands within the perimeter of the fire. Canada thistle rosettes were observed in the McKee Draw area. Noxious weed monitoring and treatment as needed is planned within and adjacent to the fire perimeter. Direct/Indirect/Cumulative Effects of No Action, Proposed Action and Alternatives

Effects of Alternatives

Alternative 1: No Action

Direct and Indirect Effects: This alternative would have no direct or indirect effects on noxious weed populations or infestations. Although noxious weeds have the potential to increase dramatically on the Burn Canyon fire, this would be due primarily to the size and intensity of the fire,and the relative nearness of large infestations of noxious weeds adjacent private land.

Cumulative Effects: Cumulative effects from post-fire recovery are expected to occur until vegetative cover is re-established. Although some revegetation seeding has been completed as a noxious weed prevention measure it is anticipated that this will not entirely prevent noxious weeds from invading the burned area. Other ground-disturbing activities, such as proposed land treatments, recreational use of the area, new construction and reconstruction of fences, exclosures, and water developments, and road maintenance activities, would result in an increase in available sites that could be invaded by invasive/noxious weed species. Any increase in noxious weed population levels would be significantly less dramatic than the increase anticipated due to the effects of the fire itself.

Alternative 2 – Proposed Action

Direct and Indirect Effects: The proposed action would result in an increase in available sites that could be invaded by invasive/noxious weed species. The risk of occurrence would be minimized by implementation of the recommended mitigation measures. The estimated increase in noxious weed species tied specifically to the proposed action, and not the other actions (ie. Land treatments, recreational use, road maintenance, construction activities) is estimated to be approximately 1-2 acres per mile of temporary road construction. Since there is no new road construction or reconstruction proposed

under this alternative, there would be no potential increase in weed infestations associated with those activities.

Cumulative Effects: Cumulative effects from the proposed action are anticipated to be the same as in the alternative 1.

Alternative 3 -

Direct and Indirect Effects: Direct and Indirect Effects are anticipated to be the same as in alternative 2.

Cumulative Effects: Cumulative effects from the proposed action are anticipated to be the same as in the alternative 1.

Noxious weeds/Bucktail

Existing Condition

Noxious weeds that exist within and adjacent to the Bucktail fire area are Canada thistle, bull thistle, russian knapweed, cheatgrass, whitetop. The infestations are small, less than 1/10th acre, and occur primarily along existing system roads on NFS lands. Russian knapweed poses the most serious threat, as there are large infestations along the 25 Mesa road (Forest development road 503) south of the National Forest boundary and on adjacent private lands. Treatment of weed infestations with herbicide has been occuring for several years, followed by handpicking seedheads, if found, on late blooming plants.

Beschta, et al, suggests that the use of pesticides, herbicides, and fertilizers “should generally be prohibited”. He also suggests that hand application for the removal of exotic plants may “occasionally be considered if there is evidence that such action is likely to lead to long term reclamation of the site.” Because of the aggressive and adaptable nature of many noxious weeds, including those that exist within the analysis area, his suggestions appear to be without merit in this case. Long-term reclamation of the ecosystems within the Bucktail fire must include noxious weed treatments if our desired objective is to favor native vegetation. Although it appears that the root crowns of many herbaceous plants were not killed during the fire, the litter and duff layer was burned away, leaving bare soil that lends itself to the introduction and establishment of invasive and noxious species. The increased availability of nutrients may be one reason that the density of weedy plants increases as the intensity of disturbances increases (Jenson 1995). Many noxious weed species are early successional species that colonize recently disturbed sites (Baker 1986, from Biology and Management of Noxious Rangeland Weeds). Canada thistle, which can propagate sexually and asexually, has a distinct competitive advantage over many annual or biennial species. (Biology and management of Noxious Rangeland Weeds, pg 164) Russian knapweed is allelopathic, very competitive and continuously fills in as other plants are overgrazed or eliminated by disturbances. (Bottoms and Whitson 1997, as quoted in Biology and Management of Noxious Rangeland Weeds, pg 315). Successful long-term control of

canada thistle, as well as other weed species such as russian knapweed require an integrated management program, including the judicious use of the appropriate herbicides, and reseeding with competitive native perennial species.

Monitoring following the Bucktail Fire in early and late summer of 2002 showed some new growth and regrowth of existing vegetation (both desirable and undesirable) on NFS lands within the perimeter of the fire. Canada thistle rosettes were observed in the southern part of the fire, and russian knapweed was reported as well. Noxious weed monitoring and treatment as needed is planned within and adjacent to the fire perimeter. Direct/Indirect/Cumulative Effects of No Action, Proposed Action and Alternatives.

Effects of Alternatives

Alternative 1: No Action

Direct and Indirect Effects: This alternative would have no direct or indirect effects on noxious weed populations or infestations. Although noxious weeds have the potential to increase dramatically on the Bucktail fire, this would be due primarily to the size and intensity of the fire,and the relative nearness of large infestations of noxious weeds to adjacent private land.

Cumulative Effects: Cumulative effects from post-fire recovery are expected to occur until vegetative cover is re-established. Although some revegetation seeding has been completed as a noxious weed prevention measure it is anticipated that this will not entirely prevent noxious weeds from invading the burned area. Other ground-disturbing activities, such as proposed land treatments, recreational use of the area, and road maintenance activities, would result in an increase in available sites that could be invaded by invasive/noxious weed species. Any increase in noxious weed population levels would be significantly less dramatic than the increase anticipated due to the effects of the fire itself.

Alternative 2 – Proposed Action

Direct and Indirect Effects: The proposed action would result in an increase in available sites that could be invaded by invasive/noxious weed species. The risk of occurrence would be minimized by implementation of the recommended mitigation measures. The estimated increase in noxious weed species tied specifically to the proposed action, and not the other actions (ie. Land treatments, recreational use, road maintenance) is estimated to be approximately 1-2 acres per mile of temporary road construction. Since there is no new road construction or reconstruction proposed under this alternative, there would be no potential increase in weed infestations related to those activities.

Cumulative Effects: Cumulative effects from the proposed action are anticipated to be the same as in the alternative 1.

Alternative 3 -

Direct and Indirect Effects: Direct and Indirect Effects are anticipated to be the same as in alternative 2.

Cumulative Effects: Cumulative effects from the proposed action are anticipated to be the same as in the alternative 1.

Insect and disease/Burn Canyon and Bucktail.

The relationships between many western forest types and fire is well known and documented. These relationships include the activities of many associated organisms including insects and fungi. The occurrence of fire in a forested ecosystem results in changes which affect organisms that are especially adapted to take advantage of the post-fire environment. Certain species of insects and fungi rapidly colonize the biomass that remains following a fire and serve to increase the rate of successional change following fire. These organisms act to deteriorate woody materials remaining after the fire, thus freeing nutrients and substrate for subsequent plant and animal inhabitants. In their role as facilitators of successional processes, most of these organisms can be viewed as beneficial. However, when the activities of these fire adapted organisms conflict with management goals they may be viewed as undesirable.

The undesirable effects of post fire insect and disease activity can be of two types. These organisms can directly affect the quality of resources that are desired for human use. The same processes which break down woody materials directly affects their suitability for human use. Timbers that is riddled with borer holes and full of wood decaying fungi is of little use on the commercial market.

The second undesirable effect has to do with their population dynamics of wood deteriorating organisms and their response to an increased food supply. In a number of cases, these benign wood deteriorating organisms are held in check by their relatively rare (in time and space) food supply. When an abundant food supply does become available their numbers can increase at an exponential rate to take advantage of the food supply. However, when the food supply is exhausted, the populations are still at high numbers and alternative food sources are sought out. Frequently this alternative food source is often the residual trees that survived the fire. In many cases, a fire will kill only a proportion of trees in an affected stand. However, the loss of trees subsequent to the fire can be even greater than the original mortality.

The proposed actions following the Burn Canyon/Bucktail fires will affect only a small proportion of the area that burned. The Burn Canyon Fire burned 10,982 acres, while the Bucktail Fire covered 2,244 acres. Of these total acres, proposed actions would treat only 2,016 acres of salvage (15% of the total affected acres) and 344 acres of commercial thinning (3% of the total affected acres). Thus, it is unreasonable to expect that these management activities will prevent an outbreak of organisms that is generated out of the greater than 80% of the affected area that will remain untouched.

A much greater concern of management is the timeliness of efforts to capture the commercial value of the fire-killed timber. Utilization of fire killed timber by decay and deterioration agents starts just as the embers of the fire begin to cool. In the case of fires that occur in late spring and early summer, these agents subject the fire-killed timber to a full season of attack. The quick initiation of the deterioration process means that much of the commercial value of the timber is lost in a relatively short period of time. Throughout much of the Rocky Mountain region, a rule of thumb is that most species of wood last only two seasons before the wood becomes unusable. In the case of the Burn Canyon/Bucktail fires, it is reasonable to assume that much of the commercial value of the fire-killed timber will be lost by the late spring of 2004.

Wood Deterioration Study

In order to determine rates of wood deterioration within the Rocky Mountain Region, the Gunnison Service Center has initiated a long-term study to gauge the rates at which timber deteriorates. The Burn Canyon/Bucktail fires are the sites where plots have been initiated to study the fire-killed ponderosa pine. The plots were installed soon after the fires were put out and although it is too early to make definitive statements regarding rates of decay, it was very evident that woodborers and *Dendroctonus valens* had already attacked the fire-killed timber in large numbers. Based on results from the first year of a 5-year assessment of wood product degradation that was initiated in the Bucktail fire in the fall of 2002, wood-boring insect activity and fungal staining is currently at a low level in the ponderosa pine. However, the study and other research indicate that wood product degradation accelerates with time and that the opportunity for commercial salvage exists for three years following wildfire kill. In the case of the both Burn Canyon and Bucktail, timber must be harvested by the end of the 2003/2004 winter or the commercial value of the dead timber will not be realized.

Organisms of concern with regards to the timber resources of the Burn Canyon/Bucktail fires

Ips beetles: Bark beetles (Family Scolytidae) that are of concern following fire belong to the genus *Ips*. Contrary to expectations, the more aggressive bark beetles (particularly those in the genus *Dendroctonus*) are not a major concern following fire. Rather it is the closely related Ips, which are better adapted to taking advantage of the post-fire situation. Ips beetles are well suited to attack trees that have been severely scorched, yet are still alive. Dead trees are not suitable as a host for Ips; they must attack and produce brood in living trees. They present a problem to foresters because they attack and kill trees that have been damaged, but would otherwise have survived the fire. They can build their population in these damaged trees and then will emerge to attack otherwise healthy, adjacent trees. These "secondary outbreaks" are not long-lived, the populations decrease over time, but the damage has been done. Trees that would have constituted post-fire residual and otherwise healthy trees that might have provided a seed source for regeneration are lost. Since damaged and stressed trees are a primary target for Ips attacks, the best defense is trees that are vigorous and healthy. Thinning of stands is a proven

technique by which residual tree vigor can be improved, resulting in an increased ability to withstand bark beetle attack.

Red turpentine beetle: This insect is a bark beetle (*Dendroctonus valens*) that is considered to be fairly non-aggressive. Often found at the base of trees under attack, it is found very often following wounding by fires. Although they almost never kill healthy trees, they can often provide enough additional stress on already damaged hosts to pre-dispose it to other tree killing agents.

Woodborers: Woodborers are the larvae of several families of beetles which specialize in feeding on woody tissues. A number of species of Cerambycidae (commonly known as the long-horned or round headed borers) and the Buprestidae (commonly known as metallic wood borers or as flat headed borers) are specifically adapted to locating and utilizing fire-killed timber. Unlike bark beetles that bore into host trees as adults, woodborers mate outside of their hosts and then the females insert eggs beneath the scorched bark of the host. The eggs hatch in short order and the larvae begins to feed beneath the bark. Soon the larvae turn down into the wood and begin to create tunnels throughout the depth of the wood as they feed. These tunnels allow moisture and oxygen to reach the interior of the wood, increasing the rate at which the wood decay fungi are able to act upon the wood. In general, the woodborers are rather long-lived for insects and can take a number of years to complete their life cycle. The larvae form pupal chambers within the wood, complete pupation and the adult beetle tunnels out through the wood to emerge and complete the cycle.

One Buprestid in particular is of concern to foresters and that is *Melanophila sp.* This insect is particularly well adapted to locating and utilizing fire-killed timber. They often thrive in stands of burnt timber and can create problems when large numbers of beetles emerge several years later. In the absence of large amounts of fire killed timber they will turn to otherwise healthy trees, attacking and killing them, often in large numbers. The outbreaks do not last long, the *Melanophila* numbers quickly dwindle without the preferred fire killed timber, but the damage is done and in many cases the trees that have survived a fire are all killed.

Ambrosia beetles: The common name ambrosia beetle describes insects from two families of beetles (Platypodidae and Scolytidae). They are grouped together because of their habit of boring into dead timber and introducing a symbiotic fungi. The adult beetles locate dead trees as well as freshly cut wood and bore directly into the wood. Ambrosia beetle activity is noticeable because of the very fine white powder that is produced as large numbers of beetles bore into the wood. The adult beetles bore deep into the wood and produce a number of side galleries. These side galleries are where eggs are deposited and the eggs are nurtured by the parents who also introduce a symbiotic fungi into the egg galleries. The fungus thrives in the galleries, deriving its nutrition from the breakdown of the wood. As the larvae of the beetle hatch and begin to grow, they feed upon the fungi. In addition to riddling the wood with large numbers of boring galleries, the wood is stained with a dark brown coloration which indicates wood degradation resulting in the loss of

commercial value. Ambrosia beetles pose no risk to trees which have survived a fire, nor to the adjacent stand, but they can completely destroy the commercial value of salvaged timber in very short order.

Decay fungi: There are a number of fungi that can affect timber following a fire. Some of these organisms were already present within the host tissue and their progress speeds up with the death of the host. Other fungi gain access to the host tissue via wounds that are a direct result of the fire. The mycelial strands of the fungi penetrate the host and in many cases can cause a loss of wood strength as well as a corresponding loss of value. During the first year following a fire the primary visible fungal agents are the staining fungi which are introduced by various insects. Although staining fungi are considered a commercial degrade, they do not actually result in the loss of much wood strength. However, in the second year following a fire the decay fungi become much more prominent. These fungi are also often visible, but the best way to determine the degree of their activity is by directly testing wood strength. The ecological processes involved with wood decay are very complicated. Various factors including host species, species of decay fungi, existence of pre-fire infections, heartwood vs. sapwood, and even post-fire weather regimes all influence rates of decay. Diagnosis of decay is often left to professional scalers and is an art for professionals. Nevertheless, in most cases the amount of decay in fire-killed timber is significant within a three-year time frame. Some of the more important decay fungi of fire-killed conifers in the West are:

Cryptoporus volvatus, Fornitopsis officinalis, Fomitopsis pinicole, and Ganoderma applantum.

Soils/Burn Canyon and Bucktail

Existing Condition

There are two USDA Soil Surveys that cover the burned areas. The soils information for the Burn Canyon Area is located in the San Miguel Soil Survey Report (publication in process), and for the Bucktail area it was covered in the Uncompahgre Soil Survey Report, USDA Natural Resources and Conservation Service, and Forest Service publication, published in 1995. Both of these surveys are at an Order III level of detail, with soils Mapped as complexes of soil series or soil families. Along with the soil survey, information the soils reports developed during the BAER process were reviewed. So also were the fire severity Maps that were developed during that process. In the late summer of 2002 various field trips were conducted to the Burn Canyon area, looking at fire impacts on soils and the effects of several runoff events. Table 3.5 below lists the soils types of the area proposed for salvage harvest.

Table 3.5: **Soils Descriptions for Salvage Harvest Units**

Fire Name	Soil Map Unit	Soil Description	Slope	Acres
Burn Canyon	42	Fivepine and Pino Loams Complex	0-15%	1773
	34	Ceek Very Flaggy Clay Loams	10-40%	423
	58	Mitch Loams	1-6%	20
	95	Skein-Rock Outcrop Complex	3-65%	13
Bucktail	30	Trampas – Delson, moderately deep, Famlies Complex	3-30%	99
	13	Chilson-Delson, moderately deep, Beenom Families Complex	1-20%	90

These soils have formed on mesa and plateau tops, small drainages that often grade into small canyons, and canyon sideslopes. The dominant land surface areas for these proposed salvage operations are on the flatter mesa and plateau tops. The terrain is typically low slope gradient. About 85 percent of the Bucktail fire and 68 percent of the Burn Canyon fire occurred on slopes of 25 percent or less (Table 3.6). Additionally, about 85 percent of the Bucktail ponderosa pine, to which harvest activity under this EA is confined, and 84 percent of the Burn Canyon ponderosa pine is on slopes of 25 percent or less (Table 3.7).

Table 3.6
Acres and Burn Area Percent by Slope Class

	Bucktail		Burn Canyon	
Slope Class	Acres	Percent	Acres	Percent
0-5	384.9	17%	3015.1	27%
6-10	400.7	18%	1511.5	14%
11-15	462.0	21%	1052.6	10%
16-20	411.3	18%	1013.2	9%
21-25	238.6	11%	919.2	8%
26-30	123.3	5%	848.1	8%
31-35	87.1	4%	812.0	7%
36-40	60.1	3%	683.0	6%
>41	76.0	3%	1127.4	10%
Burn Total	2244.1	100%	10981.9	100%

Table 3.7: **Acres and Burn Area Percent of Ponderosa Pine Cover Type by Slope Class**

	Bucktail		Burn Canyon	
Slope Class	Acres	Percent	Acres	Percent
0-5	218.8	23%	2245.71	41%
6-10	161.62	17%	1046.69	19%
11-15	160.28	17%	553.72	10%
16-20	159.35	17%	436.84	8%
21-25	101.4	11%	333.14	6%
26-30	60.8	6%	263.9	5%

31-35	42.31	4%	229.54	4%
36-40	29.19	3%	162.28	3%
>41	25.96	3%	233.2	4%
Burn Total	959.7	100%	5505.0	100%

The Bucktail area contains some more sloping terrain, as portions are located on the mid- to upper- western facing flanks of the Uncompahgre Plateau. The fire area contains lower steeper flank slopes in the pinyon-juniper vegetation, but the terrain is gentler on the upper portions where it grades into the oak-pine vegetation.

On the mesa and plateau tops, the main geologic influence has been the Dakota Sandstone. The soils in these positions generally are shallow to moderately deep with loam to sandy-loam surfaces grading into clay-loam and clay subsoils. In the deeper drainages and canyons, the geology includes interbedded shales and sandstones. The soils are shallow and moderately deep, but contain more coarse fragments (usually sandstone fragments of varying sizes) on the surface and through out the profile.

In unburned situations, the soils on these landscapes and slopes usually are considered to have a slight to moderate erosion hazard potential. Erosion hazard increases to high on slopes above 35%. (UDSA, NRCS & Forest Service Uncompahgre Soil Survey and San Miguel Soil Survey Reports).

The analysis and review of the soils data and forestry interpretations (Criteria for interpretations are found in NRCS, National Forestry Manual,1997 and Rocky Mountain Region Soils Group Interpretations Rating Guide, undated) has indicated that the dominant soils in the proposed treatment areas have characteristics that make them potentially sensitive, with the right moisture conditions, to compaction and rutting.

Effects of the Fires on the Soil Resource

The most obvious and observable impact of these fires on the soil has been defined, evaluated and mapped during the BAER process that occurred toward the end of the fire suppression efforts. In that process, soil scientists, hydrologists, foresters, and other resource specialists review areas that have burned to determine fire impacts to soil, watersheds, and vegetation. The main emphasis in the BAER process is to identify emergency situations that may be hazardous to human safety or property due to increased runoff and sedimentation. The impact to the soil is referred to as burn severity. (FSH 2509.13 as amended by draft BAER guideline paper titled Burn/Fire Severity Definition). The intent of this is to provide a consistent method for assessing fire effects on ecosystems, particularly the soil resource. The fire severity rating reflects the amount of heat that is released by fire and how it affects the soil and other resources. Factors that are utilized in the identification of burn severity include:

- Depth and color of the soil and ash
- Size and amount of live fuels consumed
- Litter consumption
- Condition of plant root crowns
- Soil crusting
- Soil structure
- Hydrophobicity

The ratings of fire severity are low, moderate, and high. Map C shows the BAER fire severity mapping for the two burns. Appendix X contains a more detailed description of severity rating.

Together with slope and rainfall intensity, burn severity influences the amount of soil erosion that could occur following a fire. Fire severity is mapped in the BAER evaluation process. Usually, the BAER team prescribes soil stabilization treatments. This has been done for both the Bucktail and Burn Canyon areas. In the BAER report, it was noted that there was a hydrophobic condition just below the ash layer that extended at most to a depth of 1 inch and in most cases was less than one inch thick. This was noted most often in the high burn severity areas and to a lesser degree also in the moderate burn severity areas. See Table 1 of Chapter 1 for acres by burn severity class in each burn area.

During the BAER process, some erosion values were predicted using the Water Erosion Prediction Project (WEPP). This model has been developed cooperatively with UDDA-ARS, NRCS and Forest Service to assist in evaluating erosion on rangelands and certain forest situations. The values for Burn Canyon ranged from .00 to 21.33 tons-per-acre. The higher values were from the soils Skein and Ceek on the steeper drainage and canyon sideslopes with high burn severity conditions. Values of .22 tons-per-acre represented the more gentle uplands where harvest and planting activities are proposed. Tolerable loss limits (T Value) for the soils in the proposed salvage area are mostly 1 to 2 tons/acre/year, but range up to 5 tons-acre/year on the Delson soils in the Bucktail area.

Other Impacts To The Soil From Fire

Through the heating of the soil and consumption of organic material, fire can have an impact on soil properties, including organic matter content and nutrient-related processes. Fire rapidly oxidizes organic matter and releases nutrients. When organic matter is consumed by fire, some of its nitrogen and sulfur and phosphorus are lost as gases or in particulates in the atmosphere (volatilization). The ash from consumed organic matter that remains on site will be available to leach nutrients into the soil from precipitation. There may be a slight increase in pH, which may favor nitrate production and nutrient availability. This is called the ash affect. (Miller and others, 1989) Nutrients that are in the ash may then be lost from the site by wind or water erosion.

How much of these nutrients are lost through volatilization and how much stays on site has been studied somewhat over the years in various controlled situations and in a number of different ecosystems. In studies of fire effects on southwestern ponderosa pine, it is pointed out that a lot depends on the temperatures reached during the burning and to a certain degree the differential volatilization temperature of the various nutrients. (Covington) It appears that those with relatively low volatilization rates, such as nitrogen, phosphorus, and sulfur, will have some loss to the atmosphere, and those with high volatilization temperatures, such as calcium, manganese, and potassium, may be left in the ash. (Covington). In other studies it has been found that there can be an increase of inorganic nitrogen concentrations in the form of soil ammonium, when ponderosa pine ecosystems burn. (Covington, 1988).

There are no local data for soil nutrients. Neither are there any research plots for quantitative nutrient balances, in the immediate vicinity. It is reasonable to assume that there has been some nutrient loss due to volatilization and erosion. However, most of the proposed salvage treatments are on rather level terrain (see slope break outs in Tables 3.5 and 3.6), and mitigation measures designed to further reduce erosion potential. We conclude that erosion is not likely to be a major factor in nutrient loss.

Ponderosa pine ecosystems are fire dependent (Crane,1982, Bradley et al 1992, Krammes,1990 Allen,1994), so fire has occurred on these landscapes in the past, but may not have been as intense on as large of an area. The soils are for the most part fine textured in the subsoil, so while the surface nutrients may have some losses, the nutrient reserve related to the CEC (cation exchange capacity) is unaltered, so inherent base productivity should be stable.

The first plants that germinate or sprout take up nutrients in ash, including nitrogen, that remain on site. However in the high severity burn areas, many roots and seeds have been either killed or damaged. This will slow the establishment of vegetation and increase the risk that nutrients, especially nitrogen, could find its way into the stream channels. Fire, however, plays a natural role in balancing vegetation systems with site, soil, and climate. Fire recycles stored carbon and nutrients back to the soil to be used again by the next generation of plants. With regard to the Bucktail area, there have been a number of similar fires on the Uncompahgre Plateau within the last 10 years and on those burned areas a variety of vegetation, especially oak brush, has returned, demonstrating the resiliency of the soils.

Past Disturbances

Natural and human-related disturbances have affected the soils in the analysis area throughout the past. Natural disturbances of the soil include, heavy rainfall events, flash floods, mass erosion, drought, insects, plant disease, and wildland fires. Natural disturbances can alter long-term soil conditions. The Burn Canyon-Bucktail Fire situations were the most recent natural disturbance in the analysis area.

Human disturbances have occurred in the analysis area for possibly hundreds of years. The extent and degree of human disturbance, however, has been most pronounced in

recent times. Recent disturbances include such activities as various silvicultural treatments (thinning, prescribed fires, timber harvests, fire suppression, off road vehicle use and grazing. Human disturbances can affect long-term soil productivity by committing areas to specific uses (e.g. roads), or disturbing the soil by compaction, rutting, puddling or displacement, or by accelerating erosion.

Effects of Alternatives on the Soil Resource

For this analysis the effects on soils will be discussed as changes over time to soil features that are related to soil productivity, such as organic matter, changes /lack of change to physical soil characteristics, soil organisms, and potential for soil erosion.

Soil Productivity

Soil productivity is the ability of the soil to supply the water and nutrients needed to sustain plant growth. Productivity reflects soil properties such as depth, texture, and parent material. Productivity is affected by changes in organic matter, in the populations of soil microorganisms, and in physical soil properties. These changes or impacts can be caused by management activities. Some of these impacts are defined as detrimental soil impacts (FSM 2550 and in Region 2 FSH 2509.18_2). These are referred to as Soil Quality Standards. They specifically relate to detrimental compaction, displacement, puddling and erosion. Rutting and puddling are soil disturbances that are similar to compaction and could be expected to last as much as several hundred years. Displacement, the mechanical loss of topsoil, is a long-term loss of soil productivity. However, the proposed action with mitigation would reduce the amount of displacement as well as reducing compaction and puddling to within tolerable limits.

Organic Matter - Organic matter in its various forms influences soil productivity. Humus is organic matter that has been decomposed by microorganisms and whose source is not recognizable. Duff and litter are leaves, needles, and twigs that are still recognizable on the surface of soils. Large woody debris consists of woody stems greater than 3 inches in diameter (Grahm et al. 1994,). Large woody debris supplies moisture to plants after the soils dry out. All organic matter provides habitat and nutrients for soil organisms.

Soil Organisms - Soil organisms, including fungi and bacteria, decompose organic matter, which releases nutrients for plant growth. Soil organisms depend on organic matter for the nutrients they need to carry out their life processes. For example, large woody debris provides important habitat for the survival of mycorrhizae fungi. These fungi form a symbiotic relationship with tree roots, increasing water and nutrient uptake by the trees and the fungi.

Physical Soil Properties - Changes in physical soil properties occur when ground based equipment makes repeated passes over the soil (Perry, 1989, Grier et al, 1989, Ballard et al 1982, Poff, 1996). These activities compact soils, reducing the amount of pore spaces in the soil. This in turn reduces the movement of water into and through the soil

and also impedes root movement through soils, reducing a plant's ability to take up water and nutrients. Compaction and other physical soil disturbances also affect soil microorganisms by altering the amount of carbon dioxide and oxygen in the soil. Changes in microorganism populations can affect soil productivity. Other physical soil disturbances include displacement and rutting. All of these physical changes are concentrated on skid trails

Soil Erosion

Erosion is infrequent on undisturbed forest soils for two reasons: first, organic matter provides a protective blanket on the soil surface that reduces the impacts of raindrops and allows water to move into the soil. Second, the surface soil below the organic layer is porous and allows water to move rapidly into and through the soil profile. Soil erosion can occur when the surface soil is compacted or when the loose surface soil and its protective layer of organic material are changed by management activities. Compaction, rutting and puddling reduce the movement of water into the soil and tend to channel water. As a result, water runs off (overland flow) and carries soil particles with it. Natural occurrences such as fire remove the organic matter from the soil surface. When organic matter is removed, soil pores can be plugged by fine soils moved by rainfall, resulting in overland flow and soil erosion. Soil erosion is minimized by reducing the area where equipment operates by locating landings and skid trails on flat ground with a low or moderate erosion hazard and by using erosion control features such as water bars, vegetation, and slash placement. Management activities that leave organic matter on the soil surface also reduce soil erosion. By using the mitigation measures as spelled out in the Regions Soil and Water Conservation Practices Handbook in the proposed project, soil erosion will be kept to a minimum.

Direct Effects of Alternative 1 (No Action) on the Soil Resource

The No Action alternative would not cause short-term effects on the soil resource over and above the existing condition. No additional road building, road decommissioning (related to timber management practices), salvage harvest or fuels reduction would disrupt the natural soil processes.

Organic Matter - The No Action Alternative would allow all standing dead trees to remain on site, eventually contributing large quantities of coarse woody debris. This quantity would exceed the recommended minimum of 5 to 10 tons/acre for this habitat type (Graham, 1994.) Needles and branches, especially in the areas with low fire severity, would fall to the ground. Over time, soil organisms would decompose the organic materials, adding humus to the soil. Nutrients associated with this material would slowly become available for plant growth. Vegetation would return to these sites. Shrubs, grasses, and forbs would dominate most of previously forested sites. Tree seedling establishment would be a very slow process in most of these areas, since most of the seed source trees were killed. Trees would gradually fill in from the edges of the burn, but re-establishment of full forest cover could take several hundred years. During the time, oak brush is dominant, which is the case in some parts of the analysis area,

organic matter would build up in the soil and would reduce soil erosion rates and capture some of the nutrients released by the fire. If, however, sagebrush and rabbit brush dominant a site, erosion rates could be higher than under a forest canopy. (Poff, 1996). Vegetation would reestablish quickly on the low burn severity soils. Moderate and high burn severity would re-vegetate more slowly, perhaps taking more than ten years. However, the seeding that was done in January of 2003 should help accelerate recovery.

Microorganisms - Microorganisms would migrate to the burned soil from adjacent or nearby unburned soils as conditions become favorable for them. Once they are back in the soil the nutrient cycling processes would return to a pre-burn level.

Physical Soil Disturbances - The No Action Alternative would cause no additional soil compaction, rutting, puddling, or soil displacement.

Soil Erosion- Under the no action alternative, erosion rates would gradually stabilize. From observations on burns throughout the country, it can be estimated that most of the large amounts of erosion occurs early on and the rates would stabilize within a 2-5 year time period (McDonald and Stednick, 2003; McGiver and Starr, 2000; Poff, 1996. Needles, twigs and large woody debris falling to the soil surface would further reduce the risk of soil erosion on low and moderate burn severity sites. In the short term, the No Action alternative would take longer than either action alternatives to get fine and large woody debris on the ground where it would begin protecting the soil from erosion.

Direct Effects of Alternative 2 on the Soils Resource

The magnitude of the impact to the soil resource is related to the type of impact, the specific soil on which the impact occurs, soil moisture conditions at the time of impact, and the amount of surface area disturbed.

Under Alternative 2, there would be approximately 2,016 acres treated with salvage logging operations within the Burn Canyon area. Based on local knowledge of past harvest activities, about 30% of those acres would have some form of soil disturbance. This would equate to 605 acres of soil disturbance. Alternative 2 also includes 344 acres of proposed thinning activities in the Burn Canyon area. Again based on local past thinning, about 20% of the area, or 69 acres, would experience soil disturbance.

Within the Bucktail area, Alternative 2 proposes 189 acres of salvage harvest, which equates to around 57 acres of soil disturbance. The amount of thinning proposed for the Bucktail area is approximately 296 acres, of which 59 acres could experience soil disturbance. Because of these potential soil disturbances, mitigation measures are built into the proposed action that would keep detrimental impacts within tolerable limits. (FSH 2509.18_2 R2)

This activity also includes reforestation, which would be accomplished through hand planting of pine seedlings. There would be no long-term effect to the soil resource other than the digging of a large number of holes about four inches wide and 8-12 inches

deep. This effort would, however, allow the ecosystem to return to a forested condition much sooner than under natural processes.

How this alternative relates to the various soil parameters relating to soil productivity is as follows:

Organic Matter- Alternative 2 proposes to remove standing dead trees, but to leave snags and additional standing and down dead material to provide protection for regeneration. Also, slash and unmerchantable material would be left on site and scattered and distributed as evenly as possible. The result would be at least 5 to 10 tons/acre of material in contact with the soil. This is well within the recommended amounts for this plant community (Graham et al 1994). Even with the removal of stems in these salvage activities, there should be no large or permanent loss of nutrients. It is estimated that boles of young and mature forests contains only 10% of the ecosystems nitrogen. (Poff,1996) In these situations, atmospheric inputs of the major nutrients along with the coarse woody debris that is left should soon replenish losses that did occur as a result of the fire. (Poff,1996)

With the coarse woody debris, snags and fine fuels that would be left on site in contact with the soil surface, all units are expected to have adequate quantities of fine and coarse organic materials to provide nutrients and habitat for soil microorganisms and substrate for nutrient cycling. This material would also act as protective groundcover and would protect the soil from the erosional forces of raindrop impact and overland flow.

Microorganisms- These fires have greatly changed the microorganism populations it has been observed and noted in the literature that after a fire, soil micro-flora recovers quite rapidly, frequently to levels greater than the original. It has also been determined that areas of less fire disturbance plays a very important role in inoculating soil that lacks or has reduced soil microorganisms. It has been found that the unburned areas within burns, adjacent unburned areas, unburned large woody debris, and soils that have only minor amounts of disturbance contain propagules for fungi, bacteria and other soil organisms. The propagules are dispersed by wind, animals and in this case the harvest equipment. The organic matter left on the harvest areas would benefit soil organisms by providing substrate for them to decompose, and habitat for them to survive in. All alternatives would leave both dead and live trees. This practice would leave a source of propagules for the burned sites.

Vegetation that returns to the harvested sites and the living vegetation that remains on the sites would utilize and store the nutrients released from organic matter. In addition, the soil microorganisms also use and store nutrients. These factors reduce the amount of nutrients that would be leached from the site. The amount leached would be similar to the effects of historic wildfires.

Soil compaction, puddling, rutting and displacement change a soils ability to exchange oxygen and carbon dioxide, which affects the ability of soil organisms to survive. However, because all proposed harvest areas would be designed to reduce soil

disturbance and meet the Regional soil guidelines favorable habitat for soil organisms would be maintained.

Timber harvest exposes soils to more sunlight and more moisture. Warm, moist conditions increase microbial activity and the amount of decomposition of organic matter that occurs on a site. In turn, nutrients would be available for plants. Management practices discussed above that leave a variety of organic matter on the site and that minimize soil compaction would leave a favorable environment for the survival of soil organisms in areas planned for salvage. No changes in long-term soil productivity would occur as a result of the proposed activities.

Physical Soil Disturbances- This alternative has the potential for causing soils disturbances. Whenever you operate heavy equipment over a natural soil surface disturbance is to be expected. The impacts of compaction, rutting, puddling and soil displacement would occur. All harvest activities would follow appropriate mitigation presented in R-2 Soil And Watershed Conservation Practices Handbook and would meet soil quality standards as directed by FSH 2509.18-2. This is especially important on these burns because most soils in these areas are susceptible to both rutting and compaction when certain soil moisture conditions exist. There would be no road construction or road reconstruction related to these proposed actions. Thinning and harvest activities would use designated skid trails and would also be designed to minimize the amount of soil disturbance off skid trails. Where skid trails already exist from previous activities, they would be reused, reducing the amount of additional detrimental soil disturbance.

Soil Erosion- Salvage operations could cause enough some disturbance to an already-disturbed site. The result would be a small, short term, increase in erosion and sedimentation. While this could be true on steep burned sideslopes, it has been found that salvage operations, if designed and executed carefully, do not increase erosion rates over what was experienced immediately after the fire. (McIver and Starr,2000 and MacDonald and Stednick,Draft Paper 2003). We believe that in the case of both Bucktail and Burn Canyon that erosion rates will only increase slightly, if at all, and that this increase attributable to salvage harvest activities will be short term (less than a year).

Soils that are mapped as moderate or high burn severity (Map C) could be sensitive to harvest-related activities, especially in the first 2 years following the fire. Before the fires occurred, soil erosion hazard in both Bucktail and Burn Canyon would have been rated low on slopes less than 35 percent; however, because the fires have reduced or eliminated ground cover and caused hydrophobic conditions in some areas, erosion hazard has been adjusted upward for this analysis. In areas where burn severity is high or moderate and slope is 15 percent or less, erosion hazard is considered moderate. Where burn severity is high or moderate and slope exceeds 15 percent, erosion hazard is considered high. Where burn severity is low and slope is 25 percent or less, erosion hazard is considered low. In recognition of the effects of fire on soil erosion potential, thinning and salvage harvest under Alternative 2 would be confined to moderate- and low-hazard soil conditions (ie. where severity is high or moderate and slope is less than

or equal to 15 percent; or where severity is low and slope is less than or equal to 25 percent). Table 3.8 below displays Alternative 2 thinning and salvage areas located on low and moderate soil erosion hazard areas. Most harvest would occur on slopes of 15 percent or less for both Burn Canyon and Bucktail and activities shown below on slopes greater than 15 percent are located only in low fire severity areas.

Reforestation activities under Alternative 2 would not be constrained by soil erosion hazard.

Table 3.8: **Acres and Percent of Total Activity Acres by Slope Class for Proposed Salvage and Thinning Activities**

	Burn Canyon				Bucktail			
Slope Class	Salvage		Thinning		Salvage		Thinning	
(Percent Slope)	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
0-5	1225.6	61%	175.9	51%	33.2	18%	153.0	52%
6-10	524.4	26%	60.1	17%	47.1	25%	82.5	28%
11-15	211.5	10%	47.6	14%	66.4	35%	37.1	13%
16-20	38.1	2%	33.4	10%	28.9	15%	21.3	7%
21-25	16.2	1%	27.3	8%	13.5	7%	2.0	1%
Activity Total	2015.8	100%	344.3	100%	189.1	100%	295.9	100%

Studies have repeatedly shown that the real source of erosion and sedimentation is not from harvest itself, but originates from skid trails and roads. (McIver and Starr, 2000; Poff,1996) Harvest activity may actually provide situations that would reduce runoff and erosion. The ground disturbance that would occur may provide enough surface roughness to slow runoff. It has also been observed recently that surface disturbance caused by salvage and thinning activities may break through a thin hydrophobic layer, allowing moisture to penetrate into the soil. (Hughes and Sandoval, personal observations on Spring Creek Fire, Glenwood Springs, Colo. 2002; McIver and Starr, 2000). Slash and coarse woody debris left on site would function to protect the soil from raindrop impact and would trap sediment, preventing its movement off site. In addition, implementing specific erosion control measures such as water bars, placing slash on disturbed soils, operating on gentle terrain, and vegetating disturbed soils would also reduce erosion. This along with the application of other mitigation measures designed to control erosion would assure that these activities would keep erosion within tolerable limits.

Most importantly, no new road construction or reconstruction would occur under Alternative 2. Only existing roads would be used to access timber stands timber. Additionally, roads identified for decommissioning under the Uncompahgre Travel Plan decision would be decommissioned. Decommissioning would consist of ripping, seeding, and water-barring road surfaces followed by motorized access through the placement of large earthen berms, rocks, or other effective physical barriers. Decommissioning would result in a long-term reduction of soil erosion compared to the No Action alternative.

Mitigation for the protection of the soil resource

From FSH 2509.25 Watershed Conservation Practices Handbook

- Manage land treatments to limit the sum of detrimentally compacted, eroded, and displaced land to no more than 15% of any land unit.

- Restrict roads, landings, skid trails, concentrated-use sites, and similar soil disturbances to designated sites.

- Use existing skid trails when possible; designate new skid trails routes and restrict skidding operations to those trails to the extent possible; limit off-trail travel.

- Mitigate compaction with mechanical treatment and control water on all skid trails (old and new) after use

- To limit compaction, operate heavy equipment for land treatments only when soil moisture is below the plastic limit or protected by at least 1 foot of packed snow or 2 inches of frozen soil. Soil moisture exceeds the plastic limit if the soil can be rolled into 3 mm threads without breaking or crumbling

- To prevent rutting, operate heavy equipment within harvest units only when soils are unsaturated.

- Work on contour as much as possible, (skid trail lay out, log retrieval, etc.)

- On skid trails greater than15% slope, provide cross drain water control at least every 30 ft

- Maintain or improve long-term levels of organic matter and nutrients on all lands. Keep all slash on site, (lop and scatter) Retain at least 5 to 10 tons/acre of material over 6 inches DBH.

Direct Effects of Alternative 3 on the Soil Resource

This alternative would have the same basic effects as discussed in Alternative 2, except there would be no thinning activity related to this proposal. This means that for Burn Canyon there would be 2,016 acres treated with salvage harvesting activities, with roughly 605 acres with actual soil disturbance of some form. The Bucktail area would have salvage harvest activities on 189 acres total, with 57 acres of potential soil disturbance. Reforestation and road decommissioning activities under Alternative 3 are the same as under Alternative 2. Reforestation would not result in degradation of the soil resource. Road decommissioning would have the same long-term benefits as under Alternative 2.

Nutrient Cycles, Water Quality And Quantity/Burn Canyon

The Beschta Report:

The “Beschta et al Report” makes a number of recommendations regarding fire salvage that has implications to erosion, water quality and riparian areas. The report states that land management practices have profoundly impacted forest, grassland and aquatic ecosystems. The term impact has a negative connotation and is subject to interpretation. There is no debate that livestock grazing; water development, fire suppression, and timber harvesting have modified ecosystems. To what extent that is acceptable to society and in some instances was preventable is the basis for debate. The aquatic resource specialists for the GMUG National Forest do not believe statements, in the “Beschta Report” which suggest widespread ecosystem health problems, apply to aquatic systems on this Forest nor would they be attributable to salvage logging or logging in general. These observations seem more targeted at watershed systems of the Northwest or the inland forests of Idaho and Montana. Whether sediment baseline references should be predicated on current conditions or desired conditions is another difficult judgment. Ecosystems are dynamic and are the product of episodic events. Major natural disturbances such as large wildfires produce short-term effects that will likely provide long-term benefits. Sediment and debris generated by fires and moved down the watershed by floods provides material for floodplain construction; provides nutrients for biological production; and provides wood and channel materials for habitat. The “Report” recommends the prohibition of road building in burnt landscapes. It also calls for the prohibition of salvage logging on sensitive sites. While this project may not go so far as to adopt all the recommendations in the report, we have independently come to agreement on a number of issues. No permanent or temporary roads will be built in order to remove timber. This aspect of the proposed action significantly reduces the potential environmental consequences to soil, water and aquatic resources. The current road system has been evaluated and a number of routes are planned for elimination, which will be a beneficial effect. This work may be accomplished through the timber sale; as a part of long-term restoration work, or as a part of the normal program of work. The Forest Service interdisciplinary team has agreed that all slopes over 25% should be avoided and any slopes over 15% should be avoided for areas where the litter cover has been lost. Buffer strips along all the drainages would be left and no disturbance within riparian areas would be permitted. The interdisciplinary team believes that some salvage is permissible and even beneficial. Logging would put material back on the ground quicker than waiting for natural events and this will aid in the creation of surface roughness and nutrient recycling.

Existing Condition

The Burn Canyon Fire is within the Dolores River Basin, a major tributary in the Upper Colorado River System. The drainages within the burn area include McKee Draw, Burn Canyon, Callan Draw, Mud Springs Draw, and Hamilton Canyon. With the exception of

Hamilton Canyon all these drainages include significant National Forest lands that are being considered for salvage logging, thinning, and reforestation. These drainages all drain north and enter Naturita Creek four miles or more below the fire. Naturita Creek enters the San Miguel River (Hydrologic Unit Code (HUC): 14030003), just upstream of the town of Naturita, Colorado. The San Miguel River joins the Dolores River just below Uravan, Colorado.

The climatic conditions of the site are influenced predominantly by elevation and topography. The activity area is predominantly located in the elevation zone of 7500 to 7900 feet. The annual average precipitation is 18 to 22 inches. In terms of water yield, the Ponderosa Pine community is not an important water yield zone of the Forest, as compared to the Spruce-Fir community type. Water yield from this area of the Forest is very low, projected at 3 inches. Winters are cold, but snow cover seldom exceeds 2 feet. Snowmelt and spring runoff can occur anytime from late March until early May, depending upon the year. Summers can be warm and dry (June is often the driest month of the year). The monsoon influence begins by mid to late July and continues through September. Thunderstorms during this period can be very intense, but often of short duration. The 10-year – 1 hour storm in this area is estimated to be 1.1 inches. The greatest magnitude floods for small drainages are all initiated by thunderstorms. Not until the larger basins, i.e., the San Miguel River, is the annual peak flow associated with snowmelt. Accumulations of winter snow begin by late November, but during a low snow year, portions of the area may be snow free at times.

All streams within the fire area are classified as either intermittent or ephemeral channels. These streams flow in response to runoff events. There are short reaches where seeps and springs discharge into channels and maintain water on the surface for short distances.

Drainage channels below the burn are incised in abandoned floodplains. This is particularly true in the streams that are 3rd order and larger, where deep valley fill soils exist. Because channels are incised, lack of flood water access to the floodplain, causes any floods originating from the fire to be even more likely to re-initiate or accelerate down-cutting or headwater movement of incision. These are mature gullies that appear to be many decades old; however, there is evidence that channel incision is still occurring in laterals draining into the mainstem channels. In both McKee Draw and Mud Springs Draw, there is the opportunity to halt active gully development with the construction of headcut erosion control structures using KV or appropriated funds. A long-term riparian exclosure was lost to the fire on McKee Draw and will be replaced. Incision has occurred where water has been concentrated along cow trails, skid trails and road drainage. Gully development indicates that these watersheds are prone to erosion and in particular disturbances that reduce ground cover, such as livestock grazing and fire.

Naturita Creek and the San Miguel River are perennial stream systems. Typical summer flows in Naturita Creek are less than 10 cubic-feet-per-second (cfs), while spring snowmelt can produce flow in excess of 500 cfs. The San Miguel River at Naturita has

an average annual flow of 320 cfs, but upstream diversions for agriculture, commonly deplete late summer flows to 10 cfs or less.

The State of Colorado has classified the beneficial uses of waters originating within tributaries to Naturita Creek as Cold 1 Aquatic Life, Recreation 1, Water Supply, and Agriculture. These designations indirectly apply to streams within the analysis area because those streams are tributary to areas downstream where these classified uses can and do occur. Refer to Colorado Water Quality Control Commission Regulation 5 CCR 1002-8, "The Basic Standards and Methodology for Surface Water 3.1.0", effective August 17th, 1989, for definitions and details regarding classified uses.

The State does not have a numeric sediment standard, but is addressed in the following manner. In addition to the State's water quality designations, classifications and numeric standards, all surface waters of the State are subject to the Basic Standards (Colorado Water Quality Control Commission), which in part read: State surface waters shall be free from substances attributable to human-caused point or non-point source discharge in amounts, concentrations or combinations that:

1. Can settle to form bottom deposits, or form floating debris, detrimental to the beneficial uses (e.g. silt and mud).

2. Produce color, odor, or conditions to the degree it creates a nuisance or harm existing beneficial uses or impart any undesirable taste.

3. Are harmful to the beneficial uses or toxic to humans, animals, plants, or aquatic life.

4. Produce a predominance of undesirable aquatic life.

The majority of water-related values at risk do not occur until flow becomes perennial, which would be Naturita Creek. (Refer to the aquatic biology section for a description of the nature and limitations for those aquatic community types.) Due to geo-climatic factors, Naturita Creek and its tributaries have evolved under the influence of extremes in the annual hydrograph, with very high annual peaks and very low late summer flows. Periodically major floods associated with thunderstorms occur. Summer temperatures exceed thresholds for coldwater fish and sediment loads are high. These are not cold water streams that are typical of others areas on the National Forest.

Riparian areas are very limited due to the scarcity of water at or near the surface over most of the area. Some percentage of the riparian areas may also meet the definition for a jurisdictional wetland. The upper reaches of McKee Draw and Mud Springs Draw do exhibit the presence of water-dependent plant species along the channel and floodplain and thus should be considered as riparian areas. Sawmill Spring is an important water feature located in the McKee Draw watershed. This water is an importance source of livestock water. The development is in poor condition due to a lack of maintenance over time. The fire burned up to and around the spring development, but was primarily a ground fire in this area of the burn. This area is

proposed for possible thinning and salvage. Lesser seeps may occur within potential treatment areas and would need to be protected from disturbance activities.

The Lilylands ditch is an important water conveyance system within the burned area. The vast majority of the ditch is located on BLM land, however there is a segment located along the western perimeter of the Forest Boundary, within a tributary to Hamilton Canyon. The system transports water to Dry Creek Basin from water stored in Lilyland Reservoir, which is located south of the fire. The main south lateral traverses through the headwaters of Hamilton basin and intercepts a number of natural drainages that are likely to see increased storm water runoff. In addition to the risk of washouts at drainage crossings, the potential for filling and plugging with sediment and ash is high. Water captured by the ditch or transported from the reservoir could overtopped ditch banks and run downhill causing significant gully erosion.

Environmental Consequences - Burn Canyon

This section is intended to address the direct and indirect effects of proposed salvage logging, thinning, reforestation and riparian KV projects on water resources. It will also address the cumulative effects associated with past, proposed and reasonably foreseeable.

Several events and activities are contributing to the cumulative water quality, flow regime and riparian health effects to which the proposed actions may cause an incrementally increase. Those events and activities of concern include the fire effects, fire suppression activities, roller chopping, livestock grazing, fire restoration, and KV activities. In all cases, those effects are spatially bounded by the individual watersheds and extend downstream to the confluence of Naturita Creek and the San Miguel River (Map F). By the time water, sediment and nutrients reach the San Miguel River, the basin area is so large that even the effects of the fire itself tend to be undetectable in the context of the influences of the larger watershed area.

By far the greatest impact to the Burn Canyon area has occurred as a result of the fire itself. The increases of sediment are expected to taper off rapidly after the first year and are expected to achieve full recovery in 3 to 5 years. The fire burned across four watersheds that drain into Naturita Creek. The basins range in size from 3200 to 17,000 acres in size. The fire has affected 65% of the total acres within the four basins. Ground cover has been reduced or completely eliminated from a high percentage of these basins. Until ground cover can be re-established, runoff due to lack of groundcover is expected to be very high on slopes over 15%. Several site visits were made to the Burn Canyon area during the late summer and into early November of 2002 for the purpose of evaluating hydrologic response to fire effects and assessing natural recovery processes. As a result of the fire, both groundcover and canopy cover were diminished in accordance with burn severity. In locations that were severely burned, this was a major disturbance that can be expected to modify hydrologic function and response. In areas that were a moderate to severe burn, there is a reduced capability of streamside zones to act as vegetative buffers for the capture of sediment or uptake of mobilized nutrients. Events such as catastrophic wildfire or major floods are known as

“reset” events that significantly alter the physical, chemical and biological balance of aquatic systems. There will likely be adjustments to the channel morphology in response to an influx of sediment and runoff. Channels will evolve in response to the increases in sediment. In the more gentle valley types, much of the sediment is likely to be stored as valley fill. Deposition within the channel could cause the formation of braided channels and lateral migration. In the steeper valley sections, sediment may be routed completely out of the basin within the span of just a few years and be deposited in flatter gradients downstream. In the lower end of these watersheds, generally below the Forest boundary, the gully network is well developed and individual gullies are quite large and deep in places. This is most evident in the Hamilton Draw and Mud Springs watersheds. These mature gully systems are growing laterally but no longer are incising as a new floodplain develops within the gully sidewalls. Increased runoff is expected to accelerate and/or reinitiate small headcuts located in the upper portions of the watershed. Advancing headcuts will adversely impact riparian communities. In less severely burned areas, impacts are expected to be considerably less and recovery much quicker, in some cases a year or even less.

While there are no site-specific data on before-and-after nutrient levels available for this fire, we know from research and monitoring of other fires that a significant amount of nutrients were lost due to volatilization by the fire. In addition, nutrients are being exported in solution or attached to sediment particles. The inorganic nutrients of greatest interest are nitrogen and phosphorus. In most instances, nutrient losses following fire are not large compared with the total amount left on site, which remain in residual organic matter and within the top 10 cm of the soil profile. An increase in nitrogen and phosphorus in surface water will increase biological production in stream and water bodies. This is often evidenced by an increase in algae and/or aquatic vegetation. This effect will be short lived. Nutrient levels for native rangelands and forests are typically supply limited. Within the first year following the fire, seeding and sprouting of live root crowns is expected to re-establish a grass/forb/shrub layer that is expected to quickly uptake any available nutrients. Export of nutrients from the watershed is expected to decline to near zero within 3 years.

Several intense thunderstorms occurred during the month of September with approximately ½ inch of rain reported on areas of the burn. On areas with less than 10% slope, little soil and ash movement was observed. Where slopes exceeded 10%, sediment, ash and litter plumes indicated that significant overland flow occurred in conjunction with the precipitation events.

Quantities of sediment and ash were transported to defined channels and routed downstream. Sediment deposition has occurred along slope breaks, along deposition reaches of surface drainages and where the road network intersected small ephemeral drainages. The types of effects observed were anticipated in the BAER analysis and report. While the quantity of sediment moving from the uplands towards, and in many cases into, surface drainages was significant, no catastrophic erosion or flooding events have been reported to date. The frequency and magnitude of runoff and erosion is expected to decline over the next 1 to 5 years, depending upon burn severity and recovery progress. Within several months following the fire, re-sprouting of perennial

herbaceous and woody species was occurring. In January of 2003, steep canyon slopes and areas that were severely burned were seeded aerially to grass.

Table 3.9: **Estimated Peak Flow Rates for Burn Canyon Fire Watersheds**

	2 Year 1 Hour Event		10 Year 1 Hour Event		25 Year 1 Hour Event		100 Year 1 Hour Event	
Drainage	Pre-fire*	Post Fire	Pre-fire	Post Fire	Pre-fire	Post Fire	Pre-fire	Post Fire
Mckee @ Naturita Cr.	0	38	62	319	168	560	516	1178
Burn Cyn @ Naturita Cr.	0	8	41	131	101	226	256	460
Callan Draw @ Naturita Cr.	0	144	154	845	374	1336	993	2434
Hamilton @ Naturita Cr.	0	123	170	1072	469	1796	1356	3346
Naturita Cr. @ San Miguel	0	144	201	1590	635	2822	2153	5652

* all flow rates are in cubic feet per second (cfs)

Water made available by a reduction in evapo-transpiration and interception losses caused by the widespread loss of trees is likely to be offset by an increase in herbaceous/shrub communities and/or a change in community types that reflect greater availability of onsite moisture. Riparian community types may expand in size and extent. Springs may increase in discharge and new wet seeps may develop. Groundwater supplies are likely to be a recipient of additional water. It is not anticipated that a sufficient amount of water would become available to cause intermittent channels to turn perennial, but that may be a possibility following extraordinary wet winters. This effect will be very subtle and difficult to verify. Increases in water availability are expected to decline as trees become established and mature. This will take many decades. Downstream water users are not likely to see any benefits, because surface water increases will only be transported out of the project area when intermittent channels are flowing.

Additional impacts occurred as a result of fire suppression activities, i.e., dozer line construction and use of abandon travel routes by fire suppression equipment. Many miles of dozer line were constructed, some on fairly steep slopes. Fire lines were water barred and seeded soon after the fire was extinguished. A track-mounted excavator was used to bring much of the slash that was created by the fire-break back onto the disturbed ground. Grass seeding for erosion and noxious weed control was done in January of 2003 and is expected to have a beneficial effect over the next several years as groundcover increases and sites stabilize. There are several proposed roller-chopping projects in the area, which would add to total disturbance. However, those sites are a significant distance from drainages and it all would occur on level ground. Before the fire occurred, the area was used extensively for livestock grazing. Indications are that riparian areas were severely impacted by this use and many are still in recovery status. An administrative decision has been made to close the area to livestock grazing during 2003 and 2004. This should help both natural recovery and rehabilitation efforts.

Channel restoration work planned for both the McKee Draw and Mud Springs watersheds will typically include reshaping of headcuts and gully sidewalls and the installation of rock or geo-textile materials designed to stabilize migration of the headcut up the drainage and also reduce the collapsing of oversteepened banks. This work will result in disturbance and exposure of soil within the channel that will likely be washed away when runoff events occur. To the degree possible, excavated material will be placed outside the ordinary high water line and sites will be revegetated. This work will be performed only when channels and stream terraces are dry. The long-term consequences of this activity will be positive, as it will prevent further channel incision and disruption of the water table within riparian areas. The result will also be a reduction in channel erosion over time.

Alternative 1- No salvage, thinning or reforestation would occur. The direct and indirect consequences of this would be no additional disturbance beyond what is attributed to the fire and described previously. Sediment production should decline rapidly over the first 1 to 2 years and then gradually recover to nearly pre-fire conditions after 5 years. Hydrologic recovery will take considerably longer. Natural restoration and recovery will take many decades and even centuries to return vegetation communities to a pre-fire condition.

Alternative 2 - Salvage logging of fire-killed timber and reforestation is proposed on approximately 2,016 acres. The acres actually treated could be less, based upon final unit design and layout. No logging or equipment operations will occur on slopes steeper than 25%. See Table 3.7. Most of this logging will occur on lands with moderate burn severity. See Table3.8. The fire burned hot enough to kill the trees, but not hot enough to damage the soil. Less than 1% (17 acres) of the area mapped as severely burned is proposed for salvage logging. Of those 17 acres, 15 acres are on slopes with less than 10% slope. The incremental effect of harvesting fire-killed trees is not expected to be significant. The steeper the ground and/or the closer to the drainage, then the greater the potential for sediment production would be, associated with disturbance activity. Skid trail location, soil moisture conditions and climatic events will all significantly influence the outcome. Any increase will be temporary (less than 2 years) and will be minor in comparison to the effects of the fire. It should be noted that logging impacts will be partially offset by the benefits of breaking up hydrophobic soil conditions as well as by quickly increasing the amount of woody material and litter on the ground, which will eventually help restore organic matter to the sites and retard sediment movement. Skidding logs and development of landings will provide opportunities for some soil loss and erosion; however, in most instances soil will not reach surface channels. Sediment production from the existing road system is likely to decrease as new culverts and dips are installed. As described earlier, avoidance of even moderately steep slopes and adequate buffers along channels should greatly reduce any potential for erosion and sediment.

Impact to the newly establishing ground vegetation can be expected as a result of logging activities. This degree of impact will depend on when logging occurs. If logging occurs before plant germination, it may be beneficial. If logging occurs at the onset of germination, it may cause a failure and would need to be mitigated. Establishment of a

new timber stand would be required within 5 years and will greatly speed the conversion back to a forest-dominated landscape. There is not expected to be any incremental changes to water production, timing or magnitude of flood events as a direct or indirect effect of salvage logging.

In addition to salvage harvest, Alternative 2 includes the thinning of approximately 344 acres of live ponderosa pine stands. These are areas within the fire perimeter that did not burn or were only affected by a ground fire, with no impacts to soil conditions or runoff characteristics. The 344 acres of thinning treatment is scattered over a large geographic area, which includes three different watersheds. This activity would be comparable to a conventional timber sale because existing tree canopy and ground cover are relatively intact. The acres actually treated might turn out to be less, based upon final unit design and layout. The same operational limitations applied to salvage logging would be applied to thinning. While there may be localized effects associated with ground disturbance, it is expected to be very short lived and will not lead to any offsite (downstream) effects. It would be preferable to delay the thinning until after the salvage operations have been completed in order to stagger the disturbances and allow for continued recovery of the burned areas. Removal of live trees is not expected to increase water production or change runoff characteristics. As earlier stated, water production from this relatively dry area of the Forest is minimal. Some very slight increases in soil moisture are possible. The thinning would not be a stand replacement treatment, and so additional moisture will be utilized by remaining trees, which are expected to increase in vigor.

In addition to planting the areas salvage logged, which is required by law, reforestation of burned areas not selected for salvage is proposed on 2,116 acres. Accomplishment of this additional, but not required by law or regulation, reforestation is dependent upon the availability of funding and would likely to be a multi-year effort. Completion of reforestation is expected to occur in about 10 years. The reforestation issue may be the most important and long-term consequence of the proposed action. Reforestation of both logged and un-logged fire-killed timber stands, will attempt to accelerate establishment of new timber stands. Planting does not guarantee success and there are many factors that affect the outcome. The indirect effect of this action would be to increase the evapo-transpiration losses from sites. Even if fully stocked timber stands are created by planting within 5 years, the changes to water availability and increased use by trees is expected to take decades. Over this period of time, site conditions may gradually dry out in the understory and around riparian areas as growing trees utilize more water; however, in this vegetation type and in this precipitation zone, this effect is miniscule.

All logging activities would be a considerable distance from the Lilylands Ditch, where it crosses through the National Forest. There will be no direct or indirect effects to this facility. As stated, the fire has and will continue over the next several years to adversely affect water quality. However, any incremental addition of pollutants as a result of harvest activities will be undetectable downstream, short term and will not constitute a violation of State water quality standards or regulations.

Alternative 3 – This alternative drops the thinning of green stands and is limited to salvage logging and reforestation of harvest areas. The effects of salvage would not change from those described in Alternative 2. The effects of thinning are so scattered and localized that elimination of thinning would not reduce the potential for adverse consequences to water quality, nutrient export or flow regimes.

The following practices are suggested mitigation, which if applied will reduce adverse environmental affects to water resources or reduce the potential for an affect. These practices supplement those required in FSH 2509.25. Required mitigations will be listed in the Decision Notice. Most of the following practices are typical of what is commonly required. However, the buffer widths exceed general standards and were developed in recognition of the areas reduced capacity, as a result of the fire, to capture and store sediments generated upslope from drainages.

Salvage Logging

1. All surface drainages will be listed as protected streamcourses in the timber sale contract.

2. No commercial harvest will occur within 100 feet of surface channels.

3. No ground disturbing activities will be allowed within any buffer areas. Ground disturbance is defined as removal of ground cover or displacement of soil.

4. As a minimum buffers will extend 100 feet either side of any surface drainage feature. A surface drainage feature is defined as any water-course where evidence of a defined channel exists; this includes perennial, intermittent and ephemeral streams.

5. Where activities are planned within areas that were moderate to high burn severity on slopes steeper than 10%, the buffer around surface drainages will be extended to 200 feet. On slopes steeper than 15% the buffer will be extended to 300 feet. Removal of merchantable timber may occur, so long as no ground disturbance results.

6. Exemptions may be allowed to the streamcourse protection outline above based upon site-specific conditions at the appropriate time. The progress of recovery of soil and ground cover conditions will be the primary consideration in adjustments to buffer widths.

7. Exemptions to buffer widths will be made only after the Sale Administrator consults with the Forest Hydrologist and District Ranger.

8. Seeps and springs constitute riparian areas and will be identified at the time of sale layout. No harvesting will occur within 50 feet of the edge of these riparian areas.

9. Logging slash will be left on site to aid in organic matter recycling and erosion protection. If whole tree logging is conducted then non-merchantable material will be removed from landings and distributed back across the unit, as directed by the sale administrator.

Thinning

1. All surface drainages will be listed as protected streamcourses in the timber sale contract.

2. No ground disturbing activities will be permitted within 100 feet of perennial or intermittent drainages. Removal of merchantable timber may occur, so long as no ground disturbance results.

3. No skid trails, landings, slash piles, or service areas will be permitted to directly impact ephemeral drainages. Single skid trips across ephemeral drainages may be permitted by the Sale Administrator.

4. Seeps and springs constitute riparian areas and will be identified at the time of sale layout. No harvesting will occur within 50 feet of the edge of these riparian areas.

5. Logging slash will be left on site to aid in organic matter recycling and erosion protection. If whole tree logging is conducted then non-merchantable material will be removed from landings and distributed back across the unit, as directed by the sale administrator.

Roads

1. Surface drainage features, i.e., ditches, dips, culverts, road crowns will be fully functional at all times throughout the term of salvage and thinning operations.

2. Utilize the timber sale and conduct of logging operations to close and/or obiliterate non-system travel routes to the extent it can be accomplished within the terms of the sale contract.

Nutrient Cycles, Water Quality And Quantity/Bucktail

Existing Condition

The Bucktail Fire had a much different and lesser effect on the landscape and its watersheds than that experienced on Burn Canyon. The most significant factor is scale. The 2,244 acres burned was a relatively large fire by recent accounts, but is small compared to the 31,616 -acre Burn Canyon Fire. While the Burn Canyon fire may have been virtually unprecedented for that ecosystem, the Bucktail fire was not. Fires of this size and intensity have undoubtedly occurred many times before. It burned during May when conditions were not as hot and dry as that experienced on Burn Canyon during

July. The Bucktail fire was mapped as having a greater percentage of fire in a high severity class than Burn Canyon; however, this is misleading. The Bucktail fire BAER assessment was a rapid assessment and was not as intensively as the BAER assessment for Burn Canyon. The basis for designating burn severity for Bucktail was merely fire consumption of tree or ground cover. However, fire severity rating for Burn Canyon was based on the degree of soil resource impact, which is more indicative of the ability of an area to recover from fire effects. The great visual impact of the Bucktail fire belied the real impact to ecosystem resilience. Much of the area mapped high on Bucktail would have been mapped as moderate using the Burn Canyon criteria.

Both fires were predominantly pinyon/juniper and ponderosa pine communities. Both contained oak brush components, with that component being a more significant type on the Burn Canyon fire. In both instances the pinyon/juniper burned similarly, although on Bucktail the effects were mostly superficial, as the soil surface was only charred and not consumed. In the ponderosa pine there were some dramatic differences. While there was a significant amount of mortality, which occurred, it did not occur nearly to the extent of that on Burn Canyon. Much of the Bucktail fire was confined to a ground fire, which had very little impact to cover or erosion rates. Generally, the mortality was confined to individual trees or small groups rather than whole stands.

The fire was a typical wind driven event that started around 7000 feet and moved rapidly upslope to the north and stopped around 7800 feet. The upper slopes of the fire are gently sloped, but from 7600 feet down, the slopes get considerably steeper. Slopes up to 45% lie in 100 to 300 foot bands adjacent to surface drainage features. Ponderosa pine stands dominate the upper 1/3 of the fire and correspond to the more gentle terrain. The lower slopes within the fire are almost pure pinyon/juniper communities. Riparian areas are very limited, as surface drainages are very steep and confined, with no floodplain development. The exception is one small area at the southern boundary of the fire, which exists along the principal drainage where the valley widens. The deeper soils and greater moisture availability has resulted in the establishment of a narrowleaf cottonwood and willow community. Annual precipitation is similar to the Burn Canyon fire, as the elevation zones and vegetative types are nearly identical.

The fire burned almost entirely within a 3rd order tributary to Big Bucktail Creek, which is a tributary to the San Miguel River. Approximately 80% of this small drainage and 30% of the Big Bucktail watershed lie within the fire perimeter. Stream channels within the fire perimeter and downstream, including Big Bucktail Creek, only flow water seasonally or intermittently. During wet years flows may be prolonged into July, but seldom later. The drainage density is high, with 5 miles of channel for every 1 square mile of land. Streams are very steep with most in the 4 to 10% gradient class. The watershed reacts very quickly to storm events as surface water is very efficiently routed to drainages and moved out of the catchment. Streams can quickly fill with water and within a matter of hours be dry once again. Channels are very well armored with large cobble and rock. The potential for channel incision is very limited. Lateral migration is not possible in the v-shaped bottom. Extreme flow events could undercut steep inner gorge slopes and

trigger small slope failures and dry ravel. Water which sources within the fire flows into the CC ditch located near the San Miguel River 5 miles east of Nucla, Colorado.

The State of Colorado has classified the beneficial uses of waters originating within tributaries to the San Miguel River as Cold 1 Aquatic Life, Recreation 1, Water Supply, and Agriculture. These designations indirectly apply to streams within the analysis area, because those streams are tributary to areas downstream where these classified uses can and do occur. Please refer to Colorado Water Quality Control Commission Regulation 5 CCR 1002-8, "The Basic Standards and Methodology for Surface Water 3.1.0", effective August 17th, 1989, for definitions and details regarding classified uses.

The State does not have a numeric sediment standard, but is address in the following manner. In addition to the state's water quality designations, classifications and numeric standards, all surface waters of the State are subject to the Basic Standards (Colorado Water Quality Control Commission), which in part read: state surface waters shall be free from substances attributable to human-caused point or non-point source discharge in amounts, concentrations or combinations that:

1. Can settle to form bottom deposits, or form floating debris, detrimental to the beneficial uses (e.g. silt and mud).

2. Produce color, odor, or conditions to the degree it creates a nuisance or harm existing beneficial uses or impart any undesirable taste.

3. Are harmful to the beneficial uses or toxic to humans, animals, plants, or aquatic life.

4. Produce a predominance of undesirable aquatic life.

The majority of water related values at risk do not occur until perennial flow begins four miles downstream where Big Bucktail Creek joins the San Miguel River.

Environmental Consequences

This section is intended to address the direct and indirect effects of proposed salvage logging, thinning and reforestation on water resources. It will also address the cumulative effects associated with past, proposed and reasonably foreseeable.

Several events and activities are contributing to the cumulative water quality, flow regime and riparian health effects to which the proposed actions may cause an incrementally increase. Those events and activities of concern include the fire effects, fire suppression activities, use of prescribed fire, livestock grazing and fire restoration activities. In all cases, those effects are spatially bounded by the Big Bucktail watershed and extend downstream to its confluence with the San Miguel. By the time water, sediment and nutrients reach the San Miguel River, the basin area is so large that even the effects of the fire itself tend to be absorbed.

By far the greatest impact has occurred as a result of the fire. As a result of the fire both groundcover and canopy cover were diminished in accordance with burn severity.

An increase in sediment is expected to taper off rapidly after the first year and is expected to achieve full recovery in 3 years. The 1996 Telephone fire, located approximately 5 miles to the southeast, was an 1100-acre fire that burned in nearly identical vegetation types, intensity, elevation zones and aspect. That fire provided an excellent opportunity to observe ecological recovery. During the first year following the fire, sheet and rill erosion was significant. By year two, vigorous sprouting of native vegetation had greatly reduced any soil displacement and by the third year following the fire there was no evidence that erosion was still occurring. Live groundcover had increase dramatically over pre-fire conditions. For the Bucktail, fire ground cover changes will not be as dramatic in the ponderosa pine as what is expected in the pinyon/juniper (PJ). Prior to the wildfire, groundcover in the PJ was very sparse, and watershed conditions were not desirable. Water runoff and erosion rates are high. Much of the ground surface is an “erosion pavement”, which typically consists of a gravel/cobble surface that is the result of the fine textured material being washed away, leaving most coarse textured materials at the surface. The absence of wildfire has significantly increased the distribution and age of PJ vegetation type across the entire Uncompahgre Plateau landscape to the detriment of watershed health. The effect of fire in the PJ is that after 3 years infiltration rates should increase and surface runoff diminish compared to pre-fire conditions.

An increase in annual water production delivered to the mouth of the Big Bucktail watershed is not expected as a result of the fire. As was the case on Burn Canyon, ponderosa pine is not an important water production zone and pinyon/juniper is even less so. Water made available by a reduction in evapo-transpiration and interception losses caused by the widespread loss of trees is likely to be offset by an increase in herbaceous/shrub communities, and or a change in community types that reflect greater availability of onsite moisture. Springs may increase in discharge and new wet seeps may develop. Groundwater supplies are likely to be a recipient of additional water. It is not anticipated that a sufficient amount of water would become available to cause intermittent channels to turn perennial, but that may be a possibility following extraordinary wet winters. This effect will be very subtle and difficult to verify. Increases in water availability are expected to decline as trees become established and mature. This will take many decades. Downstream water users are not likely to see any benefits because surface water increases will only be transported out of the project area when intermittent channels are flowing.

On September 18th 2002 a field investigation of the Bucktail burn was conducted for the purposed of evaluating fire recovery processes and stream channel conditions. A report with photographs was prepared (Almy, 2002). The site was visited following several weeks of good moisture. A nearby weather station had recorded 3.17 inches of rain during the first 18 days of September, with .63 inches falling in the previous 24 hrs. In summary, the report stated that oak sprouting was very vigorous with new shoots exceeding 3 feet in height. There was ample evidence of erosion on slopes steeper than 30%, with an estimated ½ to 1 inch of soil loss. However, the erosion noted was not as severe as feared given the heavy rain that preceded the investigation. Erosion that was occurring on the upper 2/3 of the slope was not transported to the drainage network. The rainfall and subsequent runoff had resulted in a recent event of bankful or

greater discharge. Peak flows were estimated in the BAER report on the order of 55 cfs per square mile, based upon a 2 yr 6hr storm. Measurements made in the field on September 18th estimated actual flows to be 63 cfs per square mile for the West Fork of Bucktail Creek. Associated channel impacts from this event were limited to segments of lateral bank scour.

Suppression activities did not cause any major effects. All fire lines were handline. No dozer line construction occurred. Some old roads that had been closed and were healed up were reopened to permit equipment and fire fighter access. Once the fire was extinguished the roads were re-closed and have now been seeded to control erosion and noxious weed infestation.

The area is part of an active livestock allotment. Other than a few concentration areas around water, the burned area did not receive heavy livestock use prior to the fire and therefore the soil and water impacts are negligible. It is the intent to minimize livestock use of the burned area for a period of at least two years in order to avoid conflicts with restoration objectives.

Prescribe fire treatment has been used over the last decade in ponderosa pine stands in the areas within and surrounding the Bucktail fire. The objective of this action has been to removal ground and ladder fuels. The adverse effects to soil and water are very short lived (a year or less) as these cool fires rapidly respond with vigorous re-growth and sprouting of grasses and shrubs. The net effect is an improved watershed condition as a result of improved ground cover.

Alternative 1 - No salvage, thinning or reforestation would occur. The direct and indirect consequences of this would be no additional disturbance beyond what is described in the cumulative effects section. Sediment production should decline rapidly over the first year, recovering to pre-fire or better conditions three full growing seasons after the fire. Natural restoration and recovery will take many decades and even centuries to return vegetation communities to a pre-fire condition.

Alternative 2 – This alternative proposes to salvage log a about 189 acres of fire-killed timber and conduct thinning operations on potentially another 296 acres. No logging or equipment operations will occur on slopes steeper than 25%, with most activity restricted to slopes less than 15%. No permanent road construction would occur. An existing road system is in place to access and remove the majority of timber. The incremental effect of harvesting fire-killed trees is not expected to be significant. The amount of sediment will vary with the steepness of the ground and the proximity to the drainage, the steeper the ground and/or the closer to the drainage the greater the potential for sediment production. The Bucktail fire terrain is not as gentle and is more dissected than the Burn Canyon area. The potential for sediment will also vary considerably depending upon the conduct of logging and weather. Skid trail location, soil moisture conditions and climatic events will all significantly influence the outcome. The increase will be temporary (less than 2 years) and will be minor in comparison to the effects of the fire. This area will recover quicker than the Burn Canyon area because site conditions in the ponderosa pine were not adversely impacted to the same

extent and scale. It should be noted that the logging impacts will be partially offset by the benefits of breaking up hydrophobic soil conditions, which are felt to be slightly hydrophobic, and increasing the amount of woody material and litter on the ground, which will eventually help restore the nutrient bank and retard sediment movement. Logging will not occur for more than a year after the fire and the minor amount of hydrophobicity detected immediately following the wildfire will probably be absent. Skidding logs and development of landings will provide opportunities for some soil loss and erosion; however, in most instances it will never reach surface channels. As described earlier, avoidance of even moderately steep slopes and adequate buffers along channels should greatly reduce any potential for erosion and sediment.

Some impacts to the newly establishing ground vegetation can be expected as a result of logging activities. This will be highly variable depending upon when logging occurs. If logging occurs pre-germination it may actually be beneficial. If it occurs at the onset of germination it may cause a failure and would need to be mitigated. Establishment of a new timber stand would be required within 5 years and will greatly speed the conversion back to a timbered landscape. There is not expected to be any incremental changes to water production, timing or magnitude of flood events as a direct or indirect effect of salvage logging.

The thinning of live ponderosa pine stands should have no impacts to soil conditions or runoff characteristics. This activity would be comparable to a conventional timber sale, because the existing tree canopy and ground cover are relatively intact. The same operational limitations applied to salvage logging would be applied to thinning. While there may be some localized effects associated with ground disturbance it is expected to be very short lived and will not lead to any offsite (downstream) effects. Removal of live trees is not expected to increase water production or change runoff characteristics. As earlier stated, water production from this relatively dry area of the forest is minimal. Some very slight increases in soil moisture are possible. The thinning would not be a stand replacement treatment, and so additional moisture will be utilized by remaining trees, which are expected to increase in vigor.

In addition to planting in areas salvage logged, which is required by law, reforestation of burned areas not selected for salvage is proposed on 216 acres. Reforestation is only being considered for commercial timberlands, which excludes the pinyon/juniper sites. Accomplishment of this non-essential reforestation is dependent upon the availability of funding and will likely be a multi-year effort. The reforestation issue may be the most important and long-term consequence of the proposed action. Reforestation of both logged and un-logged fire-killed timber stands will attempt to accelerate the establishment of new timber stands. Planting does not guarantee success and there are many factors that affect the outcome. The indirect effect of this action would be to increase the evapo-transpiration losses from sites. Even if fully stocked timber stands are created by planting within 5 years, the changes to water availability and increased use by trees is expected to take decades. Over this period of time site conditions may gradually dry out in the understory. Less water would be stored in the soil profile and contributions to aquifer recharge would decline. These increments of change are expected to be slight and unmeasurable.

Any incremental addition of pollutants as a result of harvest activities will be undetectable downstream, short term and will not constitute a violation State water quality standards or regulations.

Alternative 3 – This alternative drops the thinning of green stands and is limited to salvage logging and reforestation of harvest areas. The effects of salvage would not change from those described in Alternative 2. The effects of thinning are so scattered and localized that elimination of thinning would not reduce the potential for adverse consequences to water quality, nutrient export or flow regimes.

The following practices are suggested mitigation, which if applied will reduce adverse environmental affects to water resources or reduce the potential for an affect. These practices supplement those required in FSH 2509.25. Required mitigations will be listed in the Decision Notice. Most of the following practices are typical of what is commonly required. However, the buffer widths exceed general standards and were developed in recognition of the areas reduced capacity, as a result of the fire, to capture and store sediments generated upslope from drainages.

Salvage Logging

- All surface drainages will be listed as protected stream courses in the timber sale contract.

- No commercial timber harvest will occur within 100 feet of surface channels. As a minimum buffers will extend 100 feet either side of any surface drainage feature. A surface drainage feature is defined as any water-course where evidence of a defined channel exists; this includes perennial, intermittent and ephemeral streams

- Where activities are planned in moderate or high burn severity areas on slopes between 10% and 15%, the buffer around surface drainages will be extended to 200 feet. On slopes steeper than 15% the buffer will be extended to 300 feet. Removal of merchantable timber may occur outside the 100-foot core buffer and within the buffer extension provided no ground disturbance results. For example if harvest occurs on frozen snow-covered ground or if logging is accomplished with log-forwarding equipment. The forest hydrologist must approve such exceptions.

- No ground-disturbing activities will be allowed within 100-foot core buffer areas. Ground disturbance is defined as removal of ground cover or displacement of soil.

- Exemptions may be allowed to the stream course protection outline above based upon site-specific conditions at the appropriate time Exemptions to buffer widths will be made only after the Sale Administrator consults with the Forest Hydrologist and District Ranger. The progress of recovery of soil and ground cover conditions will be the primary consideration in adjustments to buffer widths.

- Seeps and springs constitute riparian areas and will be identified at the time of sale layout. No harvesting will occur within 50 feet of the edge of these riparian areas.

- Logging slash will be left on site to aid in organic matter recycling and erosion protection. If whole tree logging is conducted, non-merchantable material will be removed from landings and distributed back across the unit, as directed by the sale administrator.

Thinning

- All surface drainages will be listed as protected stream courses in the timber sale contract.

- No ground disturbing activities will be permitted within 100 feet of perennial or intermittent drainages. Removal of merchantable timber may occur as long as no ground disturbance results.

- No skid trails, landings, slash piles, or service areas will be permitted to directly impact ephemeral drainages. Single skid trips across ephemeral drainages may be permitted by the Sale Administrator.

- Seeps and springs constitute riparian areas and will be identified at the time of sale layout. No harvesting will occur within 50 feet of the edge of

- these riparian areas.

- Logging slash will be left on site to aid in organic matter recycling and erosion protection. If whole tree logging is conducted then non-merchantable material will be removed from landings and distributed back across the unit, as directed by the sale administrator.

Roads

- Roads will be maintained so that surface drainage features, i.e., ditches, dips, culverts, road crowns, will be fully functional at all times throughout the term of salvage and thinning operations.

- Utilize the timber sale and conduct of logging operations to close and/or obliterate non-system travel routes to the extent it can be accomplished within the terms of the sale contract.

Fisheries/Burn Canyon

Affected Environment/Cumulative Actions Considered:

The Burn Canyon assessment area is located within the Naturita Creek watershed and includes three small tributaries, McKee, Callahan, and Mud Spring Draws. These tributaries comprise 30% of the watershed area of Naturita Creek. Tributaries in the assessment area are not fish-bearing streams, providing no seasonal habitat use by trout or other native fish species. Fish occur only in Naturita Creek, which runs adjacent and downstream of the Burn Canyon assessment area. Naturita Creek includes three fish species (flannelmouth and bluehead suckers and roundtail chub) being proposed on the revised Forest Service Rocky Mountian Region Sensitive Species List. Management Indicator Species (MIS) do not occur within the analysis area, since these streams do not contain fish. However, MIS rainbow and brown trout have been observed in limited numbers downstream from the analysis area. Federally listed fish species or designated critical habitat does not occur within or adjacent to the Burn Canyon analysis area (USFWS 1994). Cumulative actions considered in this analysis have been identified in Chapter 2 of this document, and others relative to fish species throughout their historic range. Cumulative Effects have been confined to the Naturita Creek watershed, and would include effects over a 5-year time period.

Beschta et al (1995) suggests that existing conditions should not be used as “baseline” or “desired” conditions upon which to base management objectives. Activities to minimize the effects of the Burn Canyon fire on riparian and downstream fisheries have occurred consistent with the Forest Plan general direction for Management Prescription 9A. Post-fire activities to reduce erosion and increase plant growth have been implemented following the fire. Livestock permits in this area have been suspended for a minimum of 2 years by both the BLM and USFS to allow for riparian recovery. The Proposed Action and Alternative 3 have been designed to minimize soil disturbance and allow for watershed recovery. USFS is not considering the current condition as a desired permanent condition, and have taken steps to improve riparian and stream channel conditions, and to minimize effects of post-fire activities on the recovery of Naturita Creek watershed. These actions would all benefit downstream fisheries.

Fish assemblages in Naturita Creek vary throughout the watershed. Non-native salmonid species such as brown and rainbow trout occur down-steam from Miramonte Reservoir and appear to persist in limited numbers to the Forest boundary. It is likely that many salmonid species spill over the dam at Miramonte Reservoir and colonize this section of stream despite marginal summer rearing habitat. Species such as speckled dace and mottled sculpin have also been observed in this reach (CDOW 1977b).

Below the Forest boundary water temperatures and fish habitat conditions favor warm-water species. Flannelmouth and bluehead suckers, roundtail chub, and speckled dace comprise 92% of the estimated biomass in this reach (CDOW 1977b). Though these species are more commonly located in larger river systems, they can persist in smaller tributaries such as Naturita Creek. Limited numbers of rainbow trout have been

observed in this stream. However, favorable fish habitat and water temperatures conditions are limited for trout species, likely supporting only seasonal use for MIS such as rainbow and brown trout.

Colorado Division of Wildlife (CDOW 1977b) and the Bureau of Land Management (BLM 1981) have completed qualitative stream and riparian assessments to determine the game fishery potential and stream and riparian health of Naturita Creek (Table 3.10). Results from each survey indicate that habitat for trout species is likely limited throughout Naturita Creek. Summer water temperatures exceeding 65°F, higher suspended sediment loads, and low summer water flows are characteristic of streams in arid portions of Colorado such as the Naturita area, and are limiting factors for trout production during the summer months. Beaver dams provide some of the best rearing habitat for trout species below Miramonte Reservoir, and likely help sustain existing trout populations through the winter months.

Table 3.10: **Summary Of Observations Of Stream And Riparian Conditions From CDOW And BLM Surveys Of Naturita Creek.**

Survey Observations	CDOW (1977)	BLM (1981)
Survey Date	October 25, 1977	July 27 to Aug 20, 1981
Survey Objective	Species Composition/Game Fish Potential	Stream and Riparian Condition
Survey Section	Mouth to confluence with West and East Naturita Creek.	Mouth to USFS/BLM boundary.
Sample Scheme	Intermittent	Intermittent
Wetted Width (ft)	6-10 feet	6-8 feet
Flow (cfs)	0.28 near mouth of Naturita Creek. 0.75 at confluence w/ East and West Naturita Creek	N/A
Temperature (° F)	56° F near mouth of Naturita Creek. 45° F at confluence w/ East and West Naturita Creek.	82° F near Naturita. 61° F near USFS/BLM boundary.
Water Quality	Not summarized	Excellent near USFS/BLM boundary. Poor near mouth of Naturita Creek.
Bank Degradation	30%	20-40%
Erosion Rates	High	N/A
Fine Sediment	Excessive	> 26%
Pool Area (as % of total habitat)	N/A	43%
Pool Depth	N/A	Average: 1.5 feet Range: 0.75 to 5 feet
Anthropogenic Impacts Observed	Water Depletion	Water Depletion, Garbage, Potenial Fish Barriers
Riparian Condition	N/A	Rated “Poor” below Redvale Rated “Good” above Redvale
Aquatic Vegetation	Filamentous Algae: Common Watercress: Yes	
Beaver Dams	Numerous	N/A
Game Fishery Value	Poor	N/A

Fish habitat instead favors native omnivores such as suckers, chub, and dace. These species favor warm water temperatures, and can generally tolerate higher levels of suspended sediment and dissolved solids, characteristic of lower elevation streams along the Colorado Plateau (USGS 1997). Preferred spawning and rearing temperatures for these species generally occur between 68-75°F (NMDGF 1995), which

is within the range of water temperature regimes observed in Naturita Creek. Pool depths are good and appear to provide good rearing habitat, despite high levels of fine sediments observed. The abundance of aquatic plants, algae, and insects provide a diverse source of food for these species. However, limited flows likely cause competition between species, which may account for the higher biomass in flannelmouth and bluehead suckers.

Non-native fish introduction, stream channelization, dam construction, and water depletion have been documented as the largest threats to the long-term persistence of native omnivores throughout the Colorado River basin (Bezzerides and Bestgen 2000, MDGF 1995, Bestgen and Propst 1989). Declines in roundtail chub populations have been observed in Arizona, New Mexico, and Colorado (NMDGF 2000, Woodling 1985). Non-native species such as brown trout likely prey on juvenile longnose and bluehead suckers and roundtail chub in portions of Naturita Creek, and may out-complete adult fish for limited rearing space. Excessive water depletion near the mouth of Naturita Creek may be a limiting factor for fish production in the lower reach, and may be the reason why no were collected in 225 feet of stream below Maverick Draw (CDOW 1977).

Direct/indirect/cumulative effects of no action, proposed action, and alternatives:

Alternative 1: No Action

Direct and Indirect Effects: This alternative would have no direct effect to fish or fish habitat since all streams within the analysis area do not contain fish. No indirect effects would occur from this alternative since no ground disturbing activities would occur.

Cumulative Effects: Cumulative effects from post-fire recovery are expected to occur until vegetation re-establishes to minimize surface erosion. Surface erosion and delivery to stream is likely to be substantial in the first year following intense fires, but should decline rapidly after the second year following the re-establishment of ground cover and shrubs (Robichaud and Brown 1999). Fine sediment delivery to McKee, Callahan, Mud Springs was observed three months after the Burn Canyon fire, and was attributed to surface erosion. However, excessive fine sediment delivery could not be visually detected in Naturita Creek below the Burn Canyon fire, and therefore, did not appear to be impacting the fisheries. Other cumulative actions such as roller chopping and post-fire rehabilitation are not likely to effect downstream fisheries.

Potential increases in peak and base flows are likely to occur as a result of the Burn Canyon fire. This may result in short-term increases in nutrient loads to downstream fisheries, and could result in short-term increases in base flows during the summer (Hicks et al 1991). This could provide short-term benefits to downstream fisheries by increasing food production, and may temporary increase available habitat for MIS and native fish species. However, increases in the severity of peak flows may cause

additional bank damage in Naturita Creek as stream channels adjust to the altered flow regime.

The suspension of the existing livestock grazing permit for two years should allow fire-damaged areas to maximize growth and recovery of riparian plant species, important to the maintenance and recovery of stream channels.

Impacts to native fish fauna from the introduction of non-native fish and downstream water depletion would continue, and would remain as the greatest risks to native fish fauna in Naturita Creek.

Alternative 2: Proposed Action

Direct Effects: This alternative would have no direct effect to fish or fish habitat since all streams within the analysis area do not contain fish.

Indirect Effects: Indirect effects to downstream fisheries below the Burn Canyon assessment area resulting from the implementation of the Proposed Action are not expected to alter fish habitat for native fish species and MIS due to the harvest design, actions taken to reduce erosion, and the proximity of fish-bearing streams to the disturbance source. Fine sediment delivery from post-fire timber harvest and commercial thinning is expected to be insignificant primarily due to location of units in relation to steep soils. Because harvest systems in moderately and severely burned areas are limited to slopes less than 15%, delivery of fine sediment to streams should be minimized, and the risk of fish habitat degradation would be low. Additionally, logging slash and culled tree material left on site, and spread on skid trails, should minimize soil movement and sediment delivery to streams adjacent or below proposed harvest sites. Implementation of streamside management zones to buffer the effects of ground disturbing activities, and other erosion control measures should continue to reduce potential sediment delivery to streams.

Approximately four miles of intermittent stream occurs between tributaries adjacent or below the analysis area and Naturita Creek. The potential sediment delivery to Naturita Creek from the implementation of post fire salvage, commercial thinning, and road decommission is expected to be an insignificant source of sediment, and would not alter fish habitat and fish life history patterns for MIS and native fish species above impacts associated with the fire.

Cumulative Effects: Cumulative effects to downstream fisheries as a result of the implementation of the Proposed Action would be the same as in Alternative 1, except that a slight increase in sediment being delivered downstream could occur. However, sediment delivered to Naturita Creek is expected to be an insignificant source of sediment, and would not alter fish habitat and fish life history patterns for MIS and native fish species above impacts associated with the fire, and other cumulative actions.

Alternative 3.

Direct Effects: This alternative would have no direct effect to fish or fish habitat since all streams within the analysis area do not contain fish.

Indirect Effects: Indirect effects for Alternative 3 would be slightly less than those in the Proposed Action. Sediment delivery from harvest units is expected to be slightly less since ground disturbance associated with commercial thinning would not occur. Harvest restrictions on erosive soils, designated streamside management areas, and erosion control measures would still occur. These actions would minimize sediment delivery to streams, and keep the risk of downstream fish habitat degradation low. Downstream effects to fish habitat and fish life history patterns for MIS and native fish species in Naturita Creek from potential sediment delivery associated with post-fire salvage are expected to be insignificant.

Cumulative Effects: Cumulative effects associated with the implementation of Alternative 3 would be slightly less than the Proposed Action, and slightly more than Alternative 1. Sediment delivered to Naturita Creek is expected to be an insignificant source of sediment, and would not alter fish habitat and fish life history patterns for MIS and native fish species above impacts associated with the fire, and other cumulative actions.

Fisheries/Bucktail

Affected Environment/Cumulative Actions Considered:

The Bucktail assessment area lies entirely with the Big Bucktail Creek subwatershed. Big Bucktail Creek is 8.7 miles long, and is characterized as a steep, intermittent stream. Fish do not occur within the assessment area, and have not been observed in Big Bucktail Creek (CDOW 1977; J. Ferguson pers. comm.) CDOW (1977a) determined that this stream has no fishery value and cited intermittent flows and steep streambed gradient as limiting factors for fish production.

Cumulative actions considered in this analysis have been identified in Chapter 2 of this document. Cumulative effects have been confined to the Big Bucktail Creek watershed, and would include effects over a 5-year time period. Aquatic MIS species do not occur with the project or cumulative effects analysis area.

Beschta et al (1995) suggests that existing conditions should not be used as “baseline” or “desired” conditions upon which to base management objectives. Activities to minimize the effects of the Bucktail fire on riparian and downstream fisheries have occurred consistent with LRMP general direction for Management Prescription 9A. Post-fire activities to reduce erosion and increase plant growth have been implemented following the fire. The Proposed Action and Alternative 3 have been designed to minimize soil disturbance and allow for watershed recovery. Streamside management zones have been proposed to protect intermittent stream channels and riparian areas from disturbance. Implementation of this actions indicate that the USFS is not

considering the current condition as baseline, and have taken steps to improve riparian and stream channel conditions, and to minimize effects of post-fire activities on the recovery of Big Bucktail Creek watershed. These actions would all benefit downstream fisheries.

Direct/Indirect/Cumulative Effects of No Action, Proposed Action, and Alternatives:

Alternative 1: No Action

Direct and Indirect Effects:This alternative would have no direct effect to fish or fish habitat since all streams within the analysis area do not contain fish. No indirect effects would occur from this alternative since no ground disturbing activities would occur.

Cumulative Effects:

This action would have no cumulative effects to fish or fish habitat since fish do not reside in the entire 8.7 miles of Big Bucktail Creek.

Alternative 2: Proposed Action

Direct Effects:

This alternative would have no direct effect to fish or fish habitat since all streams within the analysis area do not contain fish.

Indirect Effects:

No indirect effects would occur from this alternative since fish do not occur with entire 8.7 miles of Big Bucktail Creek.

Cumulative Effects:

This action would have no cumulative effects to fish or fish habitat since fish do not reside in entire 8.7 miles of Big Bucktail Creek.

Alternative 3:

Direct Effects:

This alternative would have no direct effect to fish or fish habitat since all streams within the analysis area do not contain fish.

Indirect Effects:

No indirect effects would occur from this alternative since fish do not occur with entire 8.7 miles of Big Bucktail Creek.

Cumulative Effects:

This action would have no cumulative effects to fish or fish habitat since fish do not reside in entire 8.7 miles of Big Bucktail Creek.

Wildlife/Burn Canyon

As previously described in this EA, the Burn Canyon fire had a significant effect on the existing vegetation types and associated wildlife habitats. Before the fire, the Burn Canyon area was dominated by forested vegetation. On the National Forest portion of the fire, mature ponderosa pine forest and mature to late-seral pinyon/juniper woodland comprised 50 and 33 percent respectively of the total area. The fire in much of the burn area occurred as a stand replacement fire, consuming 57% of the ponderosa pine forest and 97% of the P/J woodland on the Forest. Similar effects resulted on the adjacent BLM and private lands, primarily in the P/J type. This event has significantly changed the pre-burn environment and essentially converted most of the 31,000 acres burned from mature to late-seral forest habitat to an early-seral non-forested condition.

Most of the remaining ponderosa pine forest type is located outside the burn area within the remainder of the “Naturita Division” of the Forest Ecologically, the Naturita Division contains an “island” of ponderosa pine forest that is geographically separated from other ponderosa forests on the Uncompahgre Plateau and San Juan National Forest. Prior to the Burn Canyon fire, the Naturita Division contained approximately 15,300 acres of ponderosa pine. The Burn Canyon fire impacted 4,576 acres (approximately 30%) of all the ponderosa pine within this section of the Forest. In this context, the Burn Canyon fire had a significant effect on ponderosa pine habitat and associated wildlife species existing on this landscape, especially west of Naturita Canyon.

The extensive loss of mature ponderosa pine forest within the burn area has eliminated habitat for species such as the Abert squirrel, Merriams turkey, and flammulated owl. It has also significantly altered forest cover for elk and deer. The limited live tree patches remaining within the burn area are essential for cover and nesting sites for wildlife west of Naturita Canyon.

The Burn Canyon fire is located within a transition area of winter range and summer range for elk and mule deer. The loss of cover has reduced habitat effectiveness during the summer and fall, and greatly increased the vulnerability of elk and deer to harvest during the hunting seasons. The retention of cover and effective implementation of the travel management plan are key elements in maintaining habitat capability for big game. This portion of the Forest has limited water sources in the summer. The proposed action includes the reconstruction of two guzzlers that were damaged in the fire to provide water for wildlife. The guzzlers are located on dry ridgelines. The protection of two springs through fencing is also included as a potential project to provide a water source and habitat for wildlife within the burn area. Both springs are located within McKee Draw.

Fire effects to winter range are anticipated to be highly beneficial in the long-term. The seeding projects implemented on exposed ridges and south-facing slopes in the upper elevations, and on lower elevation P/J woodlands are designed to enhance forage production and availability. The Burn Canyon fire is expected to have a significant effect on the distribution of wintering big game animals. Habitat conditions will favor use by both elk and deer in this area, and it is likely that it will become a major winter concentration area within the San Miguel River basin. The Forest Service travel plan includes a seasonal area closure to all motorized vehicles within the Naturita Division, including the burn area, to protect wintering big game.

Due to past timber and fire management practices and public firewood harvest, the presence of snags and down log habitat structure is limiting throughout the ponderosa pine forest type. The Burn Canyon fire has significantly changed this situation for species dependent upon these features. The abundance of dead trees is anticipated to greatly increase the presence of primary and secondary cavity nesting species.

The Gunnison sage grouse occupies sagebrush habitats in and around the Burn Canyon fire. Approximately 4,400 acres of occupied and suitable habitat were burned in the fire removing the sagebrush and grass cover that provide the structure for hiding and nesting cover, and forbs that are their primary food source. The proposed action includes two projects to restore and enhance habitat conditions for this federal candidate species on 700 acres of National Forest lands affected by the fire. The project sites are located in upper McKee Draw and Callan Draw near the Greager Flats. A combination of mechanical treatments and seeding of native plant species would be utilized to restore habitat conditions to contribute to the conservation and recovery of this species.

The cumulative effects analysis area includes all lands within the perimeter of the Burn Canyon fire, and USFS lands within the boundaries of the Naturita Division of the Norwood Ranger District. Cumulative Actions Considered:

1. Past timber management activities described in vegetation section.

2. Livestock grazing practices prior to the fire. Planned rest following the fire.

3. The Burn Canyon fire event, including effects to other vegetation types.

4. Post-fire BAER projects implemented or scheduled on BLM, USFS, and private lands.

5. Current travel management and habitat effectiveness.

Direct/Indirect/Cumulative Effects of No Action, Proposed Action and Alternatives

Existing Condition

Much of the effects to wildlife are the result of the Burn Canyon fire event and the environmental conditions and ongoing management practices following the fire. Other actions are included in the proposed action to continue rehabilitation and restoration of the effects of the fire on various resources, but implementation would be subject to future funding.

During the Burn Canyon fire, emergency consultation was conducted with the US Fish and Wildlife Service to assess impacts to federally listed species from fire suppression activities and emergency rehab on BLM and USFS lands. This is a normal and required process that federal agencies follow during major wildfires. As a result of this consultation, it was determined that the potential species affected include the Gunnison sage grouse and Yellow-billed Cuckoo (federal candidates), Bald Eagle (listed as threatened), Colorado River Fishes (4 endangered species), Southwestern Willow Flycatcher (endangered), and the Mexican spotted owl (listed as threatened). The remaining species currently listed by the USFWS were entirely unaffected.

Emergency consultation provided guidelines to avoid impacts to these species during fire suppression. All guidelines were able to be implemented, and the fire suppression activities resulted in no effect to T&E species.

However, the actual fire did have an impact on habitat for the Gunnison sage grouse. As previously described, about 4,400 acres of occupied and suitable Gunnison sage grouse habitat were adversely affected by the fire. Emergency consultation resulted in recommendations for habitat restoration and improvement during post-fire rehab and restoration on the affected public and private lands to avoid long-term adverse impacts. These recommendations are optional for private landowners, but some affected landowners adopted the recommendations and received assistance through the Natural Resources Conservation Service to implement the recommendations. All recommendations were included in BLM post-fire rehab and restoration efforts. The USFS identified actions necessary to implement the USFWS recommendations during post-fire restoration, and has requested funding to implement those projects. At this point in time the USFS has not indicated there is funding available through the National Fire Plan so these projects are included in this proposed action for possible implementation through KV or other funding sources.

During the Burn Canyon fire, a similar assessment was conducted by BLM and USFS biologists to determine the impacts to sensitive species and management indicator species (MIS) from the fire and fire suppression activities. All sensitive species listed by the BLM and USFS were considered in this assessment, as well as all MIS identified in the GMUG Forest Plan (the BLM does not manage public lands under the MIS concept). The assessment determined that fire suppression activities had no impact to

any sensitive or MIS species. However, the fire impacted habitat for the Abert squirrel, Lewis' woodpecker, flammulated owl, and Pygmy nuthatch in the ponderosa pine zone. Their habitat (mature ponderosa pine forest) was "virtually destroyed, and it will not be feasible or possible to restore it quickly. Only time will replace it provided the natural course of plant succession is allowed to occur" (BLM V-249, July 2002).

Elk and mule deer are MIS that were also affected by the fire. Affects are described in the cumulative effects section. Plant species mixes were specifically designed to enhance forage capacity for big game and utilized during BAER. The Burn Canyon fire is anticipated to have a significant effect upon big game distribution.

The "Beschta et al Report" makes a number of observations and recommendations for ecological recovery following a wildfire. In relation to wildlife and biodiversity, the report suggests that species are adapted to the natural patterns and processes influenced by wildfire. Recovery in the landscape and preventing additional human disturbance is the best path to ecological recovery. However, as described in the Fire Ecology section of this EA, the Burn Canyon fire burned with unnatural intensity and affected a much larger area than normally expected.

No Action Alternative

Under the No Action Alternative, salvage logging and reforestation would not occur in the ponderosa pine type. As previously described, the Burn Canyon fire has resulted in a long-term, extensive loss of ponderosa pine habitat which has resulted in a significant reduction in habitat capability for species associated with that habitat. As described in the cumulative effects section, remaining habitat for these species occurs primarily outside the burn area, and is disconnected from any similar habitat within the landscape. Live trees remaining within the burn are essential cover and nesting sites for wildlife. Under this alternative, all live trees would be retained within the burn area. This would follow the Post-fire Management Principles included in the Beschta et al Report.

No salvage would also result in retention of all standing dead trees and down logs within the burn area. This would prevent any loss of habitat for cavity-nesting species and the loss of structural and functional importance of large woody debris (Beschta et al). Based on monitoring other fires on the Uncompahgre Forest, most of the standing dead ponderosa pine trees will begin to deteriorate within three years of the fire. Deterioration occurs as a result of insect and fungal activity. The softer, larger trees will begin to fall over, and within 5 to 10 years, most of the larger standing dead trees will be down. Other Forest Service research (RMRS-RP-11) indicates that species such as the black-backed woodpecker will flourish in response to the abundant snags and available insects following the fire, then decline in numbers as site conditions change. Species such as the Lewis' woodpecker, are likely to respond to conditions after 3 to 5 years as the snags decay and the stand density decreases.

No reforestation would occur under this alternative. Shrubs, grasses, and forbs would continue recolonization of the burned area, but the re-establishment of ponderosa pine

would occur very slowly. Because of the large nature of the openings created by the wildfire, many areas would remain treeless for many decades. Eventually however, ponderosa pine would naturally re-establish from seed provided by adjacent stands and unburned patches of trees within the burn area.

As previously described, the Burn Canyon area is located in a transitional area between summer and winter range for big game. The fire has greatly reduced available cover and increased available forage. Under the No Action alternative, all existing cover would be retained within the burn area. BAER and other post-fire rehab projects have been designed to enhance forage conditions for big game.

This alternative includes other habitat enhancement projects and implementation of the travel management plan to restore habitat conditions and effectiveness for big game and sage grouse. Implementation would be dependent upon other activities and funding outside a timber sale.

Alternative 2

Proposed timber salvage, hazard tree removal, reforestation, and thinning/burning of residual stands of live trees within the Burn Canyon fire will have no adverse effect upon any threatened, endangered, or sensitive species or habitat. Adverse effects to habitat capability for some MIS are anticipated from the proposed thinning/burning within the burn area.

As suggested by Beschta et al, the presence of dead standing trees and down logs are important for a variety of wildlife species, especially cavity nesting birds. Timber salvage will remove a portion of the dead standing trees from about 2,016 acres of burned ponderosa pine. This affects roughly 37% of the ponderosa pine type within the burn area. The proposed action also includes the reforestation of up to 2,116 acres of burned ponderosa pine in addition to the salvage. Site preparation could be used in some or all of these acres. Site preparation may include directional falling of standing dead trees. If funded and implemented, this activity would affect an additional 38% of the ponderosa pine type within the burn area, for a cumulative effect of 4,132 acres (75% of the total).

Post-Fire Management Principles within the Beschta et al Report recommend leaving at least 50% of the standing dead trees in all size classes on site. Salvage harvest would not remove trees less than 8” dbh. Additional site preparation for planting may affect all size classes. GMUG Forest Plan standards require retention of 90-225 snags per 100 acres 10” dbh or greater. Snags can be retained as individual trees or in groups or patches. Forest Plan standards also include the retention of an average length per acre of down-dead logs which are at least 12” diameter of 50 linear feet per acre. The Forest Plan standards would exceed Beschta recommendations for small diameter trees, but could be less than recommended levels within salvage or reforestation areas depending on site conditions. Even if the Beschta recommendations are not met, the Forest Plan standards are designed to maintain population viability for species dependent upon these habitat features on the GMUG National Forest. Based on monitoring of previous

fires on the Forest, the persistence of standing dead tree and down log habitat features on the sites treated is anticipated to be 5 to 10 years.

This alternative would thin and underburn the remaining patches of live trees within the burn area. This includes 344, or 37% of the 928.7 acres left in the burn area. As previously described, the remaining patches of live trees are extremely important for cover and nest sites for wildlife. The proposed treatments would not eliminate, but would degrade habitat values for wildlife. Those values are highly significant some of the MIS described above (elk, mule deer, flammulated owl, and pygmy nuthatch). The proposed treatments would have an adverse effect upon habitat capability for these species.

Reforestation of the salvage units and possibly other acres identified would re-establish ponderosa pine tree cover in less time than under No Action. Reforestation is anticipated to re-establish some ponderosa pine cover in a matter of years rather than the many decades if not planted. This will help initiate recovery of the habitats for ponderosa pine dependent species and re-establish coniferous cover within the burn area in much less time that under the No Action alternative.

Implementation of the other wildlife habitat improvement projects and the travel management plan will have beneficial effects to wildlife as previously described. KV funding may be available to fund these projects, but if not, alternate funding sources would need to be sought.

Alternative 3

The anticipated effects of timber salvage, hazard tree removal, reforestation, and other fire rehab/restoration projects will be the same as those described in Alternative 2. Additional dead standing trees would be retained within the salvage units in excess of Forest Plan standards, utilizing the 50% retention standard suggested by Beschta et al. No detectable increase in habitat capability or population viability is expected from this change in mitigation. The proposed actions will have no effect upon any threatened, endangered, or sensitive species beyond the fire event.

The exclusion of thinning/burning of remaining patches of live trees within the burn area will prevent adverse effects to habitat capability for some MIS. As previously described, the Burn Canyon fire has caused a long-term, extensive loss of ponderosa pine habitat which has resulted in a significant reduction in habitat capability for species associated with that habitat. As described in the cumulative effects section, remaining habitat for these species occurs primarily outside the burn area. The limited live tree patches remaining within the burn area are essential for cover and nesting sites for wildlife west of Naturita Canyon. Under this alternative, all live trees would be retained within the burn area, preventing further degradation of the limited habitat available. MIS species benefited include the elk, mule deer, flammulated owl, and pygmy nuthatch.

Implementation of the other wildlife habitat improvement projects and the travel management plan will have beneficial effects to wildlife as previously described. KV

funding may be available to fund these projects, but if not, alternate funding sources would need to be sought.

Wildlife/Bucktail

As previously described in this EA, the Bucktail fire burned primarily through mature stands of pinyon and juniper woodland, and had much less of an impact to ponderosa pine forest than the Burn Canyon fire. 42%, or 959 acres of the Bucktail fire burned in ponderosa pine. Of those 959 acres, 35%, or 336 acres, experience stand replacement fire, while the remaining area was lightly burned. The results of this fire are strongly associated with the pre-fire management history of the area. Once the fire reached the ponderosa pine stands previously treated by thinning and under burning, the fire changed from a raging crown fire to a lower intensity ground fire. The stands experiencing the stand replacement fire were within the ponderosa pine and P/J ecotone, and in draws or other areas not previously treated.

The Bucktail fire resulted in a localized and limited loss of mature ponderosa pine habitat. Much of the pre-fire habitat remains intact within and adjacent to the fire. This area of the Uncompahgre Plateau is part of a large expanse of ponderosa pine forest habitat that extends from Dallas Divide to the Campbell Creek drainage.

The fire had very limited affects to habitat capability for species associated with mature ponderosa pine. Previous management activities and habitat/species mitigations included in the design and implementation of those management activities have prevented the extensive loss of mature forest habitat while retaining habitat capabilities for MIS and other wildlife species.

The Bucktail fire is located within a transition range between big game winter range and summer range. This portion of the Uncompahgre Plateau is a significant winter concentration area for elk and mule deer. Lower elevation pinyon/juniper woodlands and the P/J ponderosa pine transition zone are primary winter range. Habitat conditions and forage capacity prior to the burn had deteriorated with advanced succession. Forage and browse production and vigor are declining due to increased brush and tree cover.

The area in and around the Bucktail fire is the focus of a variety of ongoing land treatments on USFS and BLM lands to restore winter range for big game. Approximately 610 acres of P/J habitat were severely burned in the fire. This area was seeded with a mix of desirable native forage species in January of 2003 in an effort to contribute to this ongoing habitat improvement effort. It is anticipated that the area will continue to receive high levels of winter use from big game.

The Bucktail fire had very limited effects on big game summer range. The primary effect is the loss of roadside cover in the areas that experience stand replacement. Within the lower intensity areas, roadside cover was essentially maintained. Several roads were opened during the fire but have been closed following the fire. Other closures and travel management is included in the proposed action that will further

improve habitat effectiveness. The Forest Service travel plan includes seasonal area closures to all motorized vehicles on portions of the Uncompahgre Plateau, including the burn area, to protect wintering big game.

The cumulative effects analysis area includes all lands within the perimeter of the Bucktail fire, and adjacent public lands south of Tabeguache Creek and within the Big Bucktail Creek drainage. Cumulative Actions Considered:

1. Past timber and fuels management activities described in the Fire Ecology and Vegetation sections.
2. Past vegetation projects for big game winter range improvement on adjacent USFS and BLM lands.
3. Livestock grazing practices prior to the fire, and considered after the fire.
4. The Bucktail fire event, including effects to other vegetation types.
5. Post-fire BAER projects implemented or scheduled on the fire.
6. Current travel management and habitat effectiveness.

Direct/Indirect/Cumulative Effects of No Action, Proposed Action and Alternatives

No Action

The No Action alternative includes very little active management following the Bucktail fire. Projects that are included are designed to restore or enhance pre-fire resource conditions. The effects to wildlife would be the same as those described for the Existing Condition/Cumulative Actions.

The No Action alternative would have no adverse effects upon any Threatened or Endangered, sensitive, or management indicator species beyond the fire event. During the Bucktail and 47 fire event, emergency consultation was conducted with the US Fish and Wildlife Service to assess impacts to federally listed species from fire suppression activities. This is a normal and required process that federal agencies follow during major wildfires. As a result of this consultation, it was determined that the potential species affected was limited to the Mexican spotted owl (listed as threatened). The remaining species currently listed by the USFWS were entirely unaffected.

Emergency consultation provided guidelines to avoid impacts to these species during fire suppression. All guidelines were able to be implemented, and the fire suppression activities resulted in no effect to T&E species.

USFS sensitive species and MIS associated with the proposed action within the Bucktail fire include the elk, mule deer, Abert squirrel, fringed-tailed myotis, flammulated owl, pygmy nuthatch, olive-sided flycatcher, and Lewis' woodpecker. The Merriam's turkey is also a management species of concern here.

As previously described, the Bucktail fire resulted in a localized and limited loss of mature ponderosa pine habitat. Much of the pre-fire habitat remains intact within and adjacent to the fire. This area of the Uncompahgre Plateau is part of a large expanse of ponderosa pine forest habitat that extends from Dallas Divide to the Campbell Creek drainage.

The fire had very limited affects to habitat capability for species associated with mature ponderosa pine. Previous management activities and habitat/species mitigations included in the design and implementation of those management activities have prevented the extensive loss of mature forest habitat while retaining habitat capabilities for MIS and other wildlife species. Project design and mitigations were included in the Glencoe Timber Sale and Glencoe Prescribed Burning project to maintain habitat capability and species viability. Biological Evaluations and MIS Assessments completed for the Norwood Ranger District Small Sales Program (USFS 2002) determined that there were limited impacts to individual species, but project design and mitigation measures specified would maintain population viability. The effects of the Bucktail fire did not change that determination.

Other effects to wildlife habitat capability and available habitat structure are similar to those described for Burn Canyon, except for their magnitude. Under the No Action alternative, there would be no effect to remaining live trees and associated cover within the burn area. Without timber salvage and reforestation, all available snags and down log habitat will be retained within the burn. Post-fire habitat effectiveness for big game will be improved through implementation of the travel management plan.

Alternative 2

Proposed timber salvage, reforestation, and thinning/burning of residual stands of live trees within the Bucktail fire area will have no adverse effect upon any threatened, endangered, sensitive species or management indicator species. As previously described, the Bucktail fire resulted in a limited loss of available ponderosa pine habitat. Much of the ponderosa pine habitat remains unaffected within and adjacent to the burn area. This set of proposed actions is narrow in scope and will have only localized effects to habitats and species.

The Bucktail fire demonstrated the benefits of past timber and fire management practices in the prevention of the extensive and total loss of mature ponderosa pine forest habitat compared to the Burn Canyon fire. Potential impacts were minimized by these activities. Project design and mitigation measures included in the implementation of these management practices have demonstrated that habitat capability and species viability are being maintained. The same design standards and mitigation measures are included in this proposed action to continue protection of wildlife in the area. The re-treatment of these same areas under this proposal will have negligible cumulative effects.

Prior to the burn, snags were limiting within the Glencoe Ridge area. Previous thinning and prescribed burning in the area protected the few existing snags and created

additional snags. The Bucktail fire created additional snags in the patches that were intensively burned. The removal of roadside hazard trees and some dead standing trees within the salvage units will reduce the density of available cavity nesting sites. However, snags and down logs will be retained within the salvage units according to Forest Plan standards. Although these snag densities are less than those recommended by Beschta et al in their Post-fire Management Principles, these standards are designed to maintain habitat for viable populations on the GMUG National Forests.

The road closures and travel management actions included in the proposed action will benefit elk and mule deer. Post-fire habitat effectiveness for big game will be improved through implementation of the travel management plan.

Alternative 3

Post-fire timber salvage and reforestation activities and the effects of those actions are the same as those described in Alternative 2. Under this alternative, the proposed treatments of lightly burned, live tree sections of the burn would not be conducted.

Under this alternative, there would be no adverse effect to any TES, MIS, or other species beyond the fire event. As described in Alternative 2, the Bucktail fire resulted in a limited loss of available ponderosa pine habitat. Much of the ponderosa pine habitat remains unaffected within and adjacent to the burn area. This set of proposed actions is very narrow in scope and will have only localized effects to habitats and species.

The exclusion of any treatment of the lightly burned, live tree areas will maintain the current habitat conditions and capabilities of these sites. As previously described, all of these areas were recently treated by the same methods currently proposed in this EA.

The road closures and travel management actions included in the proposed action will benefit elk and mule deer. Post-fire habitat effectiveness for big game will be improved through implementation of the travel management plan.

Road Access/Burn Canyon

Forest Service roads in the Burn Canyon area of interest are unpaved native surface, level maintenance 2 and 3 roads. The main arterial route through Burn Canyon is Forest Service Road (FSR) 608, This is a level maintenance 3 road. It is maintained to permit passenger car traffic. All other roads affected in the Burn Canyon area are maintenance level 2 roads. These are maintained to permit high clearance vehicles. During rainy or seasonal snow melt conditions travel upon these roads can become hazardous and requires four wheel drive and tire chains. Travel is best suited during dry or frozen ground conditions.

Conditions of the road network deteriorated with impacts from the watershed and erosion as a direct result of the fire. As part of Burn Area Emergency Rehabilitation

road surface and drainage structures will be restored to pre-fire conditions. Increased maintenance as compared to prior years is required due to fire caused conditions.

The NO Action Proposal has no effect on current road conditions and current travel management. The proposed action and alternatives requires minimal increase in road maintenance. No new roads will be constructed or reconstructed to support timber salvage operations. The Burn Canyon roads currently identified on the Travel Management Decision to be decommissioned. Upon completion of the salvage project, roads identified in the Travel Plan to be decommissioned would be treated to physically close the road and re-establish vegetation, as is described in the proposed action in Chapter 2.

The proposed action and alternatives requires significant increase in road maintenance of unclassified roads. No new roads will be constructed support timber salvage operations. Other existing road templates into the burn area have been decommissioned. Decommissioning treatment included scarifying the road surface and contouring ditch and drainage structures to existing terrain. These templates are no longer a system roads. The templates required reopening will be closed after completing salvage operations. This will be done in accordance with the original decommissioning treatment.

Road Access/Bucktail

Forest Service roads in the Bucktail fire area of interest are rock surface, level maintenance 3 and decommissioned native surface road templates. The main arterial route through Bucktail is Forest Service Road (FSR) 503, This is a level maintenance 3 road. It is maintained to permit passenger car traffic. Other roads are either targeted for decommission or currently physically closed.

The Delta Nucla Road FSR 503 is a rock surface highly maintained road. Effects of the Bucktail Fire had no impact. Unclassified native surface roads branch from FSR 503 into the proposed timber salvage. Unclassified road are recommended for high clearance four-wheel drive vehicles. During rainy or seasonal snow melt conditions travel upon these roads can become hazardous and requires four wheel drive and tire chains. Travel is best suited during dry or frozen ground conditions

The NO Action Proposal has no effect on current road conditions and current travel management. The proposed action and alternatives requires significant increase in road maintenance of unclassified roads. Unclassified roads that are physically closed and reopened will be re-closed upon completion of the salvage. Roads identified in the Travel Management Decision for decommission will be treated to physically close the road and re-establish vegetation. No new roads will be constructed or reconstructed to support timber salvage operations.

Visual Impacts/Burn Canyon and Bucktail

Existing Condition

The existing landscape in the Burn Canyon area is characterized as a mesa dissected by a network of prominent canyons, specifically Naturita Canyon, Mud Springs Canyon, Callan Draw and McKee Draw. A person traveling on any of the existing roads could see large burned areas with numerous blackened standing dead trees (pinyon, juniper and ponderosa pine) that have little to no understory vegetation. Interspersed throughout the area are smaller stands of live trees with varying degrees of scorching evident in both the overstory and understory vegetation.

The Bucktail Burn area can be characterized as rolling terrain that is broken up by Bucktail Canyon and its side canyons. High severity fire occurred on almost one-half of the area but was confined almost entirely to the pinyon-juniper type. Thus, a person traveling on the 25 Mesa Road (FSR 503) and secondary roads would see large expanses of blackened standing dead pinyon and juniper trees with little to no understory vegetation remaining. The fire did not burn as intensely in the ponderosa pine stands. Consequently, large stands of ponderosa pine remain intact with minimal evidence of scorching.

When discussing the visual quality of an area, Forest Service policy directs land managers to attain the highest possible visual quality commensurate with other appropriate public uses, costs, and benefits. To accomplish this, Visual Quality Objectives (VQO's) were Mapped for the entire Forest during the GMUG's forest planning process in the early 1980's.

For the Burn Canyon area the proposed treatment areas have a Visual Quality Objective of "Modification". Under this objective, management activities may visually dominate the original characteristic landscape. However, alterations of vegetation and land form must borrow from naturally established form, line, color, or texture so completely and at such a scale that visual characteristics of natural occurrences within the surrounding are or character type are retained (FSM 2382.21.4).

For the Bucktail project area there are several VQO's that overlap the proposed treatment areas. The 25 Mesa Road (FSR 503) is within a ½ mile corridor that has been designated with a VQO of "Partial Retention". An area with this VQO allows management activities that are visually evident but subordinate to the characteristic landscape when managed according to the partial retention visual quality objective (FSM 2382.21.3). The treatment areas in the extreme northwest portion of the project area have a VQO of "Modification".

Environmental Consequences

Because of the recent wildfires, the visual character of both project areas have already been highly altered. However it is important to note that the VQO's address visual

changes to the landscape that are caused by management activities, not by natural disturbances such as a wildfire. Consequently, the following discussion will focus on the incremental effects to the landscape character that would result from implementing proposed management activities in Alteratives 2 and 3.

Under the No Action Alternative (Alt. 1), the visual landscape in both project areas would change slowly over time as the area naturally revegetated. Top-killed gambel oak trees began resprouting as early as the fall of 2002. Grasses and forbs would be the next plants to pioneer the burned areas, becoming evident in the first season following the fires. In the high severity burn areas, conifers (pinyon, juniper and ponderosa pine) would take much longer to re-establish. Seedlings of these slow-growing species would become visually evident within a 2-10 year period.

Under Alternative 2, the landscape character would be changed through the proposed thinning of selected live ponderosa pine stands, salvage harvest of dead pine trees, and replanting of pine seedlings in the burned areas. All of these proposed treatments are allowable management activities within the designated VQO's for the project areas as described above. The salvage harvest is allowable under both VQO's because residual trees would be left on site, thus reducing the visual impact. For example, in addition to trees left for wildlife habitat needs, about 5 to 10 tons per acre of standing and dead/down material (6"-plus in diameter) would be left on site.

Replanting of ponderosa pine trees within the burn areas would accelerate their recovery, restoring the visual character of the landscape more quickly than in Alternative 1. Assuming the reforestation efforts are successful, a person traveling through the burn areas would see pine seedlings within the first 2 years following the fire.

The visual effects of Alternative 3 are identical to Alternative 2 except that no thinning would be done. The proposed salvage harvest and reforestation treatments are allowable management activities within the designated VQO's for the two project areas.

Heritage Resources

A heritage resource survey of the Burn Canyon and Bucktail Salvage Harvest and Reforestation on the Norwood Ranger District, Uncompahgre National Forest was conducted by the Forest Service to locate, record and evaluate the prehistoric and historic heritage resources of the area in order to comply with the National Historic Preservation Act of 1966 (as amended, 1980), the National Environmental Policy Act and Executive Order 11593.

Burn Canyon

Existing Condition: All of the accessible ponderosa pine within the proposed project area has been logged several times prior to the present laws protecting heritage resources. The first known entry was between 1917 through 1922 when JV McKeever set up at Sawmill Springs in McKee Draw. The second known entry was when Williams

sawmill located at the intersection of the Hamilton and Redvale roads. I the late 1960's small sales logging was done in portions of the project area to control a bark beetle infestation. The last known entry was during the early to mid 1970's through the early 1980's when the entire proposed project area was logged, then portions roller chopped and burned to encourage regeneration of the ponderosa pine, and to discourage oak brush growth. There is little documentation of the activities mentioned above because the activities were planned and implemented prior to the present environmental protection laws.

Heritage resource inventories of the Burn Canyon Salvage Harvest and Reforestation project area took place in the fall of, the field seasons during 1977, 1978, 1980, and during the fire suppression efforts July and August of 2002.

A total of 37 heritage resources were recorded or reevaluated within or directly adjacent to the proposed project area. Five of the resources recorded are eligible to the National Register of Historic Places and will be avoided by the proposed project activities.

Alternative 1: No Action

Direct and Indirect Effects: This alternative would have no direct or indirect effect to the heritage resources within or adjacent to the project area.

Cumulative Effects: The heritage resources are threatened by erosion until the native vegetation has reestablished itself and more woody debris is present to hold the soils in place.

The most substantial effect to heritage resources within the project area was the fire, fire suppression activities and the erosion that follows. Other cumulative effects would include activities such as increased recreation use, travel, the transportation system, logging, grazing and post-fire BAER project implementation. Due to the increased activities within the project area there is a potential that unauthorized collection/theft of surface artifacts could occur prior to the implementation of the travel plan, and there is a vegetation cover and other organic material on the soil to reduce soil exposure.

Alternative 2: Proposed Action

Direct Effects and Indirect Effects: No effects to significant heritage resources since the identified sites will be protected from the project activities.

Cumulative Effects: The heritage resources are threatened by erosion until the native vegetation has reestablished itself and more woody debris is present to hold the soils in place.

The most substantial effect to heritage resources within the project area was the fire, fire suppression activities and the erosion that follows. Other cumulative effects would include activities such as increased recreation use, travel, the transportation system, logging, grazing and post-fire BAER project implementation. Due to the increased

activities within the project area, there is a potential that unauthorized collection/theft of surface artifacts could occur prior to the implementation of the Uncompahgre Travel Plan and there is a vegetation cover and other organic material on the soil to reduce soil exposure.

Alternative 3:

Direct Effects and Indirect Effects: No effects to significant heritage resources since the identified sites will be protected from the project activities.

Cumulative Effects: Cumulative effects from the proposed action are anticipated to be the same as in the alternative 1 and 2.

Bucktail

Existing Condition:

All of the accessible ponderosa pine within the proposed project area has been logged several times prior to the present laws protecting heritage resources. The first logging entry is unknown but the presence of high stumps characteristic of cross cut saws used prior to the mid 1920's would indicate the first logging took place prior to 1920. The area was settled in the middle1890's. The last known entry was during the late 1980's and early 1990's by the Glenco and Bucktail Timber Sales. During the1990's the Forest Service conducted prescribed burning activities to reduce fuels, discourage oak brush growth and encourage ponderosa pine regeneration.

Heritage resource inventories of the Bucktail Salvage Harvest and Reforestation project area was completed by Forest Service crews during the field seasons during 1975, and 1992. No heritage resources were identified or recorded within the proposed project area.

Alternative 1: No Action

Direct and Indirect Effects: This alternative would have no direct or indirect effect to the heritage resources within or adjacent to the project area.

Cumulative Effects: This alternative would have no known cumulative effects to heritage resources within or adjacent to the project area.

Alternative 2: Proposed Action

Direct Effects and Indirect Effects: There were no heritage resources identified within the project area therefore having a no effect determination.

Cumulative Effects: The most substantial effect to heritage resources is probably the fire, suppression activities and the erosion that follows. Other cumulative effects would

include activities such as increased recreation use, travel and the transportation system, logging, grazing and post-fire BAER project implementation. No heritage resources were identified within the proposed project area therefore having a no effect determination.

Alternative 3:

Direct and Indirect Effects: There were no heritage resources identified within the project area therefore having a no effect determination.

Cumulative Effects: The most substantial effect to heritage resources is probably the fire, suppression activities and the erosion that follows. Other cumulative effects would include activities such as increased recreation use, travel and the transportation system, logging, grazing and post-fire BAER project implementation. No heritage resources were identified within the proposed project area therefore having a no effect determination.

Impacts to Recreation

Existing Condition

Recreational opportunities in the Burn Canyon and Bucktail areas are centered on the motorized user. The ROS classification for both areas is predominantly Semi-Primitve Motorized. These areas offer moderate probabilities of experiencing solitude, are predominantly naturally appearing environments, have low concentration of users but often evidence of other users, have subtle restrictions, allow motorized access and travel by non-conventional vehicles, and allow vegetative alterations that are subordinate in the landscape.

The Burn Canyon area receives light to moderate recreation throughout the year. Big game hunting is the dominant use, occurring from late August through mid-November. Off-highway vehicles use (4WD, ATV, and motorcycle) is increasing. Nonmotorized activities such as mountain biking, equestrian riding and hiking are uncommon.

Big game hunting is also the dominant recreation activity within the Bucktail area. Snowmobiling is popular on the 25 Mesa Road during heavy snow years. Snowmobilers park on this road near the Forest boundary (southwest of the project area) and proceed north to connect with routes on the Divide Road (FSR 402) and the Delta-Nucla Road (FSR 503). Hiking and mountain biking are increasing in the area. Mountain bikers occasionally ride on the Tabeguache Trail that intersects with the project area on the 25 Mesa Road in T47N R14W Sec. 4.

Standing dead trees throughout both project areas pose a safety hazard to recreationists. Ponderosa pine trees pose a greater hazard to people than pinyon or juniper trees because of their size. The bases of many trees are burned nearly through

and trees are already beginning to fall unpredictably. As fire killed trees began to fall this hazard will increase.

Environmental Consequences

Under the No Action Alternative, standing dead trees would continue to pose a serious hazard to recreationists. These trees have the potential of falling on people and vehicles, as well as blocking road and trail access. This threat is greater in the Burn Canyon area than in the Bucktail area due to the extent of the burn and the higher density of open roads.

Snowmobile access on the 25 Mesa Road (through the Bucktail project area) would not be impacted under this alternative.

Under Alternative 2, salvage logging would remove the majority of standing dead ponderosa pine trees that occur throughout the two project areas. This would significantly reduce the safety risk of trees falling on people or on vehicles. The trees that would be retained on site would continue to pose a slight risk to recreationists traveling through the areas.

Snowmobile access on the 25 Mesa Road would potentially be impacted if winter log hauling occured during the Bucktail salvage and thinning operations. Depending on who purchases the timber and what mill would be used, there would be two possible haul routes. The most likely route would be south on the 25 Mesa Road towards Nucla. The next likely route would be north on 25 Mesa Road to Columbine Pass, then north on the Delta-Nucla Road (FSR 503) to Delta.

Regardless of which route was used, snowmobile use would be impacted. Colorado state law prohibits snowmobiles to operate on plowed roads. Once a section of road was plowed, the road would be inaccessible to snowmobilers.

To reduce this potential impact the following mitigation measure would be implemented:

“No logging operations will be allowed between December 16 – April 15 of each year unless agreed to by the Forest Service. Any agreement to allow logging during this period will require the Purchaser to take special actions to reduce conflicts with snowmobiles. These actions may include appropriate signing, plowing parking areas, plowing turnouts and access points at intersections, and other measures determined to be appropriate by the Forest Service. In no case will log hauling be allowed on weekends or holidays during this period.”

Under Alternative 3, recreation impacts would be very similar to those discussed for Alternative 2. The snowmobile mitigation measure described above would be implemented under this alternative as well.

Economics/Burn Canyon and Bucktail

Affected Environment

This analysis and discussion applies to both the Burn Canyon and the Bucktail salvage proposals.

The communities of Norwood, Naturita, and Nucla provide the social and economic landscape in the vicinity of the two burns. These communities are isolated from the main population center, which is Montrose. The Norwood-Naturita-Nucla area is rural and its economy has been historically based on mining, ranching, and timber; however, social and economic changes are occurring and these industries no longer provide the economic sustenance they once did. The economy of Telluride, located about 30 miles southeast of Norwood, has shifted dramatically in the last several decades from mining to recreation and tourism. The Telluride Ski Area is a world-class year-around destination resort. With the increase in tourism has come an increase in Telluride-based employment opportunity for the residents of Norwood and, to a more limited extent, the communities of Naturita and Nucla.

Natural resource use of the two burns includes cattle grazing and occasional commercial timber harvest of trees for products such as sawlogs, posts and corral poles. Additionally, local residents use the area to gather firewood, posts, poles and other forest products.

Environmental Effects

An economic analysis was performed on the project using “Quicksilver” analysis software. The analysis includes the financial costs and monetarily valued benefits associated with each alternative. Some benefits and costs, such as those related to scenic quality, wildlife habitat, and forest health, do not have financial values and are not considered in project-level economic analysis. These non-monetarily valued attributes are discussed and analyzed in narrative form in the various resource sections of this document.

Timber payments are the only revenue considered in the analysis. Estimated payments for timber are based on prices paid for timber on the GMUG National Forests, modified for estimated specific sale conditions of hauling time, average diameter, and volume per acre. Costs were estimated for sale preparation, harvest administration, post-sale work such as regeneration surveys and roadwork. The economic analysis is summarized in Table 3.11

Table 3.11

Summary of Benefit/Cost Analysis (Discounted Values)

	Alternative 1	Alternative 2	Alternative 3
B/C Ratio	NA	0.09	0.04
Present Value of Benefits ($)	NA	$ 152,692	$ 75,943
Present Value of Costs ($)	NA	-$ 1,710,161	-$ 1,699,344
Present Net Value ($)	NA	-$ 1,557,469	-$ 1,623,401

Present net value (PNV) is the best method for comparing costs and benefits associated with alternative activities. It is a measure of the difference between discounted revenues and discounted costs. A negative PNV means that the financial values of the monetarily valued costs outweigh the value of the benefits.

As shown in Table 3.11, both action alternatives have negative PNV's, indicating a financial loss to the Government. There are neither financial costs nor benefits associated with the no-action alternative, Alternative 1. The incremental costs ($10,817) associated with Alternative 2 relative to Alternative 3 result from sale preparation and administration associated with the thinning activity. (Planting costs are the same for both alternatives; thinning does not affect the need to plant). The incremental value ($76,749) generated by Alternative 2 relative to Alternative 3 represents a return to the Government in the form of receipts from the sale of thinning timber. The value of this timber exceeds the cost of preparing and administering the sales. Consequently, the present net value of Alternative 2 is greater, although still negative, than Alternative 3. Considering the magnitude of the values, the difference between the PNV's of the two alternatives is not great.

The greatest cost source of the two action alternatives is reforestation (Table 3.12). The costs associated with planting are the same for both alternatives. Although the timber harvest value is greater in Alternative 2 because of the added thinning volume, the reforestation cost remains an order of magnitude greater than the financial return from harvest. However, as a point of perspective, if the Forest Service were to forego timber harvest but decide to plant the burns to hasten ecological recovery, the PNV of that action would be -$ 1,549,308. While this value reflects less of a loss than Alternative 2 and is financially more desirable, the magnitude of the difference between it and the PNV of Alternative 2 is very small – about one-half of one percent.

In general, the economic analysis shows only the financial tradeoffs associated with reforestation, salvage, and thinning. While the action alternatives represent a financial loss to the Government, there are non-monetary benefits to implementation of either action alternative, chief of which is the ecological value of re-establishing tree cover relatively quickly through tree planting. Also, salvage harvest and thinning would generate a net financial return relative to timber sale preparation and administration costs.

Economic analysis is one factor that must be considered in determining on a course of action. Additional non-financial considerations include potential effects on soil and on the spread of noxious weeds from timber harvest as well as the ecological benefits of re-establishing tree cover relatively rapidly through tree planting and reducing in long-term erosion from road decommissioning.

Table 3.12
Undiscounted Costs and Receipts by Category and Alternative

Category	Alternative 2	Alternative 3
Sale Preparation	$38,200	$31,200
Sale Administration	$14,560	$10,400
Reforestation	$1,914,346	$1,914,346
TOTAL COSTS	**$1,967,106**	**$1,955,946**
RECEIPTS	$159,465	$77,250

Local Economics

None of the alternatives would cause long-term change in existing human use patterns in the two burns; however, the amount of timber proposed for sale under Alternatives 2 and 3 could have short-term impacts on the local economy by providing employment. This economic impact would be confined to the few families and companies in the logging and milling occupational group rather than on entire communities. The implementation of any of the alternatives would have little effect on domestic grazing or the non-commercial harvest of other forest products in the area. Personal use fuelwood, posts, poles, and other forest products would be in extraordinary abundance for a few years before wood decay would make them no longer desirable.

Burn Canyon and Bucktail Irreversible and Irretrievable Effects

The term "irreversible commitment of resources" describes the loss of future options. It relates primarily to nonrenewable resources, such as minerals or cultural resources, or to factors such as soil productivity that are renewable only over long periods of time. For all alternatives there are no irreversible commitments of resources.

The term irretrievable applies to the loss of production, harvest, or use of natural resources because of management decisions. Under active management, irretrievable resource commitments are unavoidable, because managing resources for any given purpose necessarily precludes the opportunity to use those resources for other purposes. With the implementation of any of the alternatives, a variable portion of one primary resource (standing dead trees) would be irretrievably lost to either use as either a natural resource for the production of commercial forest products or as a component of wildlife habitat, particularly cavity dependent species.

The analysis revealed no significant irreversible or irretrievable commitment of resources associated with implementing the alternatives that are not already identified in the Forest Plan EIS.

Burn Canyon and Bucktail Prime Farmland, Rangeland, and Forestland

Adverse effects on prime farmland, rangeland, and forestland not already identified in the Forest Plan EIS are not expected from implementing the alternatives. There are no prime farmlands within the project area.

Burn Canyon and Bucktail Floodplains and Wetlands

The proposed alternatives would have no impact on floodplains or wetlands as described in Executive Orders 11988 and 11990.

Burn Canyon and Bucktail Environmental Justice

With the implementation of any of the alternatives, there would be no disproportionately high adverse human health or environmental effects on minority or low income populations. The actions would occur in a remote area and nearby communities would mainly be affected by economic impacts as related to timber harvest or contractors implementing reforestation activities.

Burn Canyon and Bucktail Consumers, Civil Rights, Minority Groups, and Women

The proposed alternatives would not adversely affect consumers, civil rights, minority groups, or women. Timber sale and other contract provisions include non-discrimination requirements.

The proposed alternatives would not have a disproportionately high or adverse human health affect on any identifiable low-income or minority population.

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