Chapter 3

Affected Environment and Environmental Consequences

3.1 Introduction

This chapter describes the present conditions of the environment in and around the Million Fire Salvage Timber Sale Analysis Area. This chapter also discloses the probable consequences (impacts and effects) of implementing each Alternative presented in Chapter 2 on selected forest resources. It provides the analytical basis to compare the Alternatives. This chapter is organized by selected environmental resources. Each resource discussion addresses the following components: 1) scope of the analysis specific to each resource discussion, 2) past activities that have affected the existing condition, 3) existing condition, and finally, 4) direct, indirect, and cumulative effects.

This analysis considered available research and literature on post-fire salvage. This included the Beschta report (Beschta et.al.1995), Everett et al. (1995), McIver and Starr (2000), and others. See Section 3.5, Soil Health for literature citations.

The McIver and Starr literature review is a collection of 21 post-fire studies. It represents the most comprehensive source of literature available related to the effects of post-fire salvage logging. This review suggests that land managers implement adaptive management (active management) to allow the assessment of ecological and economic trade-offs. Important post-fire salvage information can be gathered through monitoring and research to assist with land management decisions. The proposed Million Fire salvage project would provide land managers and others the opportunity to study the effects of post-fire harvesting. Also, regional and local environmental groups have expressed interest in conducting monitoring projects to assess the effects of post-fire logging.

The review lists sixteen conclusions based on current research, and acknowledges that scientific research is limited. Some of the conclusions relating to this EA are summarized in Table 3.1-1.

Table 3.1-1. McIver and Starr (2000) conclusions applicable to the Million Salvage EA.

McIver and Starr Conclusions[a]	**Million Fire Proposed Action**
1. Post-fire logging associated with road building, ground based logging systems, or steep slopes can acerbate erosion (Campbell 1977, and others).	No road building. No steep slopes. Ground based systems will be mitigated.
3. Ground-based skidding causes the greatest immediate soil effect (Klock 1975).	Soil compaction and impacts will be mitigated through skid trail spacing, subsoiling and seeding, or winter operations. See 3.5 Soil Health.
4. Proper rehabilitation techniques may be capable of mitigating soil loss (Simon 1994, and others).	Logging slash, waterbars, seeding and subsoiler will assist with reducing soil loss.

Table 3.1-1 Continued

McIver and Starr Conclusions[a]	Million Fire Proposed Action
6. If post-fire logging is undertaken after establishment of new seedlings, significant mortality of these seedlings can occur (Roy 1956).	See 3.4 Salvage/Silviculture and 3.6 Vegetation. Aspen is expected to regenerate within the harvest units. Tree planting of conifers will be implemented if necessary.
8. By creating patches of disturbed soil, post-fire logging can encourage establishment of an array of plant species (including non-natives) (Greenberg 1994b, Sexton 1994, and others).	Noxious weed encroachment will be mitigated. See Chapter 2, 2.5.8.
10. Post-fire logging can reduce vegetation biomass, increase grass cover, reduce overall plant species richness and increase conifer growth in the first years after logging (Sexton 1994).	These are acceptable effects. See 3.5 Soil Health and 3.6 Vegetation.
11. Post-fire logging normally removes a great percentage of large, dead woody structure and thus can significantly change post-fire habitat for wildlife (Blake 1982, Saab and Dudley 1998, Sallabanks and McIver 1998).	See 3.17 Wildlife Resources.
13. Post-fire logging can cause significant changes in abundance and nest density of cavity nesting birds (Caton 1996, and others)	See 3.17 Wildlife Resources.
14. To maintain healthy metapopulations of wildlife species over the landscape, post-fire landscapes should be managed with great care. (Caton 1996, and others)	See 3.17 Wildlife Resources.
15. In general, post-logging enhances habitat for some wildlife species, and diminishes it for others…. (Blake 1982, and others).	See 3.17 Wildlife Resources.
16. No studies have looked at how post-fire logging alters the size distribution of fuel and the concomitant changes in future fire risk (Brown 1980).	Short-term fuel loads may increase, but intermediate to long-term fire risk could be reduced.

[a]See McIver - Starr (2000) for complete literature review and citations.

3.2 General Description of the Analysis Area

The Million Fire salvage project Analysis Area is located in the south San Juan Mountains of south-central Colorado. It is located approximately four miles southeast of South Fork, Colorado as displayed in Chapter 1, Section 1.4. The Million Fire salvage project Analysis Area contains 9,891 acres and includes two sixth-level watersheds (#130100011503 and #130100011505). See map 3 in the Map Section. The size of the Analysis Area does not vary by Alternative. However, the size of the area analyzed may vary depending on the resource.

3.3 Terms Used in the Analysis

A list of terms and definitions used in the analysis is located in Appendix 1 of this EA.

3.4 Salvage / Silviculture

Scope of the Analysis

The Analysis Area is located within two watershed areas, #130100011505 and #130100011503 and includes 9,891 acres. See Map 3 in the Map Section. The Million Fire started on June 19, 2002 and burned 9,222 acres. The recent harvest history of the Million Fire Salvage area will be discussed as well as potential future conditions as impacted by the various action alternatives.

This section discusses the timber resource and silvicultural systems associated with the past actions that have affected the existing condition as well as those associated with the proposed actions and the alternatives to the proposed action. Alternative 2 proposes to harvest 623 acres and Alternative 3 would harvest 560 acres. These harvest or salvage areas are identified as "harvest units" or "project area" in this document. Since a stand replacement fire has impacted approximately 95% of the project area, silvicultural systems would concentrate on salvage and reforestation opportunities.

Past Actions that have Affected the Existing Conditions

Past actions include past timber sales, including the Wolf Mountain Timber Sale, Shaw Mesa Timber Sale, Sierra Timber Sale, and various other small timber sales, which harvested approximately 1,792 acres within the 9,891 acre Analysis Area (approximately 6,415 acres of the Analysis Area is located on National Forest Lands).

The earliest timber harvest activities occurred in the project area in the late 1800's and early 1900's when the lower elevation timber (ponderosa pine and Douglas-fir) was heavily cut for railroad ties and mine props. Harvest activities since that time have included selective cutting on a smaller scale, with some small aspen patch cuts for wildlife habitat.

Table 3.4-1 shows harvest activities that occurred in the past (from about 1972 to the present) within the Analysis Area. The majority of the proposed harvest units had been partially harvested in the past, and include shelterwood prep cut, shelterwood seed cut and patch clearcut. See Map 3 - Past Harvest, in the Map Section.

Table 3.4-1. Historic harvest activities within the Analysis Area.

Past Harvest Activity	Acres
Patch Clearcut[a]	40
Shelterwood Prep Cut	1,422
Shelterwood Seed Cut	54
Overstory Removal	15
Group Selection Cut	86
Commercial Thinning	3
Sanitation/Salvage	152
Total	**1,792**

[a]*The patch clearcuts varied in size from approximately 2 acres to 19 acres.*

Existing Conditions

The Million Fire burned 9, 222 acres (7,856 acres on the Rio Grande National Forest and approximately 1,366 acres on private land) during the summer of 2002. The majority

of the proposed harvest units were severely burned during the fire, resulting in total crown scorching. It is estimated that approximately 95% of the trees within the harvest areas proposed for harvest in Alternatives 2 and 3 were killed. Some fire killed trees in the proposed harvest units showed significant bole checking three to four months after the fire. To reduce economic loss of merchantable timber, it is important to harvest fire-killed trees as soon as possible.

The current structure of stands within the Analysis Area is primarily mixed-conifer in the northern part and Engelmann spruce in the southern edge of the Analysis Area (higher elevations). See Map 6 in the Map Section. The project area in Alternative 2 (before the fire) consists of Douglas-fir (43%), white fir (26%), ponderosa pine (1%), and quaking aspen (9%), with trace amounts of Engelmann spruce, limber pine, and blue spruce. The average age of these stands is 120 to 160 years. The average basal area for trees 5 inches and greater is 100 to 160 and the average quadratic mean diameter is approximately 10 inches DBH. These stands have an average volume per acre of 7,000 board feet.

In the project area, some aspen regeneration has been observed since the fire. It is expected that conifer regeneration will be delayed due to lack of seed sources. However, conifer regeneration should gradually encroach from the edges of the burned area. If not, tree planting may be necessary.

Within the 623-acre project or salvage area, approximately 10 acres is meadow and 15 acres are roaded. Additionally, firewood gathering has taken place along FDR 345 during the last twenty years.

GIS and Inventory Analysis

The USDA Forest Service maintains a data set called the Common Vegetation Unit and Resource Inventory System, which contains information about stands found on Forest Service managed lands. A "stand" is the basic unit of analysis for managers. Stands are delineated either from aerial photographs or from ground-based surveys and are an attempt to distinguish one aggregation of vegetation from the next. Differentiation of stands can be based on species mix, age class, or densities of vegetation. The identified stands can vary greatly in size, from just a few acres to several thousand acres. Stands are then categorized using a systematic procedure. This analysis used the best information available. The analysis area was evaluated in the field by resource specialists.

Timber stand information has been obtained from both remote sensing and field measurements.

Site Visits

During late summer, fall, and winter of 2002, Forest Service specialists visited the Analysis Area. The road system was analyzed for maintenance needs. Proposed harvest units were reconnoitered and boundaries were identified with flagging. Mapping of the proposed harvest units included the use of GPS (Global Positioning System) and GIS (Global Information System) mapping programs.

Direct and Indirect Effects

Alternative 1 -- No Action: This alternative would not remove any dead or damaged trees from the Million Fire Salvage Area. Under this alternative, the economic value of the fire-damaged trees would not be realized. Also, slash from logging operations would not be available to reduce soil erosion. This alternative would present an opportunity to

monitor the effect of no action. Also, limited fuel wood gathering by the public and commercial interests may continue in the area. The "No Action" alternative would not meet the stated purpose and need for the proposed action.

Alternative 2 -- Salvage Harvest (Proposed Action): This alternative would include the salvage of trees killed by the Million Fire. Live trees would not be harvested unless successful bark beetle attacks are found in trees within the project area. Incidental amounts of green trees will be harvested in skid trails and landings. If bark beetle infestations are identified adjacent to the project area, further analysis will be necessary to address possible management needs. Tree marking guidelines will follow the general guidelines in Table 3.4-2. Post fire survivability is dependent on the extent of damage to the crown, stem, and root system (Denitto, et al., 2000). Additionally, the amount of damage individual trees can sustain is dependent on the characteristics of the particular species (root depth, needle length, bark thickness), and size (diameter and height). In general, mortality can be predicted as a function of crown scorch and bark thickness. Mortality increases with percentage of crown scorch and decreases as bark thickness increases. Exceptions would include tree species with thin bark (i.e., Engelmann spruce and subalpine fir), where mortality will not vary by diameter. It should be noted that mortality may not occur for several years after the fire event.

Table 3.4-2 displays the extent of damage that major tree species in the analysis area can sustain before mortality can be expected (Flannagan, 1996). Note that these are general guidelines for a tree of "average" size and that larger trees may be able to recover from a greater amount of damage. Conversely, smaller trees may succumb to a lesser amount of damage. Ponderosa pine retaining 10 to 20 percent of its live crown will most likely survive and will not be harvested.

Table 3.4-2 Fire Damage/Mortality Relationship

Species	% of Crown Scorch	% of Cambium Damage	Root Damage
Ponderosa Pine*	>60-65	40-60	Deep, Extensive
Douglas fir	>55-60	30-50	Deep to Shallow, Extensive
White fir	>55-60	25-40	Deep to Shallow, Extensive
Subalpine fir	>55-60	25-40	Shallow,Extensive
Engelmann spruce	>55-60	25-40	Shallow,Extensive
Aspen	Any	Any	Any, Shallow

Slash will be lopped and scattered to provide shade and microclimates for plant growth, and to assist with reducing soil erosion. Aspen is expected to naturally reforest some of the project area. Reforestation exams will be conducted post-harvesting to monitor regeneration. Some sections of the project area may require tree planting to meet NFMA (National Forest Management Act) regulations. Harvest activities, particularly skidding, may impact the regeneration of aspen and other plant species. These impacts are expected to be minimal. Damaged aspen is expected to regenerate vigorously, even after multiple impacts.

Trees greater than 10" diameter breast height (DBH) would be harvested. Trees 5" to 10" DBH may be removed (optional removal). Snags would be identified on the ground and retained to meet or exceed Forest Plan Standards and Guidelines.

Alternative 3 -- Slope Limitation: This alternative would have the same harvest unit boundaries as Alternative 2, with the exception of excluding harvest activities on slopes greater than 30% (see Map 5 in the Map Section). Direct and indirect effects should be similar to Alternative 2, except that more standing trees would remain on slopes exceeding 30%. Of the 623 acres proposed for harvest as described in Alternative 2, approximately 63 acres with slopes greater than 30% would be excluded from harvest in this alternative. Harvesting guidelines will be the same as Alternative 2.

Cumulative Effects

Since 95% of all trees in the project area have been killed, the harvested areas would not be re-entered for harvesting or commercial thinning for approximately 100 years, depending on reforestation success.

After harvest activities, it is expected that aspen would reforest much of the burned area. Aspen has sprouted in some areas of the proposed harvest units already. Salvage activities, including felling and skidding, may damage some aspen sprouts, but impacts should be minimal. It is expected that the aspen sprouts damaged by harvest activities would re-sprout.

A proposed "small sale" (75 acres) to salvage fire-killed aspen is located between FDR 345 and FDR 340 near proposed unit D. Since approximately 99% of the trees planned for harvest have been killed, the cumulative effects on the timber resource would be minimal.

Summary

Implementation of the proposed action would reduce the amount of heavy fuels on the forest floor, provide forest products to the public, and leave logging slash on the forest floor to help reduce soil erosion. Some shading of the forest floor from the standing boles would be lost, but aspen and certain grass and brush species would not be adversely affected, and may even benefit from more sunlight reaching the forest floor. Also, bole removal prevents drip erosion at the base of fire-killed trees.

In review, there are both positive and negative perceived and realized effects of post-fire logging on ecological and socio-economic values. The proposed harvest units of the Million Fire Salvage Sale will affect less than 8% of the total burned area of the Million Fire. Through mitigation (see Chapter 2) and adaptive management, it is expected that the effects of post-fire salvage on the project area will be minimal.

Literature Cited

Dennito, G., B. Cramer, K. Gibson, Blockmann, T. McConnell, L. Stipe, N. Sturdevant, and J. Taylor. 2000. Survivability and Deterioration of Fire Injured Trees in the Northern Rocky Mountains. A review of the Literature. USDA Forest Service, Northern Region Report 2000-13. Forest Health Protection, Missoula Field Office.

Flannagan, P. 1996. Survival of fire injured conifers. Fire Management Notes, Volume 56: No. 2, 1996.

3.5 Soil Health

Scope of the Analysis

This analysis area is defined by the proposed management treatments (Alternatives 2 and 3). Soil health was identified as a key issue in 1.7.

This soils section and analysis is tiered to the Rio Grande Land and Resource Management Plan and Final Impact Statement as amended, 1996. The Plan and FEIS should be referenced for further information regarding soil health, down woody debris, fine slash, suitable lands, and soil quality monitoring.

In recent years, there has been much discussion and debate about post-fire salvage logging. Beschta et al. (1995) (hereafter referred to as the Beschta report) summarized post-fire logging recommendations that include soils issues. They present citations and commentaries that express concerns about soil compaction and erosion, loss of large woody debris, severely burned areas, steep slopes, ground-based logging, hydrologic soil functions, post-fire treatments and roads. All of these concerns will be addressed in this environmental analysis.

In response to the Beschta report, Everett et al. (1995) presented findings on behalf of a team of Forest Service specialists. Their report acknowledged that the Beschta report raised many important issues and presented many sound principles in common with recent Forest Service reports and other reports. However, Everett was critical of the report in that it contained statements that were unsubstantiated. However, they also state the authors refer to only a very limited selection of available research, and that in spite of acknowledging the complexity and diversity of ecosystems, the Beschta report tends to promote that blanket prescriptions are appropriate.

In response to the Beschta-Everett exchange, the Pacific Northwest Research Station conducted a post-fire logging literature review and annotated bibliography (McIver and Starr 2000). This comprehensive review presents the current knowledge on the subject of post-fire logging and environmental effects and will be used as the foundation for the review of literature presented here.

The primary concerns in post-fire areas are soil erosion, runoff and sedimentation. There have been a number of studies that address these concerns. The extent to which logging exacerbates soils in post-fire logging will depend on site characteristics, site preparation, logging method, and whether new roads are necessary (McIver and Starr, 2000).

Site characteristics will affect soil erosion. Research shows that the steeper the slope, the greater the potential for erosion (Potts et al. 1985), (Chou 1994a, 1994b). The Water Erosion Prediction Program (Elliot 2003) also validates this relationship. Site preparation such as tillage for planting can affect sediment transport (Walsh et al. 1995).

Logging methods and the amount of logging residue left on a site can affect erosion. As with live tree logging operations, ground-based logging can cause soil disturbance in the post-fire environment (McIver and Starr 1998). Although ground-logging systems may disrupt water-repellant layers and decrease overland flow, in most cases managers have sought to limit such ground disturbance in post-fire stands.

Roads and road building are the biggest erosion contributors, just as they are in green timber sales. Swank (1989) and others estimate that while erosion owing to timber harvest was 7 times that of undisturbed areas, erosion rates on landings and roads were 100 times those of undisturbed areas. Roads are not being proposed in this analysis, but old landings would be used.

Logging has the potential to compact soils in post fire logging just as in live tree logging. Designating skid trails with spacing of 100 feet or more would result in 11 percent of the area compacted (Garland 1997). Operating on dry soils, on snow pack or frozen soil conditions can greatly reduce compaction. The use of a Winged Subsoiler (a farm implement device that performs deep soil tillage can reduce soil compaction) has resulted in improved infiltration, reduced compaction, and restored site productivity in a number of post-logging treatments. Carr (1989) reported that soil tillage of skid trails with the Winged Subsoiler reduced soil density and achieved a better separation of soil than conventional ripper teeth. In Oregon, a comparison was made between a slash piled area that was subsoiled and an untreated area. They found that there was no significant difference between the subsoiled plots and the untreated areas. In other words, subsoiling had restored the site to a productive capacity (BLM 1988). A study in California showed that Winged Subsoilers were able to effectively till dense soils and there was a significant reduction in bulk density (compaction) (Cafferatta 1991).

There is little published research regarding the effects of logging residue on post-fire and post-logging erosion. In general, the greater the amount of effective ground cover (created by branches and limbs and coarse woody debris), the greater the reduction in erosion. The Watershed Erosion Prediction Program (WEPP) which shows reduced erosion with increasing surface cover validates this. Shakesby (1996) and others show that Eucalyptus logging litter reduced soil loss in post-fire watersheds by up to 95%.

There are some indications that logging after fires may break up water-repellant layers, thereby improving infiltration and reducing runoff and erosion (McIver 1998), (Hughes 2003, personal communication).

After wildfire, nutrient status of a site should be evaluated. There are two distinctions in evaluating nutrients. One is total site nutrients compared to soil-borne nutrients. The other is total nutrients compared to available nutrients. When large amounts of woody vegetation burn, there is usually a loss of nutrients through volatilization, fly ash, and overland flow. Some nutrients remain on site. For example, nitrogen losses increase with increasing fire intensity (Binkley 1996). In any event, the site budget of nutrients has been decreased, but the soil reservoir of nutrients may remain unchanged (Owensby and Wyrill 1973).

Wildfire often makes nutrients available for plant uptake. Nitrogen contained in leaf litter may be made available for plant usage and uptake since it is no longer bound in an organic structure like pine needles. So, while a fire may reduce the total amount of nitrogen, there is increased availability for plant uptake.

Nature has mechanisms to restore site nutrients lost to periodic wildfire. The three mechanisms include: weathering of soil minerals, atmospheric inputs, and biological fixation. Many plants form symbiotic relationships with mycorrhizae fungi and take nitrogen out of the air and integrate it into plant growth, thereby increasing overall site nitrogen. Bacteria fixation also occurs in rotting wood. With each rainfall, a certain amount of nitrogen and sulfur are added to the soil. Lightning can also fix nitrogen into the soil system. Weathering of nutrients from geologic materials is a slow process but provides important elements like potassium. Artificial measures to restore sites can include fertilization or adding organic soil amendments, to improve total and available nutrient status.

The Rio Grande Land and Resource Management Plan (referred to as the LMP or Forest Plan) and Final Environmental Impact Statement (FEIS) describe the effects of wildfire and fire management on soils (FEIS-3-290 through 291). The LMP (or Forest

Plan) contains standards and guidelines that must be followed to protect the long-term soil productivity. The LMP and FEIS discuss the subject of "soil health" which is a comprehensive approach to protecting soil productivity on the Rio Grande Forest (FEIS-3-280). A primary desired condition of the LMP states "Soils are maintained or improved to healthy conditions so that the ecosystems they support can flourish. Healthy soils and ecosystem sustainability will be assured if soil damages such as erosion, displacement, compaction, scorching, and nutrient drains are kept within allowable limits." It is the Forest's goal to achieve the desired conditions described in the LMP.

The standards and guidelines contained in the LMP are also described in the Watershed Conservation Practices Handbook (Region 2 Amendment No: 2509.25-2001-1). Those standards and guidelines will be implemented in this proposed salvage project. In addition, the Soil Management Handbook, (FSH 2509.18-91-1 and R2 Supplement No 2509.18-92-1) defines soil protection standards and policies, defines soil impacts by activity area, and describes appropriate soil sampling techniques.

The R2 Supplement No 2509.18-92-1 clearly explains a situation where a soil standard has been exceeded in the past. The Policy Section describes that "Where excessive soil impacts already exist from prior activity, the emphasis shall be on preventing any additional detrimental impact, and on reclamation where feasible." The policy described above allows for entry into areas previously impacted, such as by wildfire or prior impacts, so long as there is no additional impact.

The following standards are taken from the SMH, Region 2 Supplement and are also contained in the Forest Plan and WCP Handbook.

Standard: No more than 15 percent of an activity area will be left in a detrimentally compacted, displaced, puddled, severely burned, and/or eroded condition. This does not include the permanent transportation system.

Standard: Effective Ground Cover. Table 3.5-1 displays the required minimum percent effective groundcover for the first and second year after disturbance under high erosion hazards such as the Million Fire. (source: SMH R2 Supplement No 2509.18-92-1)

Table 3.5-1. Required minimum percent effective groundcover for the first and second year after disturbance.

Erosion Hazard Class	1st Year (%)	2nd Year (%)
High	30	50

Standard: Maintain or improve long-term levels of organic matter and nutrients on all lands.

To accomplish this, on soils with topsoil thinner than 1 inch, topsoil organic matter less than 2%, or effective rooting depth less than 15 inches, retain 90% or more of the fine (less than 3 inches DBH) logging slash in the stand after each clearcut and seed-tree harvest, and retain 50% or more of such slash in the stand after each shelterwood and group-selection harvest, considering existing and projected levels of fine slash.

The existing condition of the soils in the analysis area is one where organic litter and down woody debris has been burned off. In addition, salvage logging is similar to a clearcut, and therefore we need to assure that 90% of the fine slash remains dispersed in the stand after harvest to meet this standard. This fine slash has multiple benefits in that

nutrients are placed in a manner that favors decomposition, erosion is reduced due to dispersal of raindrop impacts, and the slash provides a physical barrier to soil movement. The projected level of slash accumulation is not that excessive since many branches have been burned off the trees. We estimate that slash will add about 20% surface cover to the soil.

Existing Condition

The main soil type that will be affected by the proposed timber harvest is Soil Map Unit 166, Seitz Cobbly Loam, 15 to 60 percent slopes. Table 3.5-2 shows some soil interpretations for this unit taken from the Draft "Soil Resource and Ecological Inventory of Rio Grande National Forest-West Part, 1996" or from information within the Rio Grande LMP.

Table 3.5-2. Soil Interpretations for Map Unit 166 (Seitz Cobbly Loam, 15-60% slopes)

Soil Interpretation	Rating and Explanation
Surface Texture	Cobbly loam
Tentatively Suitable Timber Lands Rating	Tentatively Suitable as determined in the Forest Plan as Amended. This means that this soil type could be managed for timber production without irreversible damages to the soil resource. If soils could not withstand the criteria, they were removed from the suitable land base during Forest Planning process.
Erosion Hazard Rating	This soil is rated high. This does not preclude management activities, but suggests that appropriate mitigation must be implemented to keep erosion in check
Mass Movement Potential	Very Low. This means that there are very low probabilities of the Map Unit having mass movement indicators.
Site Index	50 to 60. This means the site is capable of producing a tree 50 to 60 feet tall in 100 years. This is about average for the Forest.
Limitations for Total Tree Harvest	Severe due to thin surface layer. This is a nutrient rating and means that branches and limbs need to be left within the forested stands. It does allow the bole of the tree, which contains few nutrients, to be removed.
Reforestation Potential	Good. This means that the soils have a good growth medium, soils are very deep and well drained and are very capable of being reforested through planting or natural reforestation.
Coarse Woody Debris Minimum from Revised Forest Plan	5 to 10 tons per acre for this forested site. This factor is important for nutrient cycling, providing microsites for soil microbes and fauna, as well as habitat for insects and macro-fauna.
Revegetation Potential	Good. This means that broadcast seeding would have good success at becoming established.

Table 3.5-2 shows that soils in the proposed harvest area are tentatively suitable for timber harvest, have low mass movement potential, and have good reforestation and revegetation potentials. The soils have been rated as having "high erosion hazard" which was an average rating based on an average slope for the map unit. High erosion hazard does not preclude management, but suggests that mitigation be developed to address soil

erosion concerns. Coarse woody debris and total tree harvest ratings are primarily soil health issues relating to nutrients and nutrient cycling. The total tree harvest rating means that fine slash, such as branches, need to be retained; scattered within the stand so that natural decomposition can occur and that these nutrients would not be lost from the site. Coarse woody debris for Douglas-fir and white fir stands means that at least the minimum retention should be achieved here so that large woody debris can promote soil and site health by the many functions it provides. Please see Forest Plan FEIS, 3-286 to 3-289 for a discussion and analysis of nutrients and coarse woody debris.

The soils of the proposed project were moderately to hotly burned during the wildfire. The loam surface texture became moderate to strongly water-repellant to at least ½ inch in depth. This reduces infiltration and increases runoff. Because of the burn intensity, there was complete ignition of the duff litter layer and most coarse woody debris. The effective ground cover went from 100% in an unburned forest to an estimated 10% after the wildfire. The soils are exposed to raindrop impact and the forces of erosion would occur even without timber salvage operations.

The current soil condition exceeds soil quality standards as a result of the fire. This is due to the exposure of the loam and cobbly loam soils to sheet and rill erosion. Though more difficult to assess, there would likely be pockets of severely-burned soils, as well as a few areas having compaction from two track roads. The detrimental soil erosion concerns are estimated to cover about 90 percent of the soil surface. Severely burned soils are estimated at about 5% and are co-incident with the 90 percent in the project area. This is based on visible rilling and sheet erosion due to the wildfire. It is also based on a limited number of transects that have been done to determine percent surface cover. Pre-existing compaction is estimated to account for 1 to 2 percent based on visual traverses throughout the sale area and is generally coincident with the erosion 90 percent. Since wildfire has set back plant succession, the burned condition of the soil is considered as baseline for the analysis.

The Million Fire has caused a net reduction in total site nutrients. Nutrients are lost via volatilization, through fly ash, or through overland flow. However, the soil reservoir of nutrients may remain unchanged. Some nutrients that were unavailable may also be converted to a form that is available for plant uptake, like nitrogen. During post-fire BAER (Burned Area Emergency Rehabilitation) implementation and surveys, the profusion of vibrant green aspen shoots seems to validate that even though the total budget has been reduced, the soil still contains adequate reserves to begin the new stage of early succession.

Direct and Indirect Effects

Alternative 1--No Action: This alternative would not provide logging slash to the forest floor to assist with reducing soil erosion. The soils would erode at high rates until natural plant succession can reduce soil losses over time.

Alternatives 2 and 3--Action Alternatives: Both alternatives would provide logging slash to the salvage area to help reduce soil erosion. There would be an increase in effective ground cover from logging slash which would physically reduce the amount of erosion from an area. Tables 3.5-3 and 3.5-4 provide erosion data to compare alternatives.

As mentioned previously in this section, The R2 Supplement No 2509.18-92-1 clearly explains a situation where a soil standard has been exceeded in the past. The Policy Section describes that "Where excessive soil impacts already exist from prior activity, the emphasis shall be on preventing any additional detrimental impact, and on reclamation where feasible." The policy described above allows for entry into areas previously impacted, such as by wildfire or prior existing impacts, so long as there is no additional impact. There are two approaches that will be used to reduce soil impacts. This first approach is to design important features into the proposed project so that impacts are reduced. The second is to mitigate both during and after implementation, so that any soil impacts are restored to favorable conditions.

The proposed sale was designed to be on slopes less than 40 percent. In addition, the proposed salvage sales were planned near existing roads to minimize cumulative effects from a new road system. The Forest Soil Scientist spent numerous days on the fire as a member of the Burned Area Emergency Rehabilitation Team (BAER Team), and subsequently as the Implementation Team leader. During sale design, the Soil Scientist also was on site to determine where the steepest slopes were and helped develop an alternative that eliminated steeper slopes in the proposed area. During those site visits, important soil features were observed and measured such as average percent effective ground cover, soil textures, hyrophobicity tests, steepness of slope, amount of coarse woody debris and soil structure. In addition, any pre-existing cumulative effects were noted, such as two-track roads, skid trails or trail impacts.

The primary soil health concerns in post-fire salvage harvest are erosion, compaction, severely burned conditions, and nutrients. Each of these soil impacts will be analyzed relative to the alternatives. The effects of mitigation measures will be addressed.

In evaluating soil erosion, there are three conditions to consider. The first is the unlogged baseline condition, where erosion occurs as a result of the expected rainfall patterns for that area. There is no or little ground cover to break raindrop impact or slow erosion. Activity erosion is the erosion from heavy equipment operation and occurs during the two weeks where logging is actively occurring on a given acre. A third kind of erosion is that estimated as post wildfire and post logging erosion. Activity erosion may or may not occur depending on environmental conditions at the time of logging. For example, if soils are dry and there is no runoff or rainfall, then activity erosion is negligible. If logging occurs on frozen soil or snow pack, little erosion would result. At the same time of logging, tree limbs are being added to the soil surface to reduce erosion potential. If rainfall events occur during logging, equipment operation would generate some erosion but this erosion could be offset by the addition of limbs to the soil surface. If conditions become wet, logging operations are temporarily terminated until the soils can dry out. In any event, activity erosion could occur during logging operations.

Immediately after logging operations are completed, a reduction in erosion is expected from baseline conditions. This is due to the addition of slash to the soil surface, which will aid in reducing erosion levels. This is the post wildfire-post logging erosion. The erosion that is captured by slash is shown in the photo of cutting unit C, which was done in the summer of 2003 in the Million wildfire area (but not included in this salvage proposal)

Table 3.5-3. WEPP Estimates for the Million Fire Salvage Alternatives

Alternatives	Year 1.5 Erosion Tons/Acre	Total Erosion for 30 Year Period Tons/Acre	Probability of Runoff First Year	Probability of Erosion First Year
Alternative 1: No Action: Unlogged Baseline Condition…erosion occurs from the burned soils				
Slopes 20-30%	2.04	13.4	97%	93%
Slopes 30-40%	2.70	18.78	97%	93%
Alternative 2: Proposed Action…Do Conventional Logging on slopes up to 40% …Activity Erosion Rate				
20-30% slopes	2.04	13.4	97%	93%
30-40% slopes	2.70	18.7	97%	93%
Post wildfire-post logging rate				
20-30% slopes	0.89	10.98	93%	87%
30-40% slopes	1.31	14.18	93%	90%
Alternative 3: Slope Limitations where operations are Limited to Less than 30%				
Activity Erosion	2.04	13.4	97%	93%
Post wildfire-post logging Rate	0.89	10.98	93%	87%

To evaluate erosion levels associated with the proposed action, the Water Erosion Prediction Program (WEPP) was used to estimate relative amounts of erosion. The

estimates in Table 3.5-3 are only relative and should not be viewed as absolute levels of erosion and runoff.

The estimates from the WEPP model are based on certain assumptions. We used the soil texture from the Draft "Soil Resource and Ecological Inventory of Rio Grande National Forest-West Part, 1996", which is consistent with field checks for texture throughout the project area. The WEPP model we used is from the Forest Service website and is the most current version of the model (Elliot 2003, personal communication). Weather data was obtained from a climate station on the Forest at an elevation comparable to the Million Fire Area.

In modeling the hotly burned timber salvage project area, we estimated 90 percent bare soil and 10 percent effective ground cover. This is based on numerous field reconnaissance trips that were conducted during BAER and subsequent trips. It is estimated that logging debris will add an additional 20% effective ground cover, making a total of 30% upon completion of the logging.

The results of the WEPP modeling show that without any salvage logging, erosion rates would be high and the probabilities of runoff and erosion are 97 and 93 percent, respectively. It also becomes evident that erosion rates increases with increasing slopes.

When logging is in progress, there may be an increase in erosion from short-term disturbances. This increase may be offset by logging debris on the site that would reduce erosion by some degree. The amount of activity erosion is estimated to be similar to the unlogged baseline rate as shown in the Table. This activity erosion may or may not occur, depending on site conditions during logging activities.

If we examine the erosion rates over a 30 year recovery period, it becomes evident that the logging debris reduced erosion by 2.42 to 4.6 tons per acre, which is about 18 to 24 percent lower than the baseline erosion condition depending on slope class. The reason is that logging debris (branches and limbs which must remain in the stand) would increase effective ground cover and reduce erosion. While intuitively we would expect logging debris to reduce erosion, the WEPP outputs have $\pm$ 50% variability and thus there may be no difference in erosion rates before or after logging. The model also shows probabilities of erosion are reduced from 93 to 87 percent from before and after logging.

The WEPP Estimates also show that erosion rates are comparable between the two alternatives. Be aware, this is not the same as erosion amounts. It just shows that erosion rates are similar because the assumptions used in the analysis are similar. Total erosion is discussed later in this section and there are differences between alternatives in the amount of erosion post wildfire and post logging.

Water-repellancy, may be reduced by logging action, but there is no research which validates this assumption. When we review the original premise of the Soil Management Handbook, (Where excessive soil impacts already exist from prior activity, the emphasis shall be on preventing any additional detrimental impact, and on reclamation where feasible), the erosion model suggests that long-term erosion may be the same or lower in the logged area vs. the unlogged area. In either event, soil erosion would be no greater than that of unlogged areas. By adding slash to the surface and subsoiling compaction, the project should show a net improvement in soil conditions.

Logging the post-fire stands would also move the soil closer to achieving surface cover standards. For the high erosion category, 30 percent effective ground cover is desired in the first year following disturbances. By the second year, 50 percent is desired and the emergence of native seeds and plants should move the soil into a more protected status.

Compaction would occur to a limited extent, but through careful design and mitigation, would be kept to less than 15 percent of the activity area. This is accomplished by designating skid trails, and requiring winching into those skid trails. The trails may be no closer than 100 feet apart, which will keep the extent of compaction impacts to about 12 percent or less. Mitigation requires that logging operations cease when the plastic limit of soil moisture is reached. This helps prevent compaction. If logging is done on frozen soil or packed snow conditions, no soil compaction is expected.

When logging operations are complete, mitigation would include that skid trails be subsoiled with the Winged Subsoiler where necessary (on areas not logged in winter) and/or the installation of waterbars. The skid trails would then be seeded with a native mix of seeds and mulched to further reduce soil erosion. These actions would restore soil health, improve infiltration, and reduce erosion from the skid trails. With the careful design of the project and mitigation, the Forest can keep compaction impacts to no higher than existing current levels. This meets the original premise of the Soil Management Handbook.

Severely burned soils are defined *as where most woody debris and the entire forest floor is consumed down to bare mineral soil. Soil may have turned red due to extreme heat. Also, fine roots and organic matter are charred in the upper one-half inch of mineral soil (*R2 Supplement No 2509.18-92-1, with clarification letter issued July 15, 2003). It is estimated that severely burned soil areas account for approximately 5% of the project area and are coincident with detrimental erosion areas. Severely burned soil is not the same as “severe burn” or ‘high intensity burn”. A high intensity or severe burn may consume most of the fuels, but the soil is not necessarily severely burned. The best mitigation for severely burned areas is to establish vegetation and protect the soil from excessive erosion. This can be accomplished with post-logging mitigation measures for subsoiling, revegetation prescriptions, and restoring surface organic matter for nutrients as well as surface cover.

Nutrient levels on the fire are lower from a total nutrient perspective, but may be the same within the soil. The wildfire also may have made certain nutrient elements more available for plant uptake. The vigorous rich-green response of aspen in this burned area seems to attest to the fact that some increase in nitrogen availability has occurred as a result of the fire. While the wildfire has reduced the total amount of nutrients, the Forest will assist in rebuilding the amount by keeping important organic matter on site. Branches, limbs, and coarse woody debris will be added to the soil surface and will ultimately be incorporated into the soil. Atmospheric inputs will occur slowly over time to improve the site’s nutrient budget. Planting nitrogen-fixing plants as part of revegetation efforts will add nitrogen from the atmosphere into the soil system, improving the site over time. The removal of the boles of the trees should have little consequence since very few nutrients are contained in the bole relative to branches, limbs and leaves. Some fertilization would also be done to improve site nutrient conditions. Overall, the site would be left in an improved condition over baseline erosion conditions and would not further add to existing soil impacts left by the fire.

Cumulative Effects

Alternative 1--No Action: Table 3.5-4 estimates that more erosion would occur in the proposed project area if the No Action Alternative is implemented.

Alternatives 2 and 3—Action Alternatives: Table 3.5-4 estimates that Alternatives 2 and 3 would reduce the total amount of erosion in the project area. The difference between the total amount of erosion produced by Alternatives 2 and 3 is minimal.

Table 3.5-4 is built from the WEPP erosion predictions and then extrapolated to the entire 6th-level watershed. It shows the cumulative effects of erosion within the fire perimeter in the context of sixth-level watersheds.

Total erosion for a 3-year period can show relative differences between alternatives and shows cumulative effects.

Table 3.5-4. Erosion estimates by Million Salvage Alternative

Factor	Alternative 1	Alternative 2	Alternative 3
Total Burn Acres in W Shaw and E Trib. Willow Watersheds	2313	2313	2313
Moderate and High Intensity Burned Acres	2164	2164	2164
Light Burned Acres	149	149	149
Total Acres Logged Including Small Sale Unit C	75	698	635
Estimated 3 year Total Erosion (tons) from Logged Portion <30% slope >30% Slopes	 149 0	 1263 204	 1263 0
Estimated 3 Year Total Erosion (tons) from Unlogged Portions	9525	6684	7109
Watersheds Estimated Total Erosion in tons Occurring Within 3 Year Period	9674	8152	8372
Percent Difference In Total Erosion over No Action	0%	-16%	-13%

Table 3.5-4 illustrates the difference in total erosion between Action Alternatives and the "No Action" Alternative. The modeling was based on WEPP erosion rates. It assumes the majority of erosion emanating from the burn will be from moderate and severely burned areas. These areas will take about three years to begin to heal via natural vegetation and accumulation of leaf litter. Beyond three years, erosion rates per year are expected to decrease dramatically. Erosion from slightly burned and unburned areas is considered low because such areas retain most of the litter that protects soils from erosion.

The percent difference in total erosion over "No Action" shows that overall there would be less erosion with Alternatives 2 and 3 compared to Alternative 1. This is because logging would add considerable branches and limbs to the soil surface, all of which reduces erosion from a site. Under Alternative 1, trees essentially remain standing. It may be many years before they fall to the ground and provide surface cover and erosion protection. In those years before they do, and before natural reforestation and revegetation occur, erosion rates are high.

The policy section from the Soil Management Handbook describes, "Where excessive soil impacts already exist from prior activity, the emphasis shall be on preventing any additional detrimental impact, and on reclamation where feasible." Based on the soil erosion analysis, the action alternatives would likely reduce erosion from the burned area and meet the intent of this policy.

The BAER treatments that were implemented during the 2002 field season would not be affected by the proposed salvage harvest. The BAER treatments were essentially in the west part of the burned area, and there is no salvage harvest proposed on top of BAER investments.

The BARA (Burned Area Rapid Assessment) treatments implemented in the field season of 2003 will have little overlap with the proposed salvage sale areas. Both BAER and BARA treatments would have positive benefits to soil health.

There are some segments of fireline that would be treated in the BARA projects. These activities may include subsoiling, seeding and mulching and other conservation measures.

Table 3.5-4 references Unit C. Unit C is being implemented under a "Small Sale" Contract, and is not part of the proposed actions being considered in this analysis. In regard to cumulative effects however, Unit C must be included.

Log hauling impacts should be minimal to soil resources. Dust abatement is expected to prevent fine soil materials from being displaced.

Livestock grazing on rangelands would be precluded for the next two growing seasons. This would allow vegetation and litter levels to improve. Generally, there is little erosion coming off the rangelands since they burned under slight severity and their recovery began as soon as the fire passed. It is expected that grasslands in these watersheds will green-up considerably in the next two growing seasons.

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3.6 Vegetation

Scope of the Analysis

This analysis discusses cover types and plant associations. Two sixth-level watersheds define the Analysis Area for this discussion. A map of the watersheds is displayed in Section 3.9, Watershed Resources.

Past Activities that have Affected the Existing Condition

There have been previous activities in this Analysis Area. See Section 3.4 Salvage/Silviculture for information concerning past activities.

Existing Condition

Presently, moderate to severely burned mixed-conifer forest dominates the Project Area. Tables 3.6-1 and 3.6-2 show the cover types in the Project Area and the Analysis Area prior to the Million Fire.

Table 3.6-1. Cover types and their extent as percent of the Project Area

Cover Type	Percent of Project Area
Grasslands	1%
Quaking Aspen	14%
Douglas-fir/White Fir	85%
Total	100.0%[a]

[a] Percentages are approximate.

Table 3.6-2. Cover types and their extent as a percent of the Analysis Area

Cover Type	Percent of Analysis Area
Grasslands	29%
Rock	1%
Quaking Aspen	1%
Douglas-fir/White Fir	35%
Spruce/Fir	34%
Total	100.0% [a]

[a] Percentages are approximate.

Early succession plant and tree species have been located sporadically across the project area. Vegetation concentrations seem to depend on burn severity, soil conditions, root health and survival, and available seed sources. It is believed that the drought has possibly limited the growth of early succession species in the burn. Oregon grape

(*Mahonia repens*) and rose (*Rosa woodsii*) have been identified, along with forb and grass species. In areas that had light fuel loading, some grass and brush species, such as Arizona fescue (*Festuca arizonica*), common juniper (*Juniperus comunis*), mountain mahogany (*Cercocarpus montanus*), etc. have survived and are showing growth this spring. Also, aspen sprouts have been seen throughout the project area.

Since cover types can change over time, a description of Landtype associations (LTA's) provides valuable insight to the long-term, stable expression of vegetation on landscapes. The LTA's for the Million Salvage Area are shown in Table 3.6-3.

The dominant LTA found within the Analysis Area is White fir/Douglas-fir on Mountain Slopes. Table 3.6-3 provides a breakdown of the dominant LTA's in the Analysis Area.

Direct, Indirect, and Cumulative Effects

Table 3.6-3. Dominant LTA's and their extent as a percent of the entire Analysis Area.

Landtype (LTA) Association	**Percent of Analysis Area**
Engelmann spruce (*Picea engelmannii*) on mountain slopes	29%
Thurber fescue (*Festuca thurberi*) on mountain slopes	7%
Ponderosa pine/Douglas-fir on mountain slopes (*Pinus ponderosa/Psuedotsuga menzesii*)	11%
White fir/Douglas-fir on mountain slopes (*Abies concolor/Psuedotsuga menzesii*)	42%
Pinyon pine (*Pinus edulis*)	10%
Western wheatgrass *(Pascopyrum smithii)* and other low elevational grasses	1%

Alternative 1 -- No Action: There would be no new human activity proposed in the area. No wood products, except possibly firewood, would be harvested in the proposed sale areas. It would be expected that standing dead trees would fall, thereby opening the forest canopy and eventually increasing the down woody debris on the forest floor. Plant communities would be expected to recover naturally, although some severely burned areas may take a hundred years or more to regenerate.

Alternative 2 -- Salvage Harvest: Harvesting trees will reduce canopy cover and may create some ground disturbance. Since this is a fire salvage sale and approximately 95% of the live trees have been killed within the project area, there is no or little effect on live trees. There may be some potential impact on vegetation reestablishment It is expected that post-fire salvage logging could reduce vegetation biomass in the first two years after logging (McIver and Starr 2000). Also, plant species diversity and growth could slightly decrease after post-fire salvage (McIver and Starr 2000). Post-salvage mitigation, including possible tree planting and seeding skid trails and landings would help alleviate vegetation concerns discussed by McIver and Starr (2000). Forest Plan Standard and

Guidelines and mitigation measures listed in Chapter 2 of this Environmental Assessment are designed to minimize ground disturbance and potential regeneration concerns. The capability of the site to regenerate tree cover should be relatively unaffected by timber harvest. There are no expected cumulative or long-term impacts on vegetation cover foreseen if the area is harvested.

Alternative 3 -- Slope Limitation: See the description for Alternative 2 since effects on vegetation would be generally similar. Volume extracted is less under this alternative than in Alternative 2, so potential effects on vegetation are expected to be less. This Alternative would decrease down woody material as compared to Alternative 2. Ground disturbance from logging operations would be slightly reduced because of less acreage harvested.

3.7 Threatened, Endangered, and Sensitive (TES) Plant Species

Scope of the Analysis

This analysis discusses plants that are considered to be Threatened, Endangered, or Forest Service designated Sensitive. The Analysis Area for this discussion is shown in Chapter 1, Section 1.4 and is defined by the area proposed for management treatment under Alternatives 2 and 3 (ie., the Project Area).

Past Activities that have Affected the Existing Condition

There have been previous activities in this Analysis Area. See 3.4, Salvage / Silviculture Section for a description of past activities.

Existing Condition

There are presently no reported records or suspected occurrences of Threatened or Endangered plants on the Rio Grande National Forest. Threatened and Endangered plants in Colorado have unique habitats or ranges that do not occur on this Forest. There are also no plants proposed for listing that occur on the Rio Grande National Forest. Therefore, no further effects analysis is conducted below.

There are nine Sensitive plants reported for the Rio Grande National Forest. However, field reconnaissance did not reveal the presence of these species within the Project Area.

Direct, Indirect, and Cumulative Effects

See the Plant Biological Evaluation prepared for this analysis in Appendix 4.
Alternative 1 -- No Action: This Alternative proposes no action. Therefore, we would not expect any direct, indirect, or cumulative impacts for any Sensitive plant species.

Alternatives 2 and 3--Action Alternatives: A search of the Project Area did not reveal any sensitive plant species and potential habitat appears to be minimal. Direct effects would be disturbance from machinery (crushing, compaction, and scrapping) on unrecorded plant populations. Indirect effects could be a change in forest canopy coverage that may or may not be detrimental to a population. Cumulative effects would be an aggregate increase in land disturbance on potential plant habitat on both Federal and private lands over time. Although these Alternatives pose some minor risk to a species' habitat, overall the risk of detrimental impact to an unrecorded population appears to be very low. See the plant Biological Assessment/Biological Evaluation (BA/BE) which discusses effects in detail (Appendix 4).

3.8 Late-Successional Forest

Scope of the Analysis

This analysis discusses late-successional forest (i.e., older forests), including old growth. Late-successional forest was defined and characterized in the Final Environmental Impact Statement for the 1996 revised Forest Plan (pages 3-139 to 3-148). Old growth is defined by Mehl (1992)[1] for the Rocky Mountain Region of the U.S. Forest Service. We chose to focus this analysis on the Project Area and not on the Analysis Area. Typically, in a proposed timber sale area (i.e. a project area), we are interested in understanding how much late-successional forest and old growth is proposed for harvest relative to the associated watershed/landscape in question (i.e., an analysis area). However, in this case there is no benefit in making that comparison spatially or quantitatively. The Million Fire killed the trees in the Project Area and therefore eliminated any late-successional forest or old growth that may have been present.

Past Activities that have Affected the Existing Condition

There has been previous timber harvesting and associated road building activities in the Project Area, as described in Sections 3.4 and 3.11.

Existing Condition

The Project Area was moderately to severely burned by the Million Fire in June 2002. Consequently, the trees in the Project Area have been severely scorched and are dead. As a result, this area presently does not contain any late-successional forest or old growth.

A spatial analysis as described in the Forest Plan (page III-14) was not conducted for this project because the area is not dominated by Engelmann spruce on Mountain Slopes Landtype Association (LTA 1). Most of the Project Area is dominated by Douglas-fir and White Fir on Mountain Slopes Landtype Association (LTA 3).

Direct, Indirect, and Cumulative Effects

Alternative 1 -- No Action: There would be no new human activity proposed in the area. Limited fuelwood gathering by the public and commercial interests may continue in the area. The Project Area is expected to regenerate primarily to aspen. This alternative would present an opportunity to monitor the effect of no action. However, selection of the "No Action" alternative would not meet the stated purpose and need for the proposed action.

Alternatives 2 and 3 -- Action Alternatives: Both of these alternatives would include the salvage of trees killed by the Million Fire. With or without timber salvage, it is expected that the Project Area will regenerate primarily to aspen. Since the harvest is almost entirely limited to salvaging dead trees (99%), there is essentially no direct, indirect, or cumulative impact on late-successional forest or on Mehl (1992) defined old growth.

[1] Mehl, Mel S. 1992. Old-Growth Descriptions for the Major Forest Cover Types in the Rocky Mountain Region. *In*: Old Growth Forests in the Southwest and Rocky Mountain Regions -- Proceedings of a Workshop, USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado, General Technical Report RM-213, June 1992.

Mitigation (see Chapter 2) should ensure that long-term soil productivity does not diminish as a result of salvage harvest (see Section 3.5 Soil Health).

3.9 Watershed Resources

This topic is divided into 4 inter-related components, as follows:

- Stream flow regime: Watershed yield, Peak flow
- Water quality
- Stream channel condition
- Cumulative watershed effects

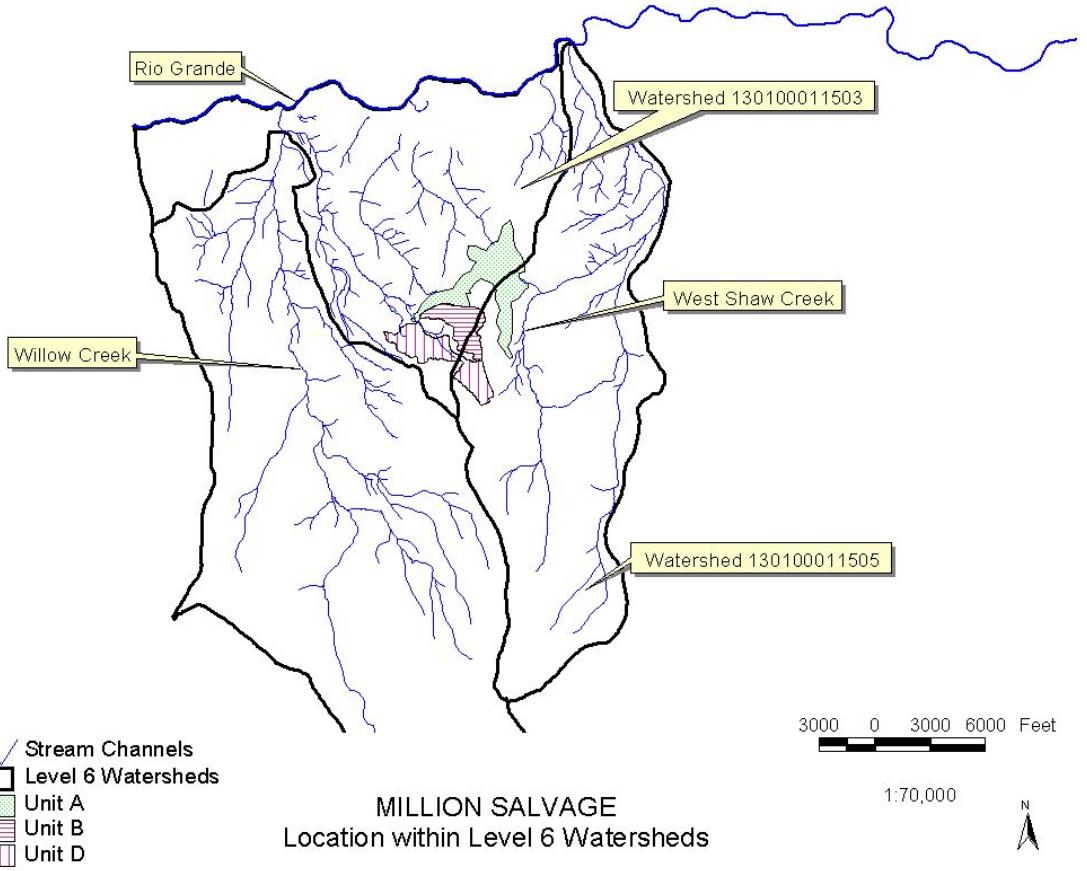
Watershed health was identified as a key issue in 1.7.

Scope of the Analysis

This analysis discusses watersheds and aquatic environments included in the Million Fire salvage project. Streams and 6th level watersheds in the Analysis Area are shown in Figure 3.9-1. All stream channels on a USGS 1:24,000 scale topographic map are included plus streams that were identified through contour crenulation.

The Analysis Area includes two sixth level watersheds: 1) #130100011503 and 2) #130100011505. Sub-watersheds in #130100011503 include a tributary to Willow Creek and several small ephemeral tributaries to the Highline Ditch. All subwatersheds of #130100011505 drain to the mouth of Shaw Creek

Figure 3.9-1. Streams and 6th-level watersheds within the Million Analysis Area



Past activities that have Affected the Existing Condition

Activities that affected the existing condition include timber harvest, livestock grazing, road construction, and recreation. Prior to the Million Fire, total watershed disturbance in the two 6th level watersheds was below Forest Plan concern levels.

Existing Conditions

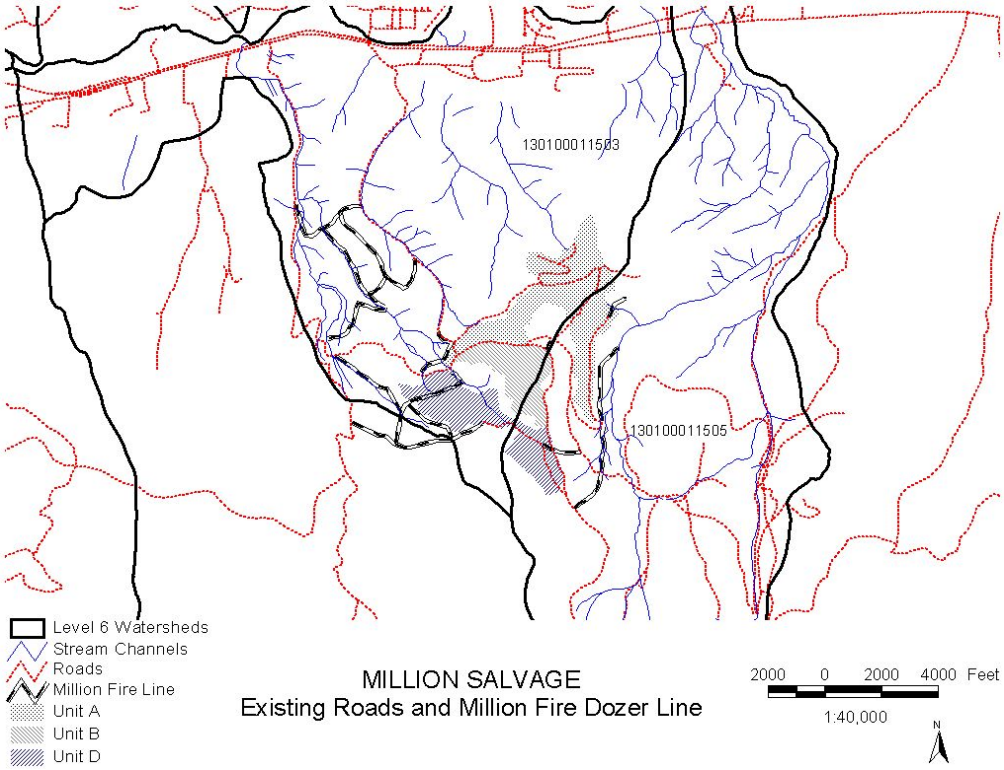
Beneficial uses for all tributaries to the Rio Grande in the vicinity of this project area have been designated by the State of Colorado and include cold-water aquatic life, primary recreation, and water supply. No violations of standards for these uses have been reported and were not identified during the last State review (2002 305(b) report). Although these uses have been designated, all streams within the project area are naturally ephemeral or intermittent and do not provide aquatic habitat or primary recreation.

The Forest does additional stream and watershed assessments to comply with the Forest Plan. Watershed condition is evaluated on the RGNF by adding up acreage of surface disturbance, according to a method described in the Forest Plan FEIS, pages 3-265

through 3-269. As part of the 1996 Forest Plan Revision, watershed disturbances were tabulated. Roads are included in this analysis and neither the total accumulation of road surface in the watershed nor the portion of road surface in the water influence zone, caused major impacts to hydrology or water quality in the past.

Roads in the Analysis Area are shown in Figure 3.9-2, including Million Fire containment line constructed by bulldozers. This dozer fireline is now present along the Willow Creek ephemeral tributary and several other areas in watershed #130100011503 (These areas were reseeded immediately after the fire). This activity caused approximately 15 acres of additional road disturbance in this watershed and about 3 acres in the Shaw Creek watershed, resulting in some increase in disturbance within the water influence zone. Dozer line was also constructed in the drainage on the west side of West Fork Shaw Creek drainage (approximately 2,050 feet in length), but it is located a minimum of 400 feet from the stream channel.

Figure 3.9-2. Roads within the Million Analysis Area



The individual statistics for the two 6th level watersheds affected by this project are provided in the project record. Adding the Million Salvage acres, fire containment line, and a small sales project to current disturbance levels results in a small increase, with the total for each 6th level watershed shown in Table 3.9-1.

Table 3.9-1. Disturbance totals by Million Salvage Alternative.

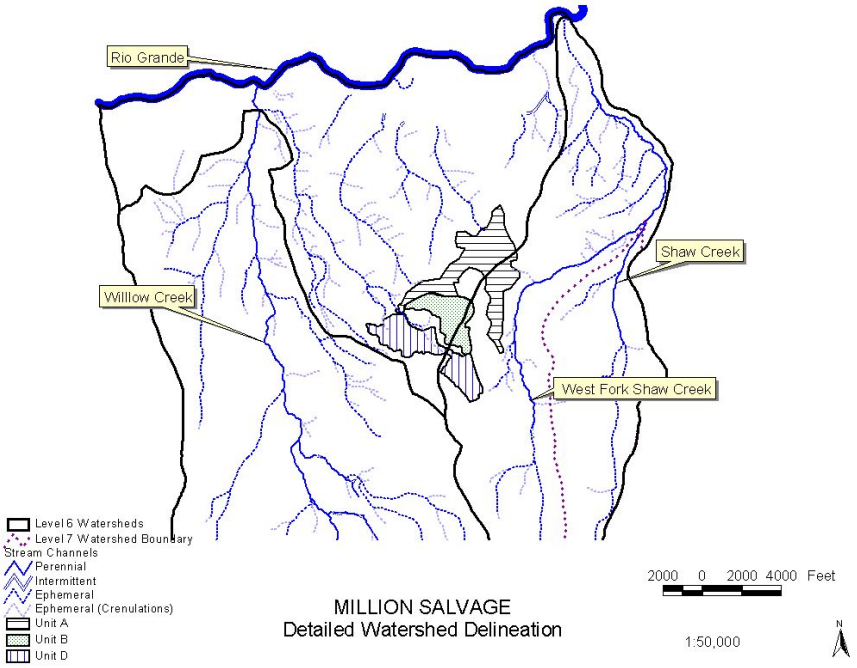
WATERSHED	**#130100011503**	**#130100011505 (Shaw Creek)**
Total Acres	4,768	5,123
Acres of watershed disturbed (**Prior to Million Fire**)	297 6.2%	501 9.8%
Disturbance acreage of Million Salvage[a], small sales, and dozer fireline	80	43
Percent watershed disturbed with Million Salvage, small sales, and dozer fireline	7.9	10.6

[a]*Acres of Million Salvage disturbance is calculated as 0.15 of total salvage area (maximum soil disturbance allowed in a project area by RGNF Standards and Guidelines)*

If enough live trees are removed from a watershed, stream flow can increase. It has been generally noted that 20 to 30 percent of a watershed must be harvested before a significant change in flow can be detected. If 25% or more of the basal area in a watershed is removed, increased stream flow could affect channel stability. Prior to the Million Fire, percent basal area removal for these 6th level watersheds was well below the 25% threshold.

In watershed #130100011503, salvage units lay in upper reaches of three ephemeral drainages that direct runoff to the Highline Ditch, just north of Highway 160, and a large ephemeral tributary to Willow Creek (Figure 3.9-3). These channels are characterized as swales in the uppermost areas near the proposed salvage units but become narrow and incised as channel slope increases. Riparian vegetation is present sporadically in the Willow Creek tributary but absent from the other three ephemeral channels.

Figure 3.9-3. Million Salvage Units



The ephemeral tributary to Willow Creek enters the main stem very low in the watershed, approximately 1,500 feet upstream of the confluence of Willow Creek with the Rio Grande. Since water yield from the ephemeral tributary can only affect this short lower reach of the perennial Willow Creek channel, it was not included in the RGNF GIS delineation of the 6th level watershed for Willow Creek, but instead included with the composite watersheds and Gerrard Gulch. There are 10,262 acres in the 6th level Willow Creek watershed, with approximately 23.8% burned during the Million Fire (Burn severity: Low=16.43 acres, Moderate=1,016.2 acres, High=1,407.93 acres).

Therefore, effects on the lower Willow Creek perennial channel due to fire impacts in the eastern ephemeral tributary (336 acres burned severely in a watershed area of 1,073 acres) would be completely masked by the large watershed area above the confluence, and an analysis of the smaller tributary is appropriate. The Million Fire burned roughly 75% of this watershed, with more area moderately burned than severe. In the lower reach of this tributary on Forest Land, the channel has grass and brush cover in many areas. Where the channel is bare, it is mainly an B type (Rosgen, 1996) with sand/silt substrate and some cobble. Flatter reaches are typified by grass/brush lined swale morphology with some small trees within the channel area. During the field evaluation on 02/12/03, the stream was not flowing at any point, but several short reaches (approximately 30-60 feet in length) in the channel contained frozen ice that may have been due to groundwater seepage or snowmelt. In addition, it was noted that eastern side slopes in the watershed, primarily meadow, were not burned to the extent the final Million Fire intensity map illustrates. Channel reaches near the salvage areas are typified by swale morphology. *As*

shown in Figure 3.9-3, this is the only ephemeral channel that extends into the salvage units.

Parts of all three salvage units drain to the West Fork of Shaw Creek. This drainage is the only perennial stream down slope from salvage units. Approximately 25 percent of this 7th level watershed burned during the Million Fire, with about equal portions of high and moderate burn severity. The fire did not burn through the main channel of the West Fork.

A field inspection along the West Fork channel was conducted on 04-09-03. The West Fork channel below salvage Unit A is about two to three feet in width with a substrate of fine gravels and sand with some cobble. Bankfull mean depth is about six inches in most reaches. Riparian and other vegetation is thick within this drainage and a large component of organic material is present along and in the channel. No fish were noted in the stream. An unburned area with a minimum width of 150 feet (in many areas is 300-500 feet) provides a buffer between the Million Fire boundary and the West Fork main channel. During the field trip it was confirmed that sediment and ash have not moved far from the burn boundary and it is not likely to be transported to the creek through the buffer. Slopes into West Fork drainage below the fire boundary are steep and rocky in the upper part but are less steep adjacent to the creek for the most part. The main stem of Shaw Creek is outside of the Million Fire boundary.

A field evaluation on 02/12/03 determined that stream channels in the Willow Creek ephemeral tributary and small composite watersheds had not been affected by sedimentation or increased channel erosion due to fire effects up to that point in time (Photo 3.9-1). Convective storms following the fire in 2002 did not occur in these watersheds as they did over the western Million Fire Area. Substrate materials in these ephemeral channels reflect available sediment from channel side slopes and adjacent hill slopes.

Photo 3.9-1
UTM 13S 360443/4167556

Upper Willow tributary ephemeral channel directly below Road 345 in Feb. 03. Small part of all salvage units drain to this channel. No apparent ash deposition or erosion since the Million Fire due to lack of runoff. Note hat in channel bottom for scale.

A field evaluation on 4-09-03 determined that snowmelt has caused some minor sheet erosion of ash and fine soil on slopes within the burned areas, and minor channel erosion had taken place in the upper reach of the easternmost ephemeral tributary that extends into salvage Unit A. This erosion is about 6-12 inches deep in several places within the channel (channel and adjacent areas were burned at this location right below Unit A). On 8-01-03, slope and channel erosion due to a recent rainfall event was noted in and below

Unit A, although not as serious as that occurring in the west part of the Million burn area. Maximum depth of channel erosion was approximately 2 feet.

The Willow Creek tributary was inspected from the project area to a point approximately 3,700 feet downstream. Channel substrate descriptors utilized in channel monitoring methodologies such as "T-walk" (Thalweg-Watershed Area LinK) were not collected due to their limited value in channel health analysis of ephemeral channels. Following runoff events in the project area, ash and sediment will naturally alter existing composition of channel substrate. This ash and sediment will move downstream with existing materials as runoff events occur. Proposed monitoring of erosion and sedimentation impacts associated with the salvage harvest would be most effective on the harvested slopes, not within these ephemeral channels that for the most part do not enter the harvest units for any distance.

As previously noted and detailed in Table 3.9-1, acreage of disturbance in each analysis watershed is well below the "watershed of concern" threshold as outlined in the Rio Grande NF Forest Plan. However, due to the drastic changes in cover conditions caused by the Million Fire *they will be treated as watersheds of concern*. Location and extent of proposed salvage activities will be carefully planned to eliminate or reduce effects to watershed and stream conditions.

Million Fire Impact to Watersheds: The Million Fire drastically changed physical conditions on approximately 8,000 acres on the Rio Grande National Forest during the summer of 2002, altering the hydrologic response of severely impacted watersheds. Research has shown that stream flows increase after fire, with the amount determined by size and severity of the fire. At fire disturbance levels present in the Analysis Area, water yield and peak discharge will increase in all watersheds to some degree due to loss of live tree basal area, loss of organic cover, and hydrophobic impact to soils, ***primarily from high severity areas***.

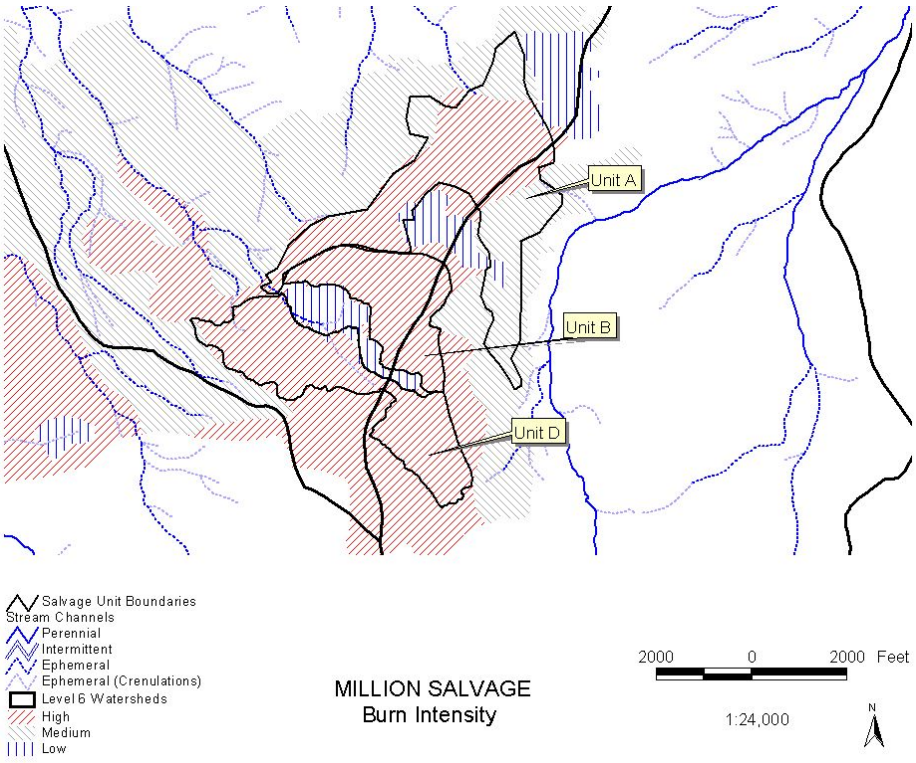
Acreages of high, moderate, and light severity burn within each 6th level watershed are listed in Table 3.9-2. The location of salvage units in relation to burn severity is shown in Figure 3.9-4.

Table 3.9-2. Acreages of high, moderate, and light severity burn within each 6th level watershed

Watershed	Total Acreage	Total Burned Acreage	Percent WS[a] Burned	Acres High Severity Burn	High Severity Percentage in WS[a]	Acres Moderate Severity Burn	Acres Low Severity Burn
Willow Trib/ Composites	4,768	1,791	37.5	572	12	1,106	113
Shaw Creek	5,123	520	17	244	8	240	36

[a] "WS" = watershed

Figure 3.9-4. Location of Million Salvage Units in relation to Burn Severity.



Substantial impacts to water yield, peak flow, water quality, and stream channel morphology have occurred in severely burned watersheds in the western part of the Million Fire Burn Area (near South Fork) hit by summer rainstorms. Examples of typical impacts that occurred are shown in Photos 3.9-2 and 3.9-3. Similar natural effects may occur in the Analysis Area watersheds, especially in the ephemeral tributary to Willow Creek and small tributary directly adjacent to the east where severely burned areas comprise 31 and 25 percent of those subwatersheds respectively.

Photo 3.9-2
UTM 13S
0353451/4167556
Downcutting in a small 100-acre ephemeral drainage in western part of Million Burn Area following late summer rainstorm. Two to three feet of downcutting and channel width increase.

Photo 3.9-3
Sediment deposition down stream from location shown in Photo 3.9-2. Significant movement of ash, rock, and soil.

Major effects to the other two ephemeral tributaries and West Shaw Creek are less likely, due to smaller percentages of high severity area. The unburned buffer zone previously mentioned along West Shaw Creek and the moderate burn on hill slopes below severely burned areas in the composite watersheds would also reduce impacts.

Springs

Three springs are located within these watersheds, one in the NE ¼ of Section 7 on a steep severely burned side slope, one at the edge of a lightly burned meadow (NE ¼ of Sec. 7), and one in the SE ¼ of the SE ¼ of Sec.1. A thick riparian zone is present within the meadow at and below the spring in Section 1. Prior to the fire, flow from these springs was used for livestock watering.

Fisheries

The West Fork of Shaw Creek, which may contain a brook trout fishery in some reaches, is the only perennial stream potentially impacted by the project. As previously mentioned, fish were not noted in the stream reach below the salvage areas during the 04-09-03 field evaluation. Parts of all three salvage units drain to the West Fork of Shaw Creek.

The likelihood of the action alternatives significantly impacting the existing fisheries or habitat is low. The nearest harvest unit to the West Fork is over ¼ mile away. The West Fork drainage experienced a low burn severity and unburned buffer zone with a minimum width of 150 feet (and in many areas 300-500 feet). These factors should effectively reduce potential impacts from the fire and the salvage project.

Direct and Indirect Effects

Alternative 1 -- No Action Alternative: This alternative would not disturb any watershed area and would therefore not directly affect watershed or stream health. Increased water yield, peak flow, and associated stream channel and water quality impacts will naturally occur in watersheds with high percentages of burned area.

Alternatives 2 and 3--Action Alternatives*:* Typical environmental effects from normal timber harvest activities are described in the Revised Rio Grande Forest Plan FEIS, pages 3-272 through 3-274 and 3-205. For more information on how these effects can influence fish and fish habitat, please see the Biological Assessment/Biological Evaluation in Appendices 2 and 3.

In a 1995 publication, Beschta (1995), et al., broadly describe their findings and recommendations regarding fire management and salvage logging, including several directed at increased sedimentation and impact to watershed resources. Beschta (1995) stressed that post-burn management practices that accelerate erosion or increase compaction must be avoided, and salvage logging should be prohibited in sensitive areas including severely burned areas, erosive soils, fragile soils, roadless areas, riparian areas, steep slopes, and other sites where accelerated erosion is possible.

Water quality and watershed health assessment of the Million Fire salvage project consider these broad concerns, but the focus of this effect analysis is *site-specific* to characteristics within the Analysis Area. As McIver and Starr (2000) state: "The extent to which logging exacerbates soil, sediment and hydrological problems in post-fire landscapes will depend on site characteristics, site preparation, logging method, and whether new roads are needed."

The Clean Water Act (1972) requires that chemical, physical, and biological integrity of all waters, stream channels, and wetlands be protected. Standards and guidelines that have proven effective would provide that protection. By following these standard mitigation measures, impacts from the salvage logging activities are expected to be minimal and insignificant for stream health in the project area. Table 3.9-3 outlines a checklist used to focus impact analysis.

Table 3.9-3. Checklist of Clean Water Act standards and guidelines

	Alternative 1	**Alternative 2**	**Alternative 3**
AQUATIC ECOSYSTEMS			
Physical: Sediment	No effect	Minor effect	Minor effect
Bed/bank stability	No effect	Minor effect	Minor effect
Flow regimes	No effect	Minor effect	Minor effect
Chemical: Temperature	No effect	No effect	No effect
Water Purity	No Effect	No effect	No Effect
Biological: Aquatic life	No effect	Minor effect	Minor effect
TES species	No effect	No effect	No effect
SPECIAL AREAS			
Riparian ecosystems	No effect	Minor effect	Minor effect

CUMULATIVE EFFECTS			
Aquatic ecosystems	No effect	Minor effect	Minor effect
Riparian ecosystems	No effect	Minor effect	Minor effect
NOTE: This checklist ensures that all required effects are analyzed, gives a snapshot of all effects, and identifies items to dismiss from rigorous analysis. .			

Water Yield/Peak Discharge

For this environmental assessment, the effect of salvage logging on runoff and peak discharge is analyzed during two time periods, the first over the next year or so during salvage operations, and the second following the harvest.

In either time period, increase in water yield from the loss of live tree basal area (live canopy) and ground litter would not change with salvage of the dead trees. Increased runoff and peak discharge from the salvage due to the hydrophobic nature of soils in the first year or two will be high regardless of logging activity effects, such as compaction. Some researchers have suggested that logging activity may actually increase infiltration and reduce runoff by breaking up the hydrophobic layer, and ongoing research is investigating this factor (McIver and Starr, 2000).

A small reduction in water yield from the logged areas may occur because of an increase in wind scour, which can slightly decrease snow depth and snow water equivalent. However, the difference in water yield reduction by this factor in logged versus unlogged areas would be minimal.

In years following the salvage, water yield and peak runoff from the salvage areas would not be substantially different from those areas not logged. Vegetative recovery will slightly reduce water yield overall. Soil water repellency will usually return to pre-burn conditions within several years, increasing infiltration. Skid trails and other areas where compaction may occur from the logging operations would be ripped and mulched following the logging, and therefore not contribute to increased runoff. In addition, lop and scatter of limbs from logged trees would add ground cover that may enhance infiltration and reduce runoff.

Air temperature and therefore snow ablation rates can be altered in severely burned forested areas, affecting runoff rate. Higher mean air temperatures have been noted in severely burned areas as compared to undisturbed timber (Molnau and Dodd, 1995). However, difference between air temperatures in salvaged areas versus unlogged areas due to loss of shade would be minimal.

In summary, logging part of the burned areas within these watersheds would have minimal, if any, effect in increasing water yield and peak discharge from the current condition. Although 16.5 to 51 percent of burned acreage within each subwatershed would be logged, actual affected area within the salvage units would be much less since detrimental impacts to soils are limited to 15% of any land unit as required by Forest Standards and guidelines. In addition, mitigation of logging disturbances within these affected areas would significantly reduce likelihood of negative impacts.

Water Quality

Impacts to stream water quality from routine timber harvest usually occur due to road construction and other disturbed soils. Disturbed areas connected directly to stream channels are the main source of damage in rain, snow, and rain-on-snow areas.

Figure 3.9-3 illustrates the lack of direct connection between the salvage areas from even ephemeral crenulated stream channels. The only perennial stream potentially affected, the West Fork of Shaw Creek, has an extensive buffer of unburned area between it and the project area/Million Fire perimeter. These factors would greatly reduce potential for effects to water quality (sediment) from proposed operations. As demonstrated in the western part of the Million Burn Area, sediment transport is greatly increased when burned areas are in steep, narrow topography located directly adjacent to stream channels. The proposed Million Salvage avoids these areas.

Another key factor in reducing the potential for effects from logging is restricting operations to areas with more gentle slopes. Million Salvage Units are located in upper watershed areas where slope is generally less than 30 percent, greatly reducing the potential for erosion and additional sediment input. Although research in this area is not extensive, a study conducted in the Stanislaus National Forest within twenty-two small burned watersheds found that sedimentation effects were correlated with watershed characteristics and seemed to be independent of logging in gentler sloped basins, generally less than 25% (McIver and Starr, 2000).

Improperly designed roads and skid trails, and lack of an adequate buffer around water bodies, are the greatest concern (USDA, 1996). Using existing roads will avoid the potential impacts from new road construction. Skid trails would be extended from the existing road system at locations where impacts would be minimized. Additional mitigation measures to be applied to skid trails following harvest include use of a subsoiler, seeding, and mulching; effectively creating an additional barrier to trap sediment and slow runoff.

Salvage logging may slightly reduce the amount of natural vegetation cover that has sprouted since the fire, resulting in less cover in the directly affected areas for one or two seasons. Reduction in this vegetation can therefore increase the potential for soil erosion, but any increase caused by this vegetative loss would be minor. In addition, Forest conservation practices would greatly reduce the potential for sediment to enter the upper ephemeral channel areas. These practices are described in the Soils Analysis Section.

Changes in nutrient levels due to logging activity are not anticipated since increased erosion and sediment is not expected from the salvage areas. However, if any small increase in sedimentation (and corresponding nutrients) would occur, it would be insignificant as compared to additional runoff and erosion from unlogged burned areas.

Regarding stream temperature, trees left by wildfire have been noted to provide shade, which can slow heating of surface waters (McIver and Starr, 2000). However, in ephemeral stream settings within this project area, the effect of this shading to runoff

temperature would be negligible. Perennial West Shaw Creek would not be affected since logging is not proposed adjacent to the stream.

Stream Channel Condition

Substantial rainfall events did not occur in the summer and fall of 2002 in the Analysis Area. As previously noted, snowmelt in spring 2003 has resulted in some sheet erosion and minor channel erosion.

As noted earlier, increase in peak discharge and associated channel alteration is most likely to occur (regardless of logging) in the ephemeral tributary to Willow Creek and the small ephemeral drainage just east of it due to a high percentage of high severity burned area (31 and 25 % respectively). Significant changes to main channel geometry or substrate are not anticipated from normal runoff events in West Shaw Creek and the other small ephemeral drainages, since only 5-16% of the watersheds were severely burned.

The Million Salvage would not increase aggradation or degradation within stream channels in the Analysis Area, since any increase to water yield, sediment yield, or peak discharge due to logging are expected to be insignificant.

In summary, Million Salvage Units are located where connection to channels is limited, and within lower slope areas near the head of watersheds where cumulative runoff is low. These two key factors greatly reduce any potential effect to stream water quality from increased sedimentation. Adherence to Forest Standards and Guidelines would insure stream health is maintained.

Alternative 2 -- Salvage Harvest (Proposed Alternative): Under this alternative, 623 acres of burned timber would be salvaged. Acreage of salvage in each watershed under this alternative is provided in Table 3.9-3. The effects to water yield, peak discharge, water quality, and stream channel condition from salvage activities are as discussed in the Direct and Indirect Effects common to both action alternatives.

Significant impacts are not anticipated, as salvage units are located in upper watershed areas on relatively gentle slopes. Only a limited area has slope over 30% (63 acres). The operation has been designed around existing roads, and skid trails would be placed on benches advantageous to reducing impact. All applicable Forest Standards and Guidelines would be followed during harvest to maintain watershed health. Standard mitigation measures prevent skidding down stream courses and limits heavy equipment operation close to channels. Stream channels can only be crossed at designated, well-constructed crossings. Channels shown in Figure 3.9-3 would be identified on the sale area map for protection.

Additional mitigation has been added to insure erosion and sediment delivery to channels are not increased by tree removal operations. Landings would be located where they would drain in a direction and manner that minimizes erosion and prevents sediment delivery to stream channels. Skid trails would be located to avoid concentration of runoff away from natural drainage channels. Dendritic skid trail patterns would be avoided. Salvage units would be surveyed following harvest for the need to implement contour felling on the lower edge of the units to increase the amount of down woody debris and reduce overland flow potential (FS personnel).

Alternative 3 -- Slope Limitation Harvest: This alternative emphasizes reducing any potential for soil and water impacts by limiting project activities to slopes less than or equal to 30 percent. This would reduce the area of salvage logging to about 560 acres.

The amount of salvage that would be conducted in each sub-watershed under this alternative as compared to Alternative 2 is shown Table 3.9-3.

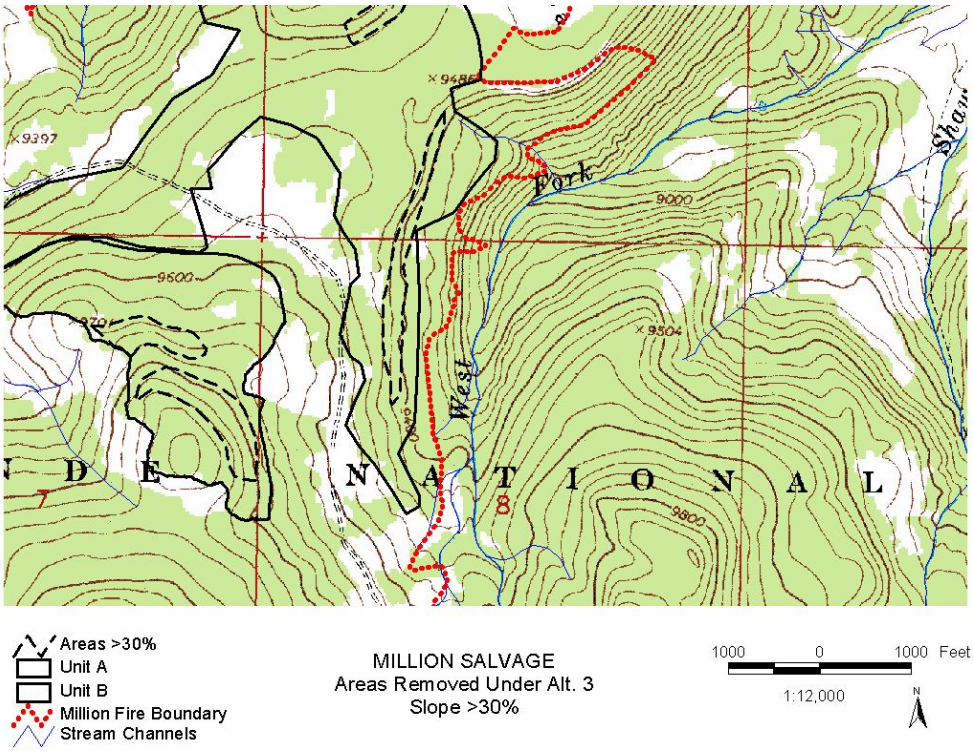
Table 3.9-4. Amount of salvage that would be conducted in each sub-watershed.

	High or Moderate burn acres in Watershed	Acres Salvaged	Acres Salvaged
Alternative		**Alternative 2**	**Alternative 3**
West Shaw	484	193	129
Willow Trib/Composites	1678	431	431

Effects to water yield, peak discharge, water quality, and stream channel condition from salvage activities with slope limitation harvest are discussed in the Direct and Indirect effects common to both action alternatives. As shown in several studies (McIver and Starr, 2000), logging of severely burned steep slope areas is most likely to produce increased sediment and runoff to stream systems.

Elimination of steep slope areas under this alternative would further reduce the likelihood that water quality would be affected by the salvage. This is especially key in the perennial West Fork of Shaw Creek drainage, where sediment could impact aquatic habitat. The areas eliminated from harvest in that drainage are shown in Figure 3.9-5.

Figure 3.9-5. Areas eliminated from harvest.



As discussed in under Alternative 2, standard mitigation to comply with Forest Standards and Guidelines as well as additional measures would be followed during harvest to maintain watershed health.

Cumulative Effects

The accumulation of watershed disturbances from past activities is not a threat to watershed health. As explained above, under "Existing Conditions", total disturbance is below concern levels established in the Forest Plan. In the analysis watersheds, erosion and sediment delivery is expected to increase from moderate and high severity burn areas within the Million Fire boundary regardless of salvage operations.

A small amount of salvage logging on private land may have occurred in watershed 130100011503. The runoff from that watershed area drains to a diversion ditch that enters Willow Creek near its junction with the Rio Grande River.

Fire suppression activities associated with the Million Fire and dozer containment line, added about 18 acres of disturbance to the watersheds. Approximately 3,700 feet of dozer line lies either within or near the water influence zone (WIZ) of the ephemeral tributary to Willow Creek. This added approximately 1.7 acres of disturbed soils near the channel. Current Forest Standards and Guidelines would not allow a similar road-like disturbance in the WIZ under normal circumstances. These areas were seeded in the summer/fall of 2002. Erosion and sediment delivery from these areas to the stream channel are not anticipated since the depth of blading was shallow, soils are rocky, and some natural vegetation remains. However, remediation measures may be considered in the future if erosion problems develop.

Additional disturbance is also anticipated from a small timber sale (approximately 75 acres) within the West Shaw Creek watershed. This timber sale is located on moderate slopes and the only stream channel within the sale area is an upper ephemeral tributary to West Shaw Creek. Effects to watershed resources would be similar to those described for the larger Million Fire salvage project. No new roads are proposed with this project.

BAER treatments implemented during the 2002 field season would not be affected by the proposed salvage harvest. The BAER treatments were essentially in the west part of the Million Fire Area, and there is no salvage harvest proposed on top of BAER investments.

The BARA treatments being planned in the field season of 2003 will have no overlap with the proposed salvage sale areas. BARA treatments will be analyzed in a separate environmental analysis, and in different watersheds, and will not contribute toward any negative watershed effects. Both BAER and BARA treatments would have positive benefits to watershed health.

There are some segments of fireline that may be treated in the BARA projects. These activities may include subsoiling, seeding and mulching and other conservation measures.

Log hauling impacts should be minimal to watershed resources. Dust abatement is expected to prevent fine soil materials from entering streams or other water resources.

As discussed in the Direct and Indirect Effects Section, change to overall water yield, peak discharge, and water quality due to the salvage logging activities would be minimal. Under Alternatives 2 and 3, proposed mitigation measures on logging disturbances may actually enhance infiltration and reduce downslope sediment delivery for those areas as compared to the burn area in general. Disturbances associated with the action alternatives would not threaten watershed or stream health as long as Forest Plan standards and guidelines are followed.

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3.10 Recreation/Travel Management

Scope of the Analysis

This analysis will discuss the recreation resources and travel management direction. The Analysis Area is outlined in Chapter 1, Section 1.4 and defined by the proposed management treatments in Chapter 2, Section 2.3.

Past Actions that Have Affected the Existing Conditions

Activities that affect the existing conditions include livestock grazing, past timber harvest areas, road construction and a variety of dispersed recreation activities.

Existing Conditions

Dispersed Recreation

A diverse array of dispersed recreation opportunities occur within the area. These opportunities include but are not limited to: driving for pleasure and sight-seeing, viewing wildlife, picnicking, stream fishing, use of ATV's on designated trails and 4 wheel drive roads in the Del Norte Peak area during the summer; big game hunting and firewood gathering during the fall; and snowmobile, cross country ski and/or snowshoe touring on groomed trails during the winter.

ROS Settings

Managed recreation settings for management area prescriptions 5.11 and 5.41 is modified roaded.

Travel Management

Forest travel regulations restrict vehicular motorized travel to designated roads and trails.

Motorized vehicles may access a suitable campsite or gather firewood within 300 feet of an open forest road or trail as long as no damage is caused to lands, streams, or other resources.

Specific travel regulations for each of the management-area prescriptions is as follows:

Prescription 5.41 - Deer and Elk Winter Range: motorized travel including snowmobiles, is restricted to designated roads and trails, except during big game hunting season for ATV big-game retrieval.

Prescription 5.11 – General Forest and Intermingled Rangelands: during big game hunting seasons, game retrieval is authorized using ATV's from noon till 5 pm each day, unless soil and water damage will occur.

Direct and Indirect Effects

Alternatives--No Action: This alternative would have no direct or indirect effects to the recreation resources or travel management since no management action would occur.

Alternatives 2 and 3--Action Alternatives: A decision to implement either of the action alternatives would have short-term (one to two years) effects to the recreation users in this area. Higher than normal traffic use and congestion between the general public and logging trucks will occur along the 4-5 mile stretch of FDR 345 during the summer and fall months requiring the need for high visibility signing and control of vehicular speed to reduce the possibility of traffic accidents. During the late summer and fall months, firewood cutting in the commercial timber sale units would not be allowed. Wood gathers will need to go to other locations on the District to obtain firewood. After the commercial timber sales are completed, firewood gathering would then be allowed. In the winter, the Powder Buster Snowmobile Club would need to relocate their snowmobile parking area to either a location on the FDR 350 road or off of FDR 340 to eliminate or reduce snowmobile and logging traffic conflicts. The first five miles of FDR 345 would not be groomed since this stretch of the road would be plowed for log-hauling operations. The club would need to groom FDR 350.2, FDR 350.2b and 2e which connects with FDR 345 (by-passing the commercial sale areas) and redirect winter users to this groomed route to avoid any and all winter traffic issues and/or congestion. After the completion of the commercial timber sales, the snowmobile club can resume using their traditional parking area and trail grooming routes.

Cumulative Effects

There are no direct, indirect or cumulative effects associated with the No Action Alternative. Under the action alternatives, there are no cumulative impacts to the area's recreation resources, but there will be short-term impacts to recreation users. Implementing the outlined mitigation measures, Forest-Wide and Management-Area Standards and Guidelines address these short-term impacts and provide for the continuation of the dispersed recreation activities in the proposed project area.

3.11 Transportation

Scope of the Analysis

This section addresses the travel-ways that could be used to access, monitor, and harvest timber in the Million Fire Salvage Analysis Area. The Analysis Area is shown in Chapter 1, Section 1.4.

Past Activities that have Affected the Existing Condition

The transportation system in the Analysis Area was constructed to allow access for timber harvest, range management, fire suppression, and recreation. Road construction occurred from approximately the mid 1970's to the mid-1980s.

Existing Conditions

The Analysis Area is accessed from Forest Developed Road (FDR) 345 off state highway 160, approximately 2 miles east of South Fork, CO. FDR 345 is maintained by the Forest Service and is suitable for use by passenger cars. See Map 7 – Transportation System for Alternatives 2 and 3, for details. The FDR 345 and 340 are not gated, except during the spring mud season. All other roads are gated. Non-motorized uses are allowed on the restricted roads within the Analysis Area.

The existing local roads within the Analysis Area are generally well located and adequate to serve the proposed project needs. Two sections of non-system road used during previous harvest activities are available if needed and are identified on Map 7-Transportation System . Pre-haul maintenance would be sufficient to prepare these roads for hauling. These non-system roads are listed as temporary roads (temp roads) and will be obliterated after use. Should an action alternative be selected, minor maintenance would be necessary to improve drainage on all road surfaces.

Direct and Indirect Effects

Alternative 1--No Action: The No Action Alternative would require no new disturbance and would result in no change to the existing transportation network in the area.

Alternatives 2 and 3--Action Alternatives: The transportation network required to accomplish the objectives of Alternatives 2 and 3 has been analyzed and planned through field reconnaissance, aerial photography, and map analysis. The main goals considered while preparing the transportation plan were to minimize new construction and disturbance as well as to minimize impacts to the environment while safely and efficiently accomplishing the goals of the proposed action. Table 3.11-1 shows the proposed transportation plan.

Table 3.11-1. Proposed transportation plan.

Road #	Length (Miles)	Work Required	Alternative	Remarks
345	6.3	Prehaul Maint.	2,3	Improved Gravel Surface
340	0.7	Prehaul Maint.	2,3	Native Surface
340.1A	1.4	Prehaul Maint.	2,3	Native Surface
340.1B	1.2	Prehaul Maint.	2,3	Native Surface
340.1I	0.2	Prehaul Maint.	2,3	Native Surface
340.1J	0.2	Prehaul Maint.	2,3	Native Surface
Non-system	0.2		2,3	*Native Surface
Non-system	0.5		2,3	*Native Surface
Total Reconst.	0	Reconst.	2,3	
Total Prehaul Maint.	11.4	Prehaul Maint.	2,3	

**Purchaser will obliterate non-system roads.*

Cumulative Effects

The cumulative effects of implementing the transportation plan outlined above would include pre-haul maintenance in the action alternatives. The Fire Rehabilitation Projects have repaired or replaced culverts on the proposed haul routes, already. It is expected that regular maintenance will be required depending on the amount of runoff and erosion from the burned area that could affect culvert efficiency.

Log hauling is expected to have short-term effects on recreation and safety. Fine road material is expected to be displaced by log truck traffic. Dust abatement should greatly reduce the loss of fine material from the road surfaces in the project area. Through mitigation measures, soil and watershed impacts should be negligible.

3.12 Economics

Scope of the Analysis

The economic analysis focuses on the financial efficiency associated with commercial harvest treatments and non-harvest treatments within the Million Fire Salvage Analysis Area. The purpose of this analysis is not to determine if these sales are above or below cost, but rather to compare the financial efficiency of each alternative. Nor is this an economic efficiency analysis incorporating a monetary value for all known market and non-market benefits and costs.

Past Activities that have Affected the Existing Condition

There have been previous activities in this Analysis Area. See Section 3.4 Salvage/Silviculture under the same heading for more information.

Existing Condition

Cost efficiency is a measure of how well inputs (activities) are used in a production process to produce a fixed set of outputs. It is only a partial measure because not all benefits and costs to society can be quantified. Revenues from sawtimber and fuelwood have been assigned dollar values. Other resources such as forest/tree health, watershed and riparian health or visuals have not been assigned dollar values; an economic efficiency analysis considers these and is not required at the project level by NFMA but is included in the Forest Plan (refer to page 3-445 through 469 of the Final Environmental Impact Statement). Alternatives that meet the requirements and intents of the Forest Plan achieve net public benefits as stated in NFMA.

To maximize the economic value of the dead timber, it is important to commence salvage operations as soon as possible to minimize loss of product value.

Quick-Silver, an economic efficiency analysis program, has been adapted and developed for use in the Forest Service and was used in this analysis.

Direct and Indirect Effects

Alternative 1--No Action: This alternative would not meet the stated purpose and need for the proposed action.

Alternatives 2 and 3--Action Alternatives: Both alternatives would result in a deficit sale due to the low appraisal value of dead timber. These alternatives would provide wood products to the public. Alternative 2 would provide 3.0 million board feet, and Alternative 3 would provide 2.5 million board feet.

One economic analysis was run for this project with the three action Alternatives as outputs. Table 3.12-1 displays the Present Net Value for each Alternative.

Table 3.12-1 Financial Analysis

Alternative	PV- Benefits	PV-Costs	Present Net Value
Alternative 1- no action	NA	NA	NA
Alternative 2	$80,769.23	-$98,324.72	-$17,555.49
Alternative 3	$70,000.00	-$84,482.89	-$14,482.89

3.13 Heritage Resources

Scope of the Analysis

The cultural (heritage) resource analysis and assessment focused on the Million Fire Salvage Analysis Area where salvaging of timber is proposed.

Past Activities that have Affected the Existing Condition

National Register of Historic Places eligible cultural resource sites were not found within the effective area of the undertaking therefore, there are no affects to cultural sites.

Existing Conditions

The previous Heritage Resource Inventory, in advance of the Timber Sales, included the project area. The Million Fire Salvage Project Area (harvest boundaries) legal description is Township 39N, Range 4E, portions of Sections 5,6,7,8,17, and 18; Township 39N, Range 3E, Section 12 of the proposed Million Salvage Timber Sale Project. National Register of Historic Places eligible cultural resource sites were not found within the Project Area.

Direct and Indirect Effects

Alternatives 1, 2, and 3: There will be no direct or indirect effects to heritage resources since National Register of Historic Places eligible cultural resource sites were not found within the Million Fire Salvage Analysis Area.

3.14 Scenic Resources

Scope of the Analysis

The scope of Scenic Resource analysis will focus on the timber harvest areas within the Million Fire from Highway 160 to FDR 345.

Past Activities that Have Affected the Existing Condition

The Million Fire has caused a change in Landscape Character between Million Reservoir, Beaver Mountain, and FDR 345. There is a drastic change in landscape color and texture and the ground plane is viewable from most sensitivity level 1 Roads within and around the area (such as Hwy 160, several Forest Service Sensitivity Level 1 Roads, the town of South Fork and Alpine Village).

Much of the burnt areas are viewable in the middle-ground and background from the communities of South Fork and Alpine Village. In addition, many areas of the Million Fire are in the Immediate Foreground (0-300') to the Foreground (up to ¼ mile of these communities).

Some areas of the Million Fire are hidden from direct view, however, the impact of the fire as a whole changed the appearance of this landscape significantly. There is an abundance of standing dead trees that are gray and black, as well as burnt stumps, a gray ground texture, mixed with red and brown, needled trees that are partially burned.

Past timber activities and associated roads and harvest in this area that have altered the characteristic landscape in specific areas are not considered significant at this time, given the magnitude of the Million Fire. However, harvesting these areas now, may cause additional impacts in addition to the catastrophic event.

Typically, in foreground areas, harvesting activities can be easily disguised when covered by snow. Snow reduces the evidence of stumps and other logging debris on the ground, making foreground openings look like natural meadows and parks.

Existing Conditions

This area has been identified in the Existing Scenic Integrity Inventory as Type I, Type II, and some small areas of Type III. However, the landscape has changed due to a catastrophic fire that has altered the existing vegetation and characteristic landscape. Any strong positive attributes where there were different vegetative patterns and water characteristics that provided a unique or outstanding scenic quality have been altered. This area has been identified as a Scenic Integrity Objective of High and Moderate.

Direct and Indirect Effects

Alternative 1 -- No Action: This alternative would leave the dead and dying trees in place. This landscape is considered a naturally appearing/slightly altered landscape character with a catastrophic event (fire). This alternative will have some impacts to the Scenic Resources. Visitors can expect to see a mixture of dead standing trees, fallen trees, with a mixture of red and green trees. Grasses, shrubs, and small trees will eventually be present in the understory with a mixture of downed trees. It is expected that the ground cover for this landscape will change from gray to green over time, but existing stalks from dead trees will be visible from all critical viewing angles for years.

This landscape contains all the elements of a naturally appearing, slightly altered, moderately altered and heavily altered landscape character, caused by past timber sales and the existence of roads. If the no action alternative is applied to this landscape, it will continue to be characterized as above. Regrowth is expected to take many years to help soften hard-line edges created by the fire. The landscape will naturally move toward a more forested appearance over time.

Viewers can expect to see a color change in the canopy as well as a texture change as trees continue to die. This change is expected to be gradual. Standing dead trees will provide texture as young trees regenerate over time.

Alternative 2 – Proposed Action: In this alternative, sanitation salvage harvest actions are proposed. This alternative is expected to have minimal impacts to the scenic resources from any critical viewing angles. If salvage prescriptions are applied, there will be areas where a change in the texture of the existing canopy can be seen. However, it is expected that most of the harvesting would take place where units are unseen for any duration or visual magnitude, therefore the impacts will not be critical to scenic resources.

Alternative 3 -- Slope Limitation: In this alternative, salvage harvest actions with slope limitations are proposed. Direct and indirect effects are similar to Alternative 2, except that more trees will be retained on steep slopes in the harvest units.

Cumulative Effects

The Million Fire Landscape Character is visibly different than the remaining landscape character that was untouched by fire. Any additional impacts within this area from seen or viewable areas have the potential to further alter this landscape in a negative manner.

Scenic Resources do not consider a catastrophic event a negative occurrence on the landscape, only a change in landscape character

As understory trees begin to cover the ground plane, management activities will be less significant on the landscape (even in the foreground areas of the burn).

3.15 Range Resources

Scope of the Analysis

The Million Fire Project Area is located within the Shaw C&H (Cattle & Horse) Allotment.

Existing Conditions

The permitted use is shown in Table 3.15-1

Table 3.15-1. Range permit for Shaw C&H Allotment

	Shaw C&H Allotment
Cattle Numbers	169 cows/calves
Season of Use	June 16 to September 30
Number of Pastures/Units	Five Units: Lower Shaw, Upper Shaw, Walker, Willow Creek, & Holding Pasture
Grazing System	Five Pastures Deferred Rotation

The Shaw C&H Allotment contains 14,828 acres of which approximately 6,792 acres are considered capable livestock grazing.

The following range improvements are located within or adjacent to the proposed action:

- F05 Unit No. 1 Pasture Fence, 1.6 total miles, barbed wire fence
- W02; Gerrard Gulch Spring Water Development and Tank
- W03 Willow Road Spring Water Development and Tank

Past Activities that have Affected the Existing Condition

Historically, cattle have been present on this allotment. Early and present day allotment boundaries are approximately the same, although the land ownership patterns and the number of permit holders have changed, somewhat. Permit and actual use records dating back to the 1920's indicated a history of overstocking on the more accessible ranges.

Recent analysis of the Shaw Allotment (1983 to 2000) indicated the condition of the range had greatly improved and the number of permitted cattle was increased to the present permitted capacity of 169 head as stated. Grazing by livestock, elk and deer has altered the range in the open areas/meadows. Prior to the fire, these areas were in fair condition.

Direct and Indirect Effects

Alternative 1--No Action: Deferred grazing for 2 to 3 years and replacement of range improvements would not be affected by this alternative.

Alternatives 2 and 3--Action Alternatives: Both action items could cause damage to fences or other range improvements within the project area.

The table below summarizes the direct and indirect effects of cattle grazing on burned areas.

Table 3.15-2. Direct and indirect effects of cattle grazing on burned areas.

	Alternative 1 No Action	Alternative 2 Salvage	Alternative 3 Slope Limitation
Cattle Numbers	A temporary reduction (2-3 years) in number (20%) for the allotment due to the Million Fire. The salvage/timber sale areas are outside the capable acreage for grazing and usually do not impact the permitted livestock numbers.		
Season of Use	Temporary reduction for the allotment due to the Million Fire. When cattle grazing resumes in 2 to 3 years, the season may be shortened by reducing the number of days the burned pastures are utilized. No additional impacts are expected due to the proposed action.		
Number of Pastures/Units	No changes in number of pastures for the allotment. However, the burned pastures will be rested for 2-3 years.		
Grazing System	Shaw C&H deferred rotation for 4 pastures for 2-3 years (one less pasture) and then return to 5 pastures deferred rotation.		
Range Improvements	No action: Fire-killed trees that are not harvested could fall on and damage range improvements. Remove and replace 1.0 mile of fence damaged during the Million Fire	Possible damage to range improvements within the project area. No impact if the damage is repaired or replaced. One mile of fence will be removed and replaced due to fire damage.	

Cumulative Effects

Present actions and management that influence the area are livestock grazing, fire suppression, hunting, fishing, other recreation, and natural events. Future activities and management activities expected to influence the area are the same as the present activities.

The BARA treatments would have positive benefits to range in terms of livestock grazing. These activities may include subsoiling, seeding and mulching and other conservation measures. Livestock grazing on rangelands would be precluded for the next two-three growing seasons pending the established of vegetation. It is expected that grasslands in these watersheds will green-up considerably improving access to additional rangeland within the next 2 to 3 growing seasons.

3.16 Noxious Weeds

Scope of the Analysis

This analysis discusses the resource area of noxious weed management.
The Analysis Area for this portion of the document is the same as the actual project area, described in Section 1.4.

Past Activities that have Affected the Existing Condition

There have been previous activities in this Analysis Area. Section 3.4 describes past actions within the Analysis Area.

Existing Conditions

An in depth inventory of weed infestations has not been compiled for the project area. An inventory is planned for the 2003 growing season. Canada Thistle (*Cirsium arvense*) is the only known noxious weed to occur in the project area and has been treated in and around the project area and at the oil drill pad. Approximately 25 different locations of Canada thistle have been identified and/or treated.

Direct and Indirect Cumulative Effects

Regardless of management actions, established weed populations will continue to expand.

Direct and Indirect Cumulative Effects

The Forest Service will continue treating weeds throughout the Analysis Area regardless of the alternative selected (subject to available funding). The Forest Service will continue treating weeds throughout the Analysis Area regardless of the alternative selected (subject to available funding)(Table 3.16-1).

Table:3.16-1 Schedule of treatment and surveys for noxious weeds

YEAR	Noxious weed treatment	Noxious weed surveys
1	x	x
2	x	x
3	x	x
4		x
5	x	x
6		x
7		x
8	x	x
9		x
10	x	x

Any treatment will be done within the scope of the Forest's Noxious Weed Programmatic EA (USDA Forest Service 1996). Existing infestations and the continued introduction of weed seed through vehicular use of the area's roads will provide a source for invasion of currently unaffected areas. Noxious weeds have the ability to out-compete native plants for sunlight, water, nutrients, and space. They can reduce forage for livestock and wildlife, impact wildlife habitat, and affect recreation opportunities.

Alternative 1 -- No Action: The "No Action" Alternative would have no direct effect on the introduction or spread of noxious weeds within the Analysis Area. It is anticipated that noxious weeds would increase along system and non-system roads due to vehicular traffic carrying in seeds from other areas. However, there is also the possibility of livestock and wildlife bringing weed seed into the area in fur or hair or by fecal deposition. All disturbed areas could be subject to noxious weed invasion. However, it is expected that road shoulders, and areas such as root wads from fallen trees would be most susceptible.

Alternatives 2 and 3--Action Alternatives: It is anticipated that noxious weeds would increase within the Project Area, under these alternatives. Timber harvest generally increases the amount of soil disturbance in an area. Weeds then easily germinate in disturbed soil (skid trails, landings, etc.). Also, the fire has already created a seedbed for noxious weeds to invade the Project Area. The two action alternatives will disturb soils, thus providing a place for weeds to germinate. Alternative 3 would disturb fewer acres and less soil, possibly allowing fewer weed species to invade these areas, although the cumulative effects would probably be minimal.

Cumulative Effects: The cumulative effects of Alternative 1, No Action, would be a slow increase in noxious weeds within the Analysis Area. For Alternatives 2 and 3 it is

expected that mitigation measures to monitor and treat weed infestations would limit the spread of noxious weeds in the project area.

3.17 Wildlife Resources

This issue is divided into three interrelated sections as follows:

- Wildlife
- Threatened, Endangered, Sensitive and Proposed Species (TESP)
- Management Indicator Species (MIS)

Wildlife

Scope of the Analysis

Specific issues identified during the scoping process included potential short and long-term impacts upon wildlife species and their habitat. This analysis discusses wildlife species and the potential impacts of the Salvage Sales upon wildlife and their habitats.

This analysis involves two scales of evaluation due to differences in species home range and mobility. These evaluation areas include:

1) ***Larger mammals and birds*** – two sixth level watersheds a) Watershed 130100011503 and b) Watershed 130100011505. These watersheds best reflect the likely home range of these species. See Map 6.

2) ***Small mammals and amphibians*** – the perimeter of the proposed salvage sale units, which best reflects the home ranges and low mobility of these species. See Map 4.

Pre Million Fire Condition

Pre-fire wildlife habitat within the proposed salvage sale units is best described as consisting mainly of a mixed conifer component of Douglas and White Fir with an understory of common juniper or kinnikinnick. A strong aspen component was also present in several areas but was being outcompeted and lost due to conifer encroachment. See Table 3.17-2: LTA's within the project perimeter.

Post Million Fire Condition

The vast majority of the Million Fire burn perimeter burned moderately to severe resulting in a moonscape appearance. The salvage sales are focused in those areas which burned the most severe and only on those trees which are obviously dead within 6% or dying within the burn area. The remaining 94% of the burn is not being considered for salvage sale activities.

Short term: In the short term (1-10 years), the area of the burn including within the salvage sale units, which was moderately to severely burned will no longer provide habitat for most species that were found in the area pre-burn. There will be little to no habitat for common species such as red squirrel and least chipmunk, with the exception of burn edges and pockets of unburned areas. It is doubtful that small mammals and birds (with the exception of woodpeckers) will be present in large numbers in the short term. Larger more mobile, species such as mule deer and elk will move through the area browsing and grazing on young nutritious grasses and aspen sprouts. It is likely that by the end of the first decade, the area will be very attractive to ungulates. Woodpeckers,

particularly flickers, hairy, downy and northern three-toed woodpeckers will be common throughout the burn area, particularly along the edges, feeding upon insects within the numerous snags present.

Long term: In the long term (10-20 years), the area as a whole including the salvage sale units should once again provide habitat for those species requiring early successional habitats, including snowshoe hare. Those species requiring later successional forests such as lynx and marten, may move through the project site but it is doubtful they will spend a significant amount of time within the majority of the burn.

Existing Condition

The most impacting single event upon wildlife and wildlife habitat, which has occurred in the watersheds, is the Million Fire. Studies have shown that wildfires, like any other significant macroenvironmental effect (including management practices), will favor some species and significantly impact or even eliminate others (McIver 2000).

It is important to remember that this analysis involves determining the impacts of the effects of the proposed salvage sales upon wildlife and wildlife habitat and not the fire itself. However, some basic knowledge and description of the existing wildlife habitat conditions post-fire are necessary in order to fully analyze the proposed sale.

Increased abundance of insects in burned stands tends to attract insectivorous birds, especially those preferring more "open" habitats (Blake 1982, Sallabanks and McIver 1998, Taylor and Barmore 1980). As a consequence, burned forests typically support significantly different bird communities than before the burn, with species composition typically reflecting an increase in cavity-nesting, aerial feeding specialists, such as woodpeckers, flycatchers and bluebirds. Similarly, mammal species composition is altered by wildfire, with the makeup of mammal communities dependent to a large extent on successional stage (Gruell 1980). Deer and elk are typically attracted to burned areas, especially after some vegetation regrowth has occurred (Campbell and others 1977). Small mammals and amphibians show a wide variety of responses, with "edge" species typically increasing, and deep forest species decreasing, or even being eliminated.

1) Sixth Level Watersheds

From a wildlife habitat standpoint, Forested Landtype Associations are an important indicator of what species may be found in an area. The Rio Grande National Forest is divided into Landtype Associations (LTA's). LTA's are based on similarities in geology, soils, and plant associations. Six separate LTA's are included within the 6th level watershed analysis and include:

Table 3.17-1: LTA's within 6th-level watersheds

Landtype Associations	Basic Description	Acres within 6th-level watershed
LTA-1	Engelmann Spruce on Mountain Slopes	1,876
LTA-3	White Fir / Douglas-Fir on Mountain Slopes	2,655
LTA-5	Ponderosa Pine and Douglas-Fir on Mountain Slopes	667
LTA-6	Pinyon Pine on Mountain Slopes	622
LTA-9	Thurber Fescue on Mountain Slopes	479
LTA-12	Western Wheatgrass and Other Low Elevation Grasses	36
LTA-12	Western Wheatgrass and Other Low Elevation Grasses	36
TOTAL:		6,335 acres

Wildlife habitat within the sixth[th] level watershed boundary is best described as mainly Pinyon-Juniper Woodlands in lower elevations with a stringer of ponderosa pine occurring at approximately 8,500-9,500 feet. At this elevation and moisture regime, a mixed conifer component occurs with a combination of Douglas Fir-White Fir and a strong component of aspen in some areas. Engelmann spruce forests occur in the higher and wetter areas of the watersheds and are concentrated mainly in the southern half. See Map 6 in the Map Section.

Species Within the Sixth Level Watersheds

Wildlife typically observed within the watershed boundaries include (but is not limited to): mule deer (*Odocoileus hemiones*), least chipmunk (*Tamias minimus*), golden-mantled ground squirrel (*Spermophilus lateralis*), coyote (*Canis latrans*), short-tailed weasel (*Mustela erminea*), red squirrel (*Tamiasciurus hudsonicus*), yellow bellied marmot (*Marmota flaviventris*), snowshoe hare (*Lepus americanus*), gray jay (*Perisoreus Canadensis*), steller's jay (*Cyanocitta stelleri*), clark's nutcracker (*Nucifraga columbiana*), ruby crowned kinglet (*Regulus calendula*), warbling vireo (*Vireo gilvus*) and northern flicker (*Colaptes auratus*)

Species fairly common but typically only seen with effort or chance encounters include (but are not limited to): beaver (*Castor canadensis*), black bear (*Ursus americanus*), elk (*Cervus elaphus*), bobcat (*Lynx rufus*), mountain lion (*Felis concolor*), badger (*Taxidea taxus*), American marten (*Martes Americana*), goshawk (*Accipter gentiles*), three- toed woodpecker (*Picoides tridactylus*), pygmy nuthatch (*Sitta pygmaea*), flammulated owl (*Otus flammeolus*), and downy and hairy woodpeckers (*Picoides pubescens and villosus*).

Other species known or highly suspected but typically not observed other than through intense surveys or by chance encounters includes but are not limited to canada lynx (*Lynx lynx*), boreal owl (*Aegolius funereus*) and wolverine (*Gulo gulo*).

2) Table 3.17-2: LTA's within the salvage sale unit project perimeter.

Landtype Associations	Basic Description	Acres within Project Perimeter
LTA-3	White Fir and Douglas-Fir on Mountain Slopes	581
LTA-5	Ponderosa Pine/Douglas-Fir on Mountain Slopes	4
LTA-6	Pinyon Pine on Mountain Slopes	2
LTA-9	Thurber Fescue on Mountain Slopes	35
LTA-12	Western Wheatgrass and Other Low Elevation Grasses	1
TOTAL:		623 acres

Pre-fire wildlife habitat within the project perimeter is best described as consisting mainly of a mixed conifer component of Douglas and White Fir with an understory of common juniper or kinnikinnick. A strong but suppressed aspen component was also present in several areas but isn't reflected in the LTA's above due to other species being more dominant.

Species Within the Proposed Salvage Sale Perimeter

The Million Fire destroyed or significantly altered the habitat components necessary for most species. The fire was declared out late in the fall, making wildlife surveys impractical. However, as stated previously, it is well known that fire is beneficial to some species and detrimental to others. Species expected to be common in the burn in the immediate future include woodpeckers, (Lewis's, downy and hairy), northern flickers, flycatchers, and mountain bluebirds. Deer and elk are also expected to be attracted to those areas of the burn in which revegetation is occurring. Part VIII in the MIS section lists those species observed by Forest Service personnel in the burn area and salvage sale units during various surveys.

Direct and Indirect Effects

Alternative 1 -- No Action: This alternative would result in the retention of the burned trees within the proposed harvest area perimeter.

Larger mammals and birds in the sixthth level watersheds

Under this alternative, the influence of the Million Fire will remain as the biggest impact upon wildlife and wildlife habitat in the watersheds. Larger, more mobile species such as deer and elk will move through the burn area, browsing and grazing on young grasses and aspen sprouts. However, due to the relative openness resulting from the fire, it is doubtful they will spend significant amounts of time in the area where roads are in close proximity but rather will forage along the edges of the burn while bedding down for the day in unburned areas. Hiding cover was degraded by the fire within the burned area. However, standing, blackened trees do provide some cover from a distance for these species (See Photo 3.17-1). Within the watersheds, adjacent stands of unburned areas will continue to provide hiding cover and forage for larger mammals.

Photo 3.17-1
Example of degraded but still marginally functional hiding cover present following the burn as viewed from FDR 345.

Bird species more adapted to open areas will become more common than those species requiring dense interior forests. Snags within the burn area will be abundant. A study by Hitchcox (1996) showed following a burn, unlogged areas had more cavity-nesting bird species nesting at significantly higher densities compared to salvage-logged areas. Diversity and density of primary cavity-nesting bird species was lower in salvage-logged compared to unlogged areas.

This alternative provides the best option for species diversity for larger mammals and birds within the watershed Analysis Area. It also and best provides for retention of snags, in terms of numbers, distribution, and size for cavity nesters.

Small mammals and amphibians within the salvage sale unit perimeter.
A study by Haim (1994) investigating small mammal recovery after fire, including after salvage logging, demonstrated that original species disappeared after the fire and were replaced by species typical of forest margins. No harvest allowed a return to original species mix in the shortest time due mainly to downed trees providing microhabitat and cover for these species (See Photo 3.17-2). This alternative best provides for small mammals and amphibians by retaining current and future downed debris.

Photo 3.17-2
Example of microclimate habitat provided by downed woody debris in an old harvest unit.

Alternative 2 -- Salvage Harvest, and Alternative 3-Salvage Harvest with Slope Limitations: The differences in potential impacts upon wildlife and wildlife habitat between the two action alternatives are minor and are more associated with the difference in acres being proposed for treatment rather than slope limitations. The difference discussed in this analysis between the three alternatives is summarized in Table 3.17-3.

Larger mammals and birds in the sixthth level watersheds

Under both action alternatives, larger, more mobile species will continue to utilize the area, grazing and browsing on the new growth in a similar fashion as Alternative 1. Removal of standing dead trees will decrease hiding cover for these species in the harvest units (Grifantini 1991). However, not all of the standing dead will be removed providing some hiding cover for these species from a distance. Overall, the action alternatives may make these species slightly more vulnerable to disturbance, but use of the salvaged units by these species will be similar to Alternative 1 and species use and movement patterns resulting from the action alternatives will not be significantly different than Alternative 1. Logging activities will result in some ground scarification, which in turn may improve the growing conditions for revegetation to occur, benefiting wildlife. Within the Analysis Area, adjacent stands of unburned areas will continue to provide hiding cover and forage for larger mammals.

The area will be more open due to the fire but salvage activities will add to this openness. Bird species will be those more adapted to open areas such as mountain bluebirds, flycatchers and flickers. Salvage activities will remove much of the larger dead tree component from the salvage perimeter. Hitchcox 1996 showed that overall, bird abundance and nest densities were lower in post-fire forest stands that were logged, and fewer sites in logged stands were suitable for nesting. In his study, the availability of suitable nesting trees appeared to explain patterns of nest abundance for some species but not for others.

Salvage activities will focus on removal of the larger trees with approximately 50-80% in the 8”DBH class and above size class being removed. The majority of the trees in smaller size classes will remain. Most species of birds select larger than average trees for nesting, in both logged and unlogged plots (Hitchcox 1996). Nesting and foraging opportunities will be reduced under these alternatives. However, Forest Plan Standards and Guidelines for snag retention will be met in the harvest units and snag habitat will remain well above Standards and Guidelines in the unharvested areas of the burn (>90% of the burn will not be harvested) and in adjacent unburned areas.

Small mammals and amphibians within the salvage sale unit perimeter

Postfire logging normally removes a great percentage of large dead woody structure and thus has the potential for significantly changing postfire habitat for these species (Lindenhayer and Possingham 1995, 1996). These changes include structural effects, such as removal of existing and future snags and large woody material, and functional effects, such as reduction in insect populations that serve as food for various wildlife species (Blake 1982, Saab and Dudley 1998, Sallabanks and McIver 1998).

Overall, with removal of current and future downed woody debris from the harvest units, the action alternatives will reduce the current and future habitat effectiveness of the project perimeter for recovery of small mammal and amphibian populations within the sites. However, similar to the effects described for more mobile species, 94% of the burn will not be harvested and adjacent unburned areas will continue to provide habitat for these species.

Cumulative Effects

Cumulative effects include a combination of past impacts of activities and events within the areas and other ongoing or planned activities.

Activities and events which have taken place, are ongoing or are foreseeable future actions, include timber sales (including Unit C of the Million Fire Small Sale Salvages), firewood cutting, cattle grazing and various recreational activities including hiking, mountain biking, motorized trail use, and hunting. In comparison to other areas on the Forest, this area is moderately to heavily roaded.

None of the alternatives are precedent setting. The preferred alternative, and associated activities will not automatically trigger other projects, which might have similar effects on this area. Any future actions, which may be proposed by the Forest Service, will be studied and an independent evaluation will be made of the cumulative effects of those actions. There are no other known or anticipated projects in this Analysis Area which cumulatively might detrimentally impact wildlife or wildlife habitat.

Summary

Implementation of the action alternatives will have little impact upon the long and short-term recovery of the area for wildlife. Larger species of wildlife will increasingly utilize the area as revegetation occurs. There will be fewer snags available within the project perimeter for snag-dependant species, but the harvest units, adjacent unharvested areas and unburned areas will all meet or exceed Forest Plan Standards and Guidelines for snag retention. Recovery of smaller, less mobile species, may be delayed in the specific harvest units due to removal of current and future downed woody debris.

Table 3.17-3. Alternative Comparison.

WILDLIFE **Potential Impacts upon:**	**Alternative 1**	**Alternative 2**	**Alternative 3**
Hiding Cover	No effect	Minor Effect upon 623 acres.	Minor Effect upon 560 acres.
Snag Density/Size	No effect	Minor Effect upon 623 acres.	Minor Effect upon 560 acres.
Woody Debris on Forest Floor	No effect	Minor Effect upon 623 acres.	Minor Effect upon 560 acres.

Threatened, Endangered, Sensitive and Proposed Species

Scope of the Analysis

Specific issues identified during the scoping process included potential short and long-term impacts upon TESP species, particularly lynx. This analysis discusses TESP species and the potential impacts of the salvage sales upon these species and their habitats. This

analysis tiers to the more in-depth analysis within the Biological Assessment/Evaluation completed for this project which are Appendices 2 and 3.

The U.S. Fish and Wildlife Service received a copy of the Biological Assessment on July 15, 2003 and concurred with the assessment's determination that the action alternatives are not likely to jeopardize the continued existence of the Canada lynx on October 14, 2003. This determination was based off of the following facts; "that there will be no conversion of habitat types in the LAU as a result of the salvage sale (the area was already converted into non-habitat by the Million Fire), no new roads will be constructed which would further fragment the habitat, no additional snow compaction, and no (lynx) denning or winter foraging habitat will be degraded".

The analysis contains three separate analysis boundaries due to differences in species home ranges and mobility. These boundaries include:

1) ***Lynx and Wolverine*** - the Trout-Handkerchief Lynx Analysis Unit which best reflects the likely home ranges of these two species.

2) ***Larger mammals and Avian Species*** – two sixth level watersheds a) Watershed # 130100011503 and b) Wateshed # 130100011505. These watersheds best reflect the likely home ranges of these species.

3) ***Small Mammals and Amphibians*** – the perimeter of the proposed salvage sale units, which best reflects the home ranges of these species.

Pre Million Fire Condition

Pre-fire wildlife habitat within the proposed salvage sale units is best described as consisting mainly of a mixed conifer component of Douglas and White Fir with an understory of common juniper or kinnikinnick. A very strong aspen component was also present in several areas but was being outcompeted and lost due to conifer encroachment. See Table 3.17-2: LTA's within the project perimeter.

Post Million Fire Condition

The vast majority of the Million Fire burn perimeter burned moderately to severe resulting in a moonscape appearance. The salvage sales are focused in those areas which burned the most severe and on only those trees which are obviously dead or dying within 6% of the burn area. The remaining 94% of the burn is not being considered for salvage sale activities.

Short term: In the short term (1-10 years), that part of the analysis area including the salvage sale units, which was moderately to heavily burned will no longer provide habitat for most TESP species with the exception of Lewis' woodpecker, olive-sided flycatchers and northern three-toed woodpeckers. There will be little to no habitat for smaller mammals and amphibians with the exception of the edges of the burn and pockets of unburned areas. More mobile TESP species such as lynx, wolverine, goshawk and marten will move through the area while hunting but it is unlikely that they will spend a significant amount of time in the area.

Long term: In the long term (10-20 years), the area should once again provide habitat for those TESP species prey items as a whole including the salvage sale units, which require early successional habitats, such as snowshoe hare and blue grouse. This potential increase in prey items may attract species such as lynx, marten and wolverine from unburned areas into the outer edges of the burn.

Existing Condition

Lynx Analysis Units (LAU's)

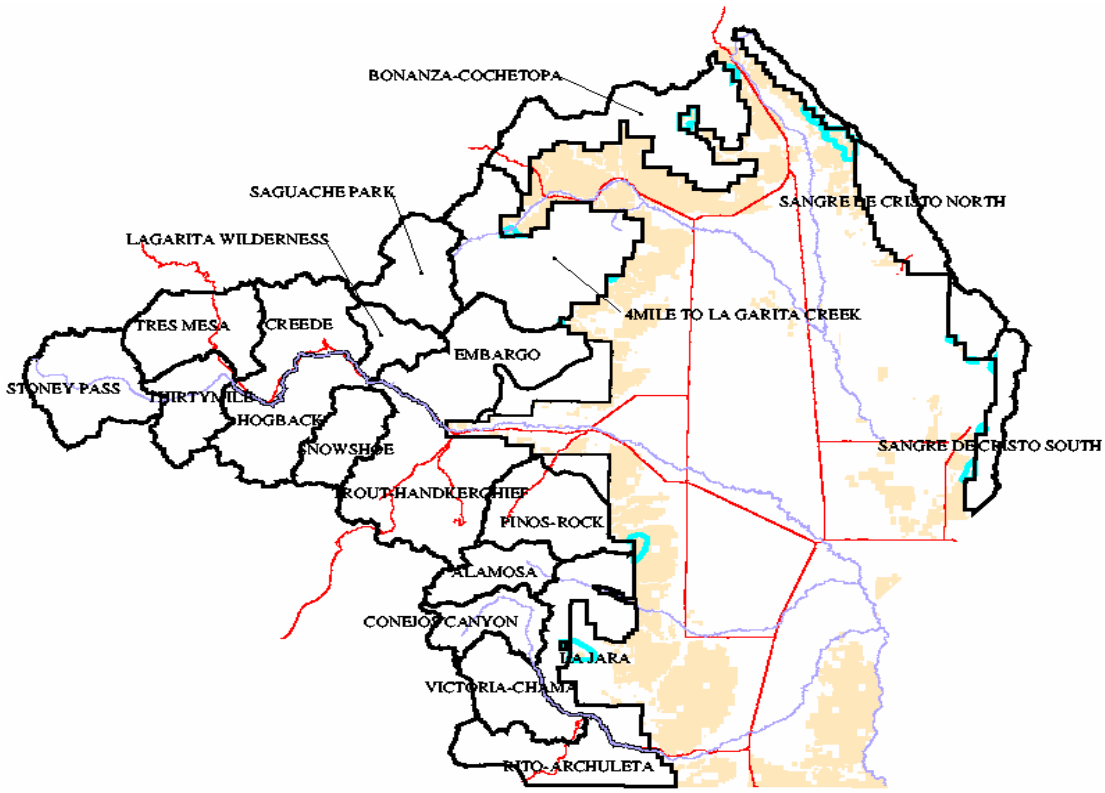
LAU's serve as baseline landscape units from which long-term trends in landscape change can be tracked (Figure 3.17-1). In concept, LAU's are intended to reflect an average female lynx home range in size and landscape.

The Forest's LAU's were delineated utilizing fifth level watersheds. In several instances, LAU boundaries were divided along major features other than watersheds such as major roads and the Rio Grande River. A total of 20 LAU's have been identified on the Forest.

LAU's range in size from 38,000 acres to over 183,000 acres and encompass a variety of habitat types. The Rio Grande National Forest is at the southern-most boundary of the Southern Rocky Mountain Lynx Geographic Area. Larger blocks were identified based on information included within the Lynx Conservation Assessment and Strategy document, which suggests that lynx home ranges at the periphery of their range are typically larger than those in other areas due to patchiness of habitat. The USFWS has reviewed and concurred with the Forest's LAU mapping, which serve as the best representation of land area that can be used by an individual lynx based on topography and vegetation.

The Trout-Handkerchief LAU is one of the largest LAU's on the Forest and is over 176,000 acres. This LAU is best characterized as moderately to heavily roaded and contains ponderosa pine in lower elevations, which changes into a mixed conifer and aspen forest type with increasing elevation. North slopes are characterized by Engelmann spruce and Douglas-fir forests. Beaver Creek Reservoir, Poage Lake and Alberta Reservoir are located within the LAU.

Figure 3.17-1. Rio Grande National Forest Lynx Analysis Units (LAU's).



TESP Species Within the LAU: This Analysis Area is specifically for lynx and wolverine, two species with large home ranges that utilize a variety of habitat types during various times of the year. The Million Fire was located completely within the Trout-Handkerchief Lynx Analysis Unit. Pre-Fire habitat conditions are listed in the table below.

Table 3.17-4: Pre– Fire conditions for the Trout-Handkerchief LAU

Description/LAU (#20913)	**Pre-Fire Habitat Acres and Percentages**
Total Acres within LAU	176,750
Total Acres of Lynx Habitat within LAU	134,216 (75.94%)
Acres and Percent of Denning Habitat	54,906 (40.90%)
Acres and Percent of Winter Habitat	15,829 (11.79%)
Acres and Percent of Other Habitat (Low Quality and Summer Forage)	43,363 (32.30%)
Acres and Percent of Lynx Habitat within LAU in a Suitable Condition	114,097 (85.00%)
Acres and Percent of Lynx Habitat within LAU in an Unsuitable Condition	20,119 (14.99%)

Sixth Level Watersheds

Sixth level watershed condition and wildlife habitat was previously addressed in the Wildlife Section.

TESP species known or suspected of occurring in the watersheds include: bald eagle (*Haliaeetus leucocephalus*), mountain plover (*Charadrius montanus*), boreal owl

(*Aegolius funereus*), flammulated owl (*Otus flamineolus*), fox sparrow (*Passerella iliaca*), golden-crowned kinglet (*Regulus satrapa*), goshawk (*Accipter gentiles*), Lewis' woodpecker (*Melanerpes lewis*), olive-sided flycatcher (*Contopus borealis*), osprey (*Pandion haliaetus*), three-toed woodpecker (*Picoides tricactylus*), marten (*Martes Americans*) and Townsend's big-eared bat (*Corynorhinus townsendii townsendii*).

Salvage Sale Unit Perimeter

Project perimeter condition and wildlife habitat was previously addressed in the Wildlife Section. Overall, habitat within the project perimeter was severely burned by the Million Fire. The vast majority of the project site is currently not providing adequate habitat for most species due to the intensity of the fire destroying or significantly altering the habitat components necessary for most TES species.

More detailed information on species-specific existing habitat within the area of influence and the project site is presented within the Biological Assessment/Biological Evaluation (BA/BE) in Appendices 2 and 3.

TESP species with small home ranges and limited mobility, which may have been in the project perimeter pre-fire include: boreal toad (*Bufo boreas boreas*), northern leopard frog (*Rana pipiens*), tiger salamander (*Ambystoma tigrinum*), and dwarf shrew (*Sorex nanus*).

Direct, Indirect and Cumulative Effects

This affects analysis tiers to the more in-depth analysis within the BA/BE completed for the Million Fire salvage project. Table 3.17-5 summarizes the TESP wildlife addressed in this analysis and the effects determination made by Alternative. The summary below includes only those species with habitat or potential habitat present within the analysis areas. See Appendices 2 and 3 for all species evaluated.

Table 3.17-5. TES Determinations

SPECIES **(T) Threatened** **(E) Endangered** **(S) Sensitive** **(P) Proposed**	**Alternative 1** **No Action**	**Alternative 2** **Salvage Harvest**	**Alternative 3** **Slope Limits**
Bald Eagle (T)	NE	NE	NE
Canada Lynx (T)	NE	NLAA	NLAA
Mountain Plover (P)	NE	NE	NE
Boreal Toad (S)	NI	NI	NI
Northern Leopard Frog (S)	NI	NI	NI
Tiger Salamander (S)	NI	NI	NI
Boreal Owl (S)	NI	MI	MI
Flammulated Owl (S)	NI	MI	MI
Fox Sparrow (S)	NI	NI	NI
Golden-Crowned Kinglet (S)	NI	NI	NI
Goshawk (S)	NI	MI	MI
Lewis' Woodpecker (S)	NI	MI	MI
Olive-Sided Flycatcher (S)	NI	MI	MI
Osprey (S)	NI	NI	NI
Peregrine Falcon (S)	NI	NI	NI
Pygmy Nuthatch (S)	NI	MI	MI
Three-Toed Woodpecker (S)	NI	MI	MI
Dwarf Shrew (S)	NI	MI	MI
Marten (S)	NI	MI	MI
Townsend's Big-Eared Bat (S)	NI	MI	MI
Wolverine (S)	NI	MI	MI

Threatened, Endangered and Proposed Species
NE - No Effect
NLAA - May Effect, but Not Likely to Adversely Effect
LAA- May Effect, Likely to Adversely Affect

Sensitive Species
NI - No Impact
MI - May Impact Individuals but is not likely to cause a trend towards Federal listing or result in loss of viability in the planning area.
BI - Beneficial Impact
LI - Likely to Result in a trend towards Federal listing or loss of viability in the planning area.

Cumulative Effects

Cumulative effects for TESP species are the same as those described in the Wildlife Section. Specific projects with potential to impact lynx habitat within the LAU are described below:

The Trout-Handkerchief LAU is the most heavily impacted LAU on the Forest. The area was heavily harvested and roaded in the 1970's and 80's but no large timber sales have occurred recently. In addition to the Million Fire, several ongoing or planned vegetation management altering activities include: 1) Million Fire Salvage Sale 2) Million Fire Small Salvage Sales 3) Beaver Creek II Timber Sale 4) Shaw Divide Aspen Sale and several timber sales associated with the Handkerchief Mesa Analysis. Impacts from the Handkerchief sales will be analyzed when, and if, a decision to pursue the sales is made.

Table 3.17-6: Proposed and Cumulative Effects to the Trout-Handkerchief LAU.

HABITAT	MILLION FIRE	MILLION SALVAGE SALE	MILLION SMALL SALVAGE SALES	BEAVER CREEK II TIMBER SALE	SHAW DIVIDE ASPEN SALE	NET CHANGE
Lynx Denning Habitat	-3,093 acres	No change	No change	-27 acres	No change	-3,120 acres
Lynx Winter Foraging	-1,396 acres	No change	No change	+27acres -70 acres	-5 acres	-1,444 acres
Other or Summer Foraging	-1,298 acres	No change	No change	+70 acres	+5 acres	-1,223 acres
Unsuitable Habitat	+5,787 acres	No change	No change	No change	No change	+5,787 acres

Cumulatively, from the five projects addressed, there are several separate impacts. These changes can be tracked in the above table and are referenced below:

1) The Million Fire converted all suitable lynx habitat within its boundary into unsuitable habitat.
2) The Million Salvage Sales are occurring in habitat already converted into unsuitable habitat.
3) The Beaver Mtn II Timber Sale will result in converting 27 acres of denning habitat into winter foraging habitat and 70 acres of lynx winter foraging habitat into summer or other foraging habitat.
4) The Shaw Divide Aspen Sale will result in converting 5 acres of lynx winter foraging habitat into lynx summer or other foraging habitat.
5) Future lynx denning/winter foraging habitat will be not be “degraded” into a lesser quality by removal of dead standing trees. It will be approximately 200-300 years before the salvage units are once again providing a mature, mixed-conifer habitat type, at which time it is doubtful that any of the remaining burned trees will be providing denning/winter habitat structure important to lynx.

Table 3.17-7. Expected cumulative effects change in lynx habitat as a result of proposed and cumulative activities.[a]

Description/LAU (20913)	Pre-Fire	Expected Condition from all vegetative manipulation projects/events
Total Acres within LAU	176,750	176,750
Total Acres of Lynx Habitat within LAU (Includes capable but not currently suitable)	134,216 (75.94%)	134,216 (75.94%)
Acres and Percent of Denning Habitat	54,906 (40.90%)	51,786 (38.58%)
Acres and Percent of Winter Habitat	15,829 (11.79%)	14,390 (10.72%)
Acres and Percent of Other Habitat (Low Quality and Summer Forage)	43,363 (32.30%)	42,135 (31.39%)
Acres and Percent of Lynx Habitat within LAU in a Suitable Condition	114,097 (85.00%)	108,311 (80.69%)
Acres and Percent of Lynx Habitat within LAU in an Unsuitable Condition	20,119 (14.99%)	25,906 (19.30%)

[a] This table reflects the changes or potential changes resulting from the expected cumulative effects to lynx habitat from all vegetative projects and the Million Fire Event within the LAU.

Summary

Implementation of the action alternatives will have little impact upon the long and short-term recovery of the area for TESP species.

The Trout-Handkerchief LAU will continue to meet the Standards and Guidelines within the LCAS, which includes limiting the amount of unsuitable habitat within an LAU to no more than 30% (19.30% in the Trout-Handkerchief LAU) and will not result in degrading future lynx denning and winter foraging habitat.

Concurrence with this determination for lynx was received by the US Fish and Wildlife Service on October 14, 2003.

Management Indicator Species

I. BACKGROUND

This section discusses the selected MIS Species and the potential impacts of the salvage sale upon these species and their habitats. Specific MIS related issues identified during the scoping process include potential impacts upon snags and cavity-nesting birds and maintenance and improvement of big game winter range.

The Rio Grande National Forest has 9 Management Indicator Species. Four species were selected as Management Indicator Species due to presence in the project area, habitat availability, management affects on habitat and as a result of the issues identified during internal and external scoping. The selected species include mule deer, elk, pygmy nuthatch and hermit thrush. Rationale for selection and non-selection of species is further addressed in Section II, MIS selection summary.

Pre Million Fire Condition within the salvage sale units
Pre-fire wildlife habitat within the proposed salvage sale units is best described as consisting mainly of a mixed conifer component of Douglas and White Fir with an understory of common juniper or kinnikinnick. A strong aspen component was also present in many areas but was being outcompeted and lost due to conifer encroachment. See Table 3.17-2: LTA's within the project perimeter.

Post Million Fire Condition within the salvage sale units
The vast majority of the Million Fire burn perimeter burned moderately to severe resulting in a moonscape appearance. The salvage sales are focused in those areas which burned the most severe and on only those trees which are obviously dead or dying within 6% of the burn area. The remaining 94% of the burn is not being considered for salvage sale activities.

SUMMARY

Short term effects: In the short term (1-10 years), the area of the salvage sale units, which was moderately to severely burned will no longer provide optimum habitat for the four MIS species due to the impacts of the Million Fire. Mule deer and elk will move through the area browsing and grazing on young nutritious grasses and aspen sprouts but will retreat into unburned areas or isolated parts of the burn for hiding cover, this is especially true for elk. It is likely that by the end of the first decade, the area will be very attractive to ungulates. Pygmy nuthatch and hermit thrush are expected to utilize the edges of the burn and salvage units but are not expected to spend a significant amount of time in the heart of the area. By the end of the first decade, use in the interior portion of the burn and salvage units by these two species is expected to increase particularly by hermit thrush, if a shrub component is beginning to become established.

Long term effects: In the long term (10-20 years), the area should once again provide habitat for those species requiring early successional habitats, including mule deer. Aspen stands will be of the height where adult deer and elk can utilized the stands as hiding cover. Use of the area by pygmy nuthatch and hermit thrush is expected to increase.

II. Table 1: MIS Selection Summary

SPECIES SELECTED	RATIONALE
Mule Deer	Indicator of road density, early successional vegetative conditions and other related forest disturbances. Identified during scoping as an issue based upon the Million Fire burning within mule deer winter range and 468 acres of the proposed sale being located within higher elevation winter range.
Elk	Indicator of road density and other related forest disturbances. Identified during scoping as an issue based upon the Million Fire burning within elk winter range and 468 acres of the proposed sale being located within higher elevation winter range.
Pygmy Nuthatch	Indicator of ponderosa pine habitat types and utilizes snags and cavities. Helps meet issues identified during the scoping process.
Hermit Thrush	Life history is tied closely with mature spruce/fir forests but also relies upon complex forest floor components such as shrub development and woody debris for foraging and nesting. May indicate recovery of the area from the burn as species begins to utilize the area.

Rationale for species selected:

Mule Deer – This species is an indicator of road density, early successional vegetative conditions and other related forest disturbances. Population estimates from the Colorado Division of Wildlife indicate that there are currently 19,700 mule deer within the four Data Analysis Units on the Forest. Herd population estimates have not been met (see population objective table under mule deer) in most DAUs since the late 1980's. Specific harvest regulations are administered by the Colorado Division of Wildlife to improve herd numbers and achieve population objectives. The Rio Grande National Forest manages habitat and uses on the Forest to promote winter range and reduce harassment during critical periods.

Mule Deer were selected due to issues raised during scoping and due to special interest locally (economic and recreational values). Additionally, 5,260 acres of the burn and 468 acres within the proposed harvest areas are located within Management Prescription 5.41 – Deer and Elk Winter Range. The intent of this prescription is to manage the area

to supply adequate amounts of quality forage, cover, and solitude for deer, elk and other species while on winter range. These areas consist of both forested and non-forested habitats, generally in the lower-elevation fringes of the Forest.

The Million Fire has converted the area into an earlier successional landscape generally preferred by mule deer and whose use of the area can be used to indicate the recovery of the burn area including within the salvage sale perimeter. Accordingly, mule deer were selected as an MIS for the Million Salvage Sale.

Elk - This species is an indicator of road density and other related forest disturbances Population estimates from the Colorado Division of Wildlife indicate that there are currently 17,000 elk within the four Data Analysis Units on the Forest. Herd population estimates have been over objective (see population objective table under elk) since the late 1980's. Specific harvest regulations are administered by the Colorado Division of Wildlife to reduce herd numbers and achieve population objectives. The Rio Grande National Forest manages habitat and uses on the Forest to promote winter range and reduce harassment during critical periods.

Elk were selected due to issues raised during scoping and due to special interest locally (economic and recreational values). Additionally, 5,260 acres of the burn and 468 acres within the proposed harvest areas are located within Management Prescription 5.41 – Deer and Elk Winter Range. The intent of this prescription is to manage the area to supply adequate amounts of quality forage, cover, and solitude for deer, elk and other species while on winter range. These areas consist of both forested and non-forested habitats, generally in the lower-elevational fringes of the Forest.

The Million Fire has converted the area into a landscape consisting of a mixture of habitat types containing important habitat components for elk such as hiding and feeding habitat. Accordingly, elk were selected as an MIS for the Million Salvage Sale.

Pygmy Nuthatch – This species is an indicator of mature ponderosa pine and represents snag users and cavity nesters. The Natural Heritage Ranking for this species is demonstrably secure globally. Trend for this species as indicated by the Colorado Breeding Bird surveys for this area are unclear (RGNF Pygmy Nuthatch Assessment 2003) but show a slightly downward trend for the Southern Rockies region. Analysis based on the potential habitat and average territory size (9 acres/pair) indicates that the Forest may be capable of supporting a maximum density of 4,075 pairs (Gillian 2002).

Pygmy Nuthatch was selected as an MIS species for this analysis due to the identified issue of snag retention and cavity nesters. The pygmy nuthatch is highly associated with ponderosa pine systems throughout its range but can also be found in mixed conifer/ponderosa pine stands (particularly if a high snag component is present) which are in close proximity. They are considered primary cavity excavators and require snag habitat for nesting and roosting purposes. Ponderosa pine is not a major component of the salvage sale but is found in the lower elevational boundary of the burn and occurs in limited areas within the proposed harvest perimeter.

Hermit Thrush – This species is an indicator of mature and old growth forests on the RGNF. On a national scale and at the scale of the local Southern Rockies-Colorado Plateau Bird Conservation Region, the hermit thrush shows an increasing trend. At the scale of the local Southern Rocky Mountains province, however, the hermit thrush shows a slightly decreasing trend; reasons for this are as yet unknown. Population estimates obtained from the Colorado Breeding Bird Atlas estimate a higher end abundance of 17,060 pairs of hermit thrush in suitable habitat on the Forest (Gillian 2002).

The Hermit Thrush was selected because of its association with spruce/fir, which is a major component in the 6th level watershed (and was a major component in the salvage sale perimeter pre-burn) and is commonly associated with, but not restricted to, older forest structure. It is tied to complex structural forest elements and may represent mature to late-successional forest floor characteristics. Hermit thrush have been found to recolonize burned boreal forests in a relatively short time frame (approximately 10 years) in various numbers depending upon the burn intensity and shrub regeneration progress. This species was selected over Brown Creeper because it has a higher likelihood of inhabiting the burn area earlier than the creeper, thus better serving as a management indicator species.

SPECIES NOT SELECTED	RATIONALE
Rio Grande Cutthroat Trout (or proxies, ie. brook, rainbow and brown trout)	Indicator of the health of montane aquatic ecosystems. No fish bearing streams are present.
Wilson's Warbler	Indicator of the health of willows and riparian communities. No riparian communities are located within the sale perimeter.
Lincoln's Sparrow	Indicator of the health of willows and riparian communities. No riparian communities are located within the sale perimeter.
Vesper Sparrow	Indicator of the health of upland bunchgrass/shrub communities. No suitable habitat is located within the sale perimeter.
Brown Creeper	Indicator of mature and old growth forests particularly spruce/fir. Suitable habitat was eliminated by the Million Fire.

Rationale for species not selected:

Rio Grande Cutthroat Trout (or proxies) – This species is an indicator of the health of montane aquatic ecosystems. According to the USFWS, it is estimated that there are currently 161 waters in Colorado and 106 waters in New Mexico that contain RGCT. Not all of these waters support naturally reproducing, stable populations of genetically pure RGCT that are free of nonnative salmonids. Only 13 waters have been designated with "core' conservation populations of RGCT, 3 in Colorado and 10 in New Mexico. A core conservation population of RGCT supports at least 2500 total individuals, has a genetic purity of less than 1% introgression and has no nonnative salmonids. On the Rio Grande, approximately 1,050 miles of streams and over 1,200 lake surface acres provide trout habitat. Core (>99% genetically pure) and conservation populations (>90% pure) of RGCT are typically restricted to smaller 6th or 7th level streams and currently occupy less than 200 stream miles. CDOW has stocked RGCT (recreational populations) in an additional 150 miles of stream and 59 high mountain lakes for the purpose of providing sport fishing opportunities and to maintain genetic refugia for pure populations.

No populations of Rio Grande Cutthroat Trout or proxies (ie. brown trout, rainbow trout or brook trout) are present within the salvage sale perimeter. The salvage sale perimeter contains no perennial streams nor contains any drainages which empty into streams containing a fishery. Brook trout were historically recorded in two streams within the fire perimeter but these fisheries were eliminated following large rain events and subsequent mud flow brought upon by the Million Fire. Accordingly, no fish bearing streams are present within the watersheds and Rio Grande Cutthroat Trout and proxies were not selected as MIS species for the salvage sale project.

Wilson's Warbler – This species is an indicator of the health of willows and riparian communities. The Colorado Breeding Bird Atlas documented Wilson's warblers as breeders in a high percentage of the survey blocks in the mountainous areas of the state that contained willow communities above 9,000 feet elevation.

No riparian communities are located within the boundary of the salvage sale units nor will riparian communities within the 6th level watershed be influenced by activities associated with the salvage sale. Accordingly, Wilson's warbler was not selected as an MIS for the project.

Lincoln's Sparrow – This species is an indicator of the health of willows and riparian communities. The Colorado Breeding Bird Atlas documented Lincoln's sparrow as breeders in a high percentage of the survey blocks in the mountainous areas of the state.

No riparian communities are located within the boundary of the salvage sale units nor will riparian communities within the 6th level watershed be influenced by activities associated with the salvage sale. Accordingly, Lincoln's sparrow was not selected as an MIS for the project.

Vesper Sparrow – This species is an indicator of the health of upland bunchgrass/shrub communities. The Colorado Breeding Bird Atlas lists the vesper sparrow as the most abundant species in mountain grasslands.

Primary habitat for vesper sparrows on the Rio Grande NF occurs in montane and lower elevation grasslands that occupy about 12% of the Forest landbase. No suitable habitat is within the boundaries of the salvage sale units nor will grasslands outside the boundary be influenced by activities associated with the salvage sale. Accordingly, the vesper sparrow was not selected as an MIS for the Million Salvage Sales.

Brown Creeper – This species is an indicator of mature and old growth forests on the RGNF. Population trend ratings for brown creepers in the southern Rocky Mountains province indicate a stable or undetectable trend, while those at the Bird Conservation Region level indicate a slightly increasing trend.

Suitable habitat for this species was eliminated by the Million Fire. Due to the specialized habitat needs of this species (mature and old growth forests) it is doubtful that this species will utilize any area of the Million Fire boundary (including the salvage sale boundary) with the exception of the burn's edge for many decades. The hermit thrush

which also represents mature and old growth forests, is a more appropriate MIS for this habitat types and project. For these reasons, the brown creeper was not selected as an MIS for the Million Salvage Sales.

III. SCOPE OF THE ANALYSIS

This analysis contains two separate analysis boundaries for the four selected MIS species. These boundaries include for mule deer and elk, the Lower Rio Grande Data Analysis Unit which reflects the herd units for these two species and for pygmy nuthatch and hermit thrush, the two sixth level watersheds (Map 6) which best reflects the probable area of genetic exchange for these species.

A) MULE DEER: The Colorado Division of Wildlife (CDOW) manages for herds of big game animals within distinctive boundaries referred to as Data Analysis Units or DAUs. These DAUs are geographically discrete and contain distinct big game populations which are managed to support and accomplish the objectives of CDOW's Long Range Plan and meet the public's objectives for big game. The DAU used for this analysis is the Lower Rio Grande Mule Deer Data Analysis Unit or D-35 (RGNF Mule Deer Species Assessment 2003).

1. Existing Condition within the Lower Rio Grande Mule Deer DAU

The DAU includes Game Management Units 80 and 81**.** The DAU is 2,077 square miles encompassing approximately 700,000 acres and includes portions of Rio Grande, Conejos, Mineral, and Archuleta Counties. The DAU is bounded by US Highway 160 on the north, the continental divide on the west, the New Mexico state line to the south, and the Rio Grande River to the east.

The main geographic features are the San Juan Mountains, which rise to nearly 14,000 feet to the west along the continental divide and the Rio Grande River, which is at 7,500 feet elevation at the New Mexico state line. The climate is highland or mountain climate with cool summers and very cold winters with heavy snows. The higher elevations of the San Juan Mountains receive 50 inches of precipitation yearly, while the foothills receive 12 to 16 inches and the valley floor gets only 7 to 8 inches a year and is considered high desert.

The lower elevations are grassland/shrub and agricultural lands but as elevation and precipitation increase, the vegetation changes to pinyon-juniper, ponderosa pine, then Douglas fir and white fir combined with extensive stands of aspen. Between 9,500 and 12,500 feet stands of Engelmann spruce and subalpine fir predominate. Extensive areas of alpine tundra occur above 12,500 feet.

Deer generally occupy the DAU from the grassland/shrub and pinyon/juniper areas of the foothills on the winter range through all vegetative zones up to the alpine tundra during the summer and early fall. Another distinct population of deer spends the majority of the year in the riparian and agricultural areas of the valley floor especially along the Rio Grande River. It appears that the valley population of deer is increasing, while those occupying the higher elevation traditional ranges have decreased over the last ten years.

Deer movement to winter range is dictated by weather with snow and limited forage availability driving the deer to lower elevations. This movement usually occurs during November and continues until January. The migration of deer is usually elevational in most of the DAU. Some deer in the riparian areas west of Del Norte will move to higher elevations on traditional winter ranges if the snow depth in the river bottoms becomes too great. There is evidence that some deer that summer on the western side of the DAU may winter west of the Continental Divide or in northern New Mexico.

2. Existing Condition within the Salvage Sale Unit Perimeter

The Million Fire converted approximately 9,222 acres of mid to late successional vegetation into an early, seral stage favored by mule deer. Aspen shoots and other mule deer browse species are beginning to resprout in the salvage sale perimeter along with limited grasses. Areas which experienced a severe burn are not revegetating as well as other areas which experienced a low severity burn. Mule deer use of the salvage sales at this point appears low but is expected to increase as the area revegetates.

3. Direct and Indirect Effects

a) Alternative 1 -- No Action: This alternative would result in the retention of the burned trees within the proposed harvest area perimeter.

The Lower Rio Grande DAU has never been considered a good deer unit (Lower Rio Grande Mule Deer DAU Plan, CDOW). A high elevation winter range lacking in abundant browse and hard winters lower the quality of the habitat in the DAU for deer. Mule deer have been under herd objective in the DAU since 1982. Livestock grazing, competition between elk, decrease in early seral conditions, predation, loss of habitat and in general, low productivity of winter ranges may all be cumulatively impacting mule deer not only in Colorado, but throughout the west (RGNF mule deer species assessment 2003).

Overall, mule deer should have long-term benefit from the Million Fire once vegetation begins to reestablish. Short-term impacts include loss of hiding cover due to removal of tree limbs and shrubs during the fire, temporary loss of forage and displacement (Grifantini 1991). However, in the longer term, mule deer hiding cover and browse should become more abundant throughout the majority of the burn and the burn will be a positive event for mule deer.

Aspen is expected to be a significant tree species emerging in the burn in areas where conifer encroachment had either limited aspen regeneration previously or eliminated it all together. Aspen and vegetation associated with aspen stands are an important food source for mule deer (see Photo 3.17-3).

Photo 3.17-3
Resprouting aspen in the Million Fire approximately 3 months following the burn.

This alternative and its relationship to mule deer habitat and management as a whole within the DAU is not expected to impact this species viability in the future nor will it cause a significant population shift or change in population numbers within the DAU as a whole. This is due to a temporary shift of deer into better habitat, and a small direct loss of animals that may have been caught in the fire. In the long-term, better forage and cover should allow deer to return to pre-fire population levels.

b) Impact upon Population

Population trends of mule deer within the DAU are determined by CDOW based upon harvest data, sex and age composition of the herd, and mortality factors including wounding loss and winter severity. Post hunt herd composition is acquired by aerial surveys usually completed in early winter. This information is then input into a POP II model to determine post-hunt population trend (Lower Rio Grande Mule Deer DAU Plan, CDOW).

Based on information provided by the POP II Model (DAU Plan) , approximate Post-Hunt Population Numbers from 1980-2003 include:

Population Objective is 8,500

1980	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**
7600	9000	8250	8450	7450	8100	7450	6950	6450	6500	6550	6600

1992	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
6800	6810	6650	6600	6800	6810	7265	7400	7450	7400	7620	7850

Alternative 1 is not expected to have significant impacts upon the population objectives and population trend within the DAU. Local herds in the South Fork and Del Norte area may increase slightly due to improved foraging habitat resulting from the fire (earlier successional stage) but not in sufficient numbers to move the DAU much closer to population objective or to show a significant change. Mule deer population numbers within the DAU are most heavily impacted and managed by the number of yearly hunting permits issued. The number of hunting permits combined with other factors such as

private development of winter range and competition with elk will continue to play more significant roles in impacting the population trend for mule deer within the DAU.

a) Alternative 2 -- Salvage Harvest and Alternative 3 Salvage Harvest with Slope Limitations:

As discussed in the Wildlife Section, under both action alternatives, mule deer will continue to utilize the area, grazing and browsing on the establishing new growth in a similar fashion as Alternative 1. Removal of standing dead trees will decrease hiding cover for these species in the harvest units (Grifantini 1991). However, some of the standing dead trees will be retained providing shielding for deer and elk from a distance (See photo 3.17-1). Overall, the action alternatives may make these species slightly more vulnerable to disturbance but use of the salvaged units by these species will be similar to Alternative 1. Mule deer use and movement patterns resulting from the action alternatives will not be significantly different than Alternative 1. Logging activities will result in some ground scarification, which in turn may improve the growing conditions for revegetation to occur, benefiting wildlife. Within the burn perimeter, adjacent stands of unburned or lightly burned areas will continue to provide hiding cover and forage for larger mammals.

These alternatives and their relationship to mule deer habitat and management as a whole within the DAU is not expected to impact this species viability in the future nor will it cause a significant population shift or change in population numbers within the DAU as a whole.

b) Impact upon Population

Neither action alternative is expected to have a significant impact upon the population objectives and population trend within the DAU. Similarly to Alternative 1, local herd numbers may increase slightly but not in large enough numbers to impact the population objective within the DAU as a whole. Mule deer within the project perimeter may be more vulnerable in the hunting season as the result of a decrease in hiding cover (particularly near open system roads). However, the number of hunting permits within the DAU will continue to be limited, restricting the number of animals harvested in the DAU which is intended to help meet overall DAU population objectives.

4). SUMMARY TABLE for Mule Deer, effects upon habitat and population

MULE DEER	Acres of habitat	Estimated Population Status	Comments
Pre-Fire Suitable Habitat within the DAU.	Approximately - 700,000 acres -215,000 acres of winter range in the DAU.	7,850 within the DAU	Numbers of deer are managed by CDOW mainly by the number of hunting licenses.
Post-Fire – Habitat converted into an earlier successional stage within the DAU for mule deer by the Million Fire.	5,260 acres burned	7,850 no change	5,260 acres of deer habitat burned within the Million Fire and was converted into a earlier successional stage. This habitat is degraded but is still utilized by deer in the short term.
Alt 1: Additional habitat to be converted into an earlier successional stage for mule deer by the alternative.	0 additional acres	7,850 no change	No action.
Alt 2: Additional habitat to be converted into an earlier successional stage for mule deer by the alternative.	0 additional acres	7,850 no change	468 acres of the 215,000 acres of winter range in the DAU are included in the salvage sale perimeter.
Alt 3: Additional habitat to be converted into an earlier successional stage for mule deer by the alternative.	0 additional acres	7,820 no change	Same as Alternative 1.

Population Trend at the Project Level: One field season has passed since the Million Fire. Surveys of the burn area and salvage sale units have shown little use by mule deer in the salvage units. Occasional deer tracks in the ash are observed particularly in areas with aspen regeneration but overall the number of deer utilizing the salvage units appears to be less than a dozen. No reports of deer in the units have been reported by sale administration personnel or biological technicians.

Population Summary

Estimated Population at the Forest Level	Estimated Population at the DAU Level	Estimated numbers to be impacted as a result of the salvage sales.
19,700	7,850	0

5). MONITORING

Key Monitoring Question:

A. Are the habitat components that are important to the viability of mule deer being maintained as planned in quality, quantity and distribution?

Key habitat components identified in the RGNF Mule Deer Assessment include:

- Winter ranges in stable to improving condition.

The Rio Grande National Forest has completed winter range improvement projects in the past including mountain mahogany pruning, prescribed fire, water developments and pinyon-juniper reduction. Ongoing or planned activities include pinyon-juniper reduction and mountain mahogany pruning by mechanical methods (hydro axe and chainsaw) prescribed burns, fertilization, water developments and shrub planting. Partners include Rocky Mountain Elk Foundation, National Wild Turkey Federation, Colorado Division of Wildlife and the Mule Deer Foundation.

- Early seral vegetative conditions, which favor the establishment of a variety of browse species.

There has been a decrease in the amount of projects, which encourage the establishment of earlier vegetative conditions on the Forest in the last decade. The Million Fire is the largest event of this type this decade.

- Maintenance of adequate hiding, feeding, resting and thermal cover.

Within the DAU hiding, feeding, resting and thermal cover appears adequate.

a) Monitoring Needs:

1) Continue to implement and monitor habitat improvement projects Forest-Wide.

2) Monitor the establishment of aspen and other early successional species in the Million Fire.

b) Findings after the first growing season following the Million Fire

1) Tremendous response by aspen is occurring in many areas with aspen sprouts already reaching over 3 feet in many areas.

2) Aspen sprouts located in several small salvage sales completed in 2003 were not significantly damaged by harvest activity.

3) Ungulate browsing on aspen sprouts is evident but appears not to be at a degree where the sprouts are being damaged including within cut units.

B) ELK: The Colorado Division of Wildlife (CDOW) manages for herds of big game animals within distinctive boundaries referred to as Data Analysis Units or DAUs. These DAUs are geographically discrete and contain distinct big game populations which are managed to support and accomplish the objectives of the Colorado Division of Wildlife's Long Range Plan and meet the public's objectives for big game. The DAU used for this analysis is the Lower Rio Grande Elk Data Analysis Unit or E-32.

1) Existing Condition within the Lower Rio Grande Elk DAU

The DAU include Game Management Units 80 and 81**.** The DAU is 2,077 square miles encompassing approximately 700,000 acres and includes portions of Rio Grande, Conejos, Mineral, and Archuleta Counties. The DAU is bounded by US Highway 160 on the north, the continental divide on the west, the New Mexico state line to the south, and the Rio Grande River to the east.

The main geographic features are the San Juan Mountains, which rise to nearly 14,000 feet to the west along the continental divide and the Rio Grande River, which is at 7,500 feet elevation at the New Mexico state line. The climate is highland or mountain climate with cool summers and very cold winters with heavy snows. The higher elevations of the San Juan Mountains receive 50 inches of precipitation yearly, while the foothills receive 12 to 16 inches and the valley floor gets only 7 to 8 inches a year and is considered high desert.

The lower elevations are grassland/shrub and agricultural lands but as elevation and precipitation increase, the vegetation changes to pinyon-juniper, ponderosa pine, then Douglas fir and white fir combined with extensive stands of aspen. Between 9,500 and 12,500 feet stands of Engelmann spruce and subalpine fir predominate. Extensive areas of alpine tundra occur above 12,500 feet.

Elk generally occupy the western portion of the DAU from the grassland/shrub winter range adjacent to the foothills to above timberline on the alpine ecosystems in summer. Movement to winter range generally begins in November and continues until January. In the northern part of the DAU, movement to winter range is elevational and southerly. It is believed that many elk migrate out of Colorado into New Mexico. The amount of migrational movement is dependant on the severity of the winter

2) Existing Condition within the Salvage Sale Unit Perimeter

The Million Fire converted approximately 9,222 acres of mid to late successional vegetation into an early, seral stage. Aspen shoots and other browse species are beginning to resprout in the salvage sale perimeter along with limited grasses. Areas which experienced a severe burn are not revegetating as well as other areas. Elk use of the salvage sale perimeter at this point appears low to moderate but is expected to increase as the area revegetates.

3) Direct and Indirect Efffects

a) Alternative 1 – No Action: This alternative would result in the retention of the burned trees within the proposed harvest area perimeter.

Elk numbers have been above herd objectives in the DAU since the early 1980's (Rio Grande Elk DAU Plan, CDOW). One of the larger management issues in the DAU has been to regulate the population to meet herd objectives (RGNF Elk Species Assessment 2003).

Similar to mule deer, the fire should have short-term impacts upon hiding cover for elk but in the longer term, emerging new vegetation, particularly aspen, will benefit elk. No new roads are being created and the mosaic style of burn, which occurred in much of the area on the east side, should maintain or improve upon elk habitat (see Photo 3.17-4).

Photo 3.17-4
Burn mosaic created in the burn in which no harvesting is planned.

This alternative and its relationship to elk habitat and management as a whole within the DAU is not expected to impact this species viability in the future nor will it cause a significant population shift or change in population numbers within the DAU as a whole.

b) Impact upon Population

Population trends of elk within the DAU are completed by CDOW based upon harvest data, sex and age composition of the herd, and mortality factors including wounding loss and winter severity. Post hunt herd composition is acquired by aerial surveys usually completed in early winter. This information is then input into a POP II model to determine post-hunt population trend (Lower Rio Grande Elk DAU Plan, CDOW).

Based on information provided by the POP II Model (DAU Plan), approximate Post-Hunt Population Numbers from 1980-2003 include:

Population Objective is 5,000

1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
5200	5600	6100	6850	6850	7050	7350	7600	7500	7400	6750	6800

1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
6450	5800	5200	5400	6200	6400	6400	6500	6700	6530	6450	6500

Alternative 1 is not expected to have significant impacts upon the population objectives and population trend within the DAU. Local herds in the South Fork and Del Norte area are not expected to increase but population distribution may shift into the burn due to improved foraging habitat resulting from the fire. Elk population numbers within the DAU are most heavily impacted and managed by the number of yearly hunting permits issued. The number of hunting permits combined with weather conditions during the hunting season will continue to play more significant roles in impacting the population trend for elk within the DAU.

a) Alternative 2 -- Salvage Harvest and Alternative 3 Salvage Harvest with Slope Limitations:

As discussed in the Wildlife Section, under both action alternatives, elk will continue to utilize the area, grazing and browsing on the establishing new growth in a similar fashion as Alternative 1. Removal of standing dead trees will decrease hiding cover for these species in the harvest units (Grifantini 1991). However, some of the standing dead trees will be retained providing shielding for deer and elk from a distance. Overall, the action alternatives may make elk slightly more vulnerable to disturbance but use of the salvaged units by these species will be similar to Alternative 1 and elk use and movement patterns resulting from the action alternatives will not be significantly different than Alternative 1. Logging activities will result in some ground scarification, which in turn may improve the growing conditions for revegetation to occur, benefiting elk. Within the salvage sale, adjacent stands of unburned areas will continue to provide hiding cover and forage for larger mammals.

These alternatives and their relationship to elk habitat and management as a whole within the DAU is not expected to impact this species viability in the future nor will it cause a significant population shift or change in population numbers within the DAU as a whole.

b) Impact upon Population

Neither action alternative is expected to have a significant impact upon the population objectives and population trend within the DAU. Similarly to Alternative 1, local herds in the South Fork and Del Norte area are not expected to increase but population distribution may shift into the burn due to improved foraging habitat resulting from the fire. Elk population numbers within the DAU are most heavily impacted and managed by the number of yearly hunting permits issued. The number of hunting permits combined with weather conditions during the hunting season will continue to play more

significant roles in impacting the population trend for elk within the DAU more so than any impact from the action alternatives.

4) SUMMARY TABLE for elk, effects upon habitat and population.

ELK	Acres of habitat	Estimated Population Status	Comments
Pre-Fire Suitable Habitat within the DAU	Approximately - 700,000 acres -215,000 acres of winter range in the DAU.	6,500 within the DAU	Numbers of elk are managed by CDOW mainly by the number of hunting licenses.
Post-Fire - Habitat converted into an earlier successional stage within the DAU for elk by the Million Fire.	5,260 acres burned	6,500 no change	5,260 acres burned within the Million Fire and was converted into a earlier successional stage. This habitat is degraded but is still utilized by elk to a lesser extent in the short term.
Alt 1: Additional habitat to be converted into an earlier successional stage for elk by the alternative.	0 additional acres	6,500 no change	No action.
Alt 2: Additional habitat to be converted into an earlier successional stage for elk by the alternative.	0 additional acres	6,500 no change	468 acres of the 215,000 acres of winter range in the DAU are included in the salvage sale perimeter.
Alt 3: Additional habitat to be converted into an earlier successional stage for elk by the alternative.	0 additional acres	6,500 no change	Same as Alternative 1.

Population Trend at the Project Level: One field season has passed since the Million Fire. Surveys of the burn area and salvage sale units have shown little use by elk in the salvage units. Tracks of individuals or small groups of elk tracks in the ash have been observed but they appear to be passing through versus spending time in the units. Timber personnel and biological technicians have reported elk in the salvage units but overall it is extremely doubtful that the units are providing any type of significant habitat for elk at this point in time.

Population Summary

Estimated Population at the Forest Level.	Estimated Population at the DAU Level.	Estimated numbers to be impacted due to the salvage sale.
17,000	6,500	0

5) MONITORING

Key Monitoring Question:

A. Are the habitat components that are important to the viability of elk being maintained as planned in quality, quantity and distribution?

Key habitat components identified in the RGNF Elk Assessment include:

- Winter ranges in stable to improving condition.

The Rio Grande National Forest has completed winter range improvement projects in the past including mountain mahogany pruning, prescribed fire, water developments and pinyon-juniper reduction. Ongoing or planned activities include pinyon-juniper reduction and mountain mahogany pruning by mechanical methods (hydro axe and chainsaw) prescribed burns, fertilization, water developments and shrub planting. Partners include Rocky Mountain Elk Foundation, National Wild Turkey Federation, Colorado Division of Wildlife and the Mule Deer Foundation.

- Road densities no more than 1 mile of road per square mile.

The Rio Grande strives to maintain system open road density to no more than 1 mile of road per square mile. Within the burn, no new roads are being created.

- Maintenance of adequate hiding, feeding, resting and thermal cover.

Within the DAU hiding, feeding, resting and thermal cover appears adequate as elk herds are over objective and deer numbers appear to be increasing.

a) Monitoring Needs:

1) Continue to implement and monitor habitat improvement projects Forest-Wide.

2) Monitor the establishment of aspen and other forage species in the Million Fire.

3) Monitor the effectiveness of any road closures (permanent or temporary roads) and fireline revegetation (to ensure that ATVs use of the firelines as trails is not occurring) within the Million Burn.

b) Findings after the first growing season following the Million Fire

1). Tremendous response by aspen is occurring in many areas with aspen sprouts already reaching over 3 feet in many areas.

2) Aspen sprouts located in several small salvage sales completed in 2003 were not significantly damaged by harvest activity.

3) Ungulate browsing on aspen sprouts is evident but appears not to be at a degree where the sprouts are being damaged including within cut units.

4) Road closures and fireline revegetation efforts are recent and ongoing and monitoring is just underway.

C) PYGMY NUTHATCH AND HERMIT THRUSH*:*

The two sixth level watersheds a) # 130100011503 and b) # 130100011505 represent the area of analysis (See Map 6). These watersheds best reflect the likely area of genetic exchange for these two species.

1). Existing Condition within the Sixth Level Watersheds for Pygmy Nuthatch and Hermit Thrush

From a wildlife habitat standpoint, Forested Landtype Associations are an important indicator of what species may be found in an area. The Rio Grande National Forest is divided into Landtype Associations (LTA's). LTA's are based on similarities in geology, soils, and plant associations. Six separate LTA's are included within the 6th level watershed analysis and include:

Table 3.17-1: LTA's within 6th-level watersheds

Landtype Associations	Basic Description	Acres within 6th-level watershed
LTA-1	Engelmann Spruce on Mountain Slopes	1,876
LTA-3	White Fir / Douglas-Fir on Mountain Slopes	2,655
LTA-5	Ponderosa Pine and Douglas-Fir on Mountain Slopes	667
LTA-6	Pinyon Pine on Mountain Slopes	622
LTA-9	Thurber Fescue on Mountain Slopes	479
LTA-12	Western Wheatgrass and Other Low Elevation Grasses	36
LTA-12	Western Wheatgrass and Other Low Elevation Grasses	36
TOTAL:		6,335 acres

Wildlife habitat within the watershed boundary (FS only) is best described as mainly Pinyon-Juniper Woodlands in lower elevations with a stringer of ponderosa pine occurring at approximately 8,500-9,500 feet. At this elevation and moisture regime, a mixed conifer component occurs with a combination of Douglas Fir-White Fir and a strong component of aspen in some areas. Englemann spruce forests occur in the higher

and wetter areas of the watersheds and are concentrated mainly in the southern half. See Map 6 in the Map Section.

2). Existing Condition within the Salvage Sale Unit Perimeter for PygmyNuthatch and Hermit Thrush

Table 3.17-2: LTA's within the salvage sale unit perimeter

Landtype Associations	Basic Description	Acres within Project Perimeter
LTA-3	White Fir and Douglas-Fir on Mountain Slopes	581
LTA-5	Ponderosa Pine/Douglas-Fir on Mountain Slopes	4
LTA-6	Pinyon Pine on Mountain Slopes	2
LTA-9	Thurber Fescue on Mountain Slopes	35
LTA-12	Western Wheatgrass and Other Low Elevation Grasses	1
TOTAL:		623 acres

Pre Million Fire Condition

Pre-fire wildlife habitat within the project perimeter is best described as consisting mainly of a mixed conifer component of Douglas and White Fir with an understory of common juniper or kinnikinnick. A very strong aspen component was also present in several areas but was being outcompeted and lost due to conifer encroachment. The aspen component isn't reflected in the LTA's above due to other species being more dominant (ie. White Fir and Douglas Fir).

Post Million Fire Condition

The vast majority of the habitats within the Million Fire burn perimeter burned in a moderate to severe intensity resulting in a moonscape appearance. The salvage sales are focused in those areas which burned the most severe and on only those trees which are obviously dead or dying. The remaining 94% of the burn is not being considered for salvage sale activities.

3). Direct and Indirect Effects

a) **Alternative 1 – No Action:** This alternative would result in the retention of the burned trees within the proposed harvest area perimeter.

Pygmy Nuthatch

The pygmy nuthatch is highly associated with ponderosa pine systems throughout its range. They are considered primary cavity excavators and require snag habitat for nesting and roosting purposes, the latter of which includes large-diameter soft snags for communal roost sites. The pygmy nuthatch also requires large-diameter green trees for foraging and future snag recruitment (RGNF Pygmy Nuthatch Species Assessment 2003).

The Million Fire burned pygmy nuthatch habitat, particularly along the northern boundary. Within the 6th level watershed, there was approximately 667 acres

(Table 3.17-1) of ponderosa pine habitat. Of those acres, approximately 234 acres burned in the Million Fire. Of those acres, four are involved in the proposed sales (Table 3.17-2). The proposed units are at the upper elevational limit of pygmy nuthatch habitat and do not contain a large ponderosa pine component. However, the sale is adjacent to and contains a small component of ponderosa pine within the mixed-conifer zone.

Under this alternative, no trees will be removed making all species and sizes of snags available for pygmy nuthatch and other species requiring snags (Photo 3.17-5).

Photo 3.17-5
Example of snags in an unburned area. Snag in the center of photo is the right size for cavity nesters. Snag on the right is a good snag for foraging as it still contains bark.

b) Impact upon Population

Population effects analysis is based on the assumption that the potential habitat and average territory size is about one pair per nine acres (Gillihan 2002). This indicates that the Forest may be capable of supporting a relative density of about 4,075 pairs if the quality and quantity of habitat components are spatially distributed across cover type. Pre-fire, there were 667 acres of Ponderosa Pine and Douglas Fir on Mountain Slopes in the 6th level watershed analysis area depending upon the age and distribution of this habitat type. Utilizing the average territory size described above (which is 9 acres per pair), the analysis area should support 74 pairs of pygmy nuthatch (pre-fire).

Under this alternative, there is no potential for a decrease or increase in pygmy nuthatch populations within the watershed or the Forest other than those populations, which may have been impacted by the fire itself (see summary table).

a) Alternative 2 – Salvage Harvest and Alternative 3 Salvage Harvest with Slope Limitations:

Under the action alternatives, fewer snags for both nesting and foraging will be available for pygmy nuthatch than what currently exists following the fire. However, the burned area of the watershed will meet or exceed Forest Plan Standards and Guidelines for snag retention. That area of ponderosa pine habitat within the sixth level watershed, which was not burned will continue to provide adequate habitat for this species.

These alternatives and their relationship to pygmy nuthatch habitat and management as a whole within the 6th level watersheds is not expected to impact this species viability in the future nor will it cause a significant population shift or change in population numbers within the watersheds as a whole.

b) Impact upon Population

Of the 234 acres of pygmy nuthatch habitat burned within the watershed, 4 acres are within the proposed salvage sale perimeters. These acres are moderately burned and no longer provide optimum pygmy nuthatch habitat. This is less than the habitat required to support one pair of breeding nuthatches.

These 4 acres do not represent the average acreage necessary for a breeding pair, which on a watershed level is insignificant. Standards and Guidelines for snag retention are in place, which decreases the likelihood of the four acres moving out of pygmy nuthatch habitat. The potential for the action alternatives to impact pygmy nuthatch population viability within the watershed and Forest is extremely low given the existing Standards and Guidelines and small amount of habitat involved with the project.

These alternatives and their relationship to pygmy nuthatch and other snag requiring species is not expected to impact species viability in the future nor will it cause a significant population shift or change in population numbers within the sixth level watershed or Rio Grande National Forest as a whole.

4). SUMMARY TABLE for pygmy nuthatch, effects upon habitat and population.

PYGMY NUTHATCH	Acres of habitat	Estimated Population Status	Comments
Pre-Fire Suitable Habitat within 6th level watershed analysis area.	667 acres	74 pairs within the 6th level watersheds.	Based off of an average home territory of 9 acres per pair.
Post Fire – Habitat converted into unsuitable habitat within the watersheds for pygmy nuthatch by the Million Fire.	234 acres burned	48 pairs post-fire	Habitat lost for 26 pairs (or 35%) of the population within the watersheds due to the Million Fire.
Alt 1: Additional habitat to be converted into unsuitable habitat for pygmy nuthatch by the alternative.	0 additional acres	48 pairs, no change	Habitat converted into unsuitable by the Million Fire.
Alt 2: Additional habitat to be converted into unsuitable habitat for pygmy nuthatch by the alternative.	0 additional acres	48 pairs, no change	4 acres of habitat already converted into unsuitable (by the fire) are involved with this Alternative.
Alt 3: Additional habitat to be converted into unsuitable habitat for pygmy nuthatch by the alternative.	0 additional acres	48 pairs, no change	4 acres of habitat already converted into unsuitable (by the fire) are involved with this Alternative.

The Million Fire converted 234 acres of suitable pygmy nuthatch habitat into unsuitable habitat. Removing 4 of the 234 acres by the action alternatives will reduce the amount of snags in these acres for future use by pygmy nuthatch but will not result in further impacting the future viability of this species.

Population trend at the Project Level: One field season has passed since the Million Fire. Surveys of the burn area and salvage sale units have shown little use by pygmy nuthatch in the salvage units. While setting up monitoring transects (discussed in the monitoring section) biological technicians noted nuthatches to be common in those areas containing ponderosa pine burned at a light level. These areas were characterized as having trees killed from the fire but not burned to a significant degree (not blackened). These areas also contained a green tree component mixed in with the burned trees and had bark remaining. Nuthatches are well documented to be "gleaners", which means they forage by prying off bits of bark from trees and eating the insects found underneath the bark. No nuthatches were noted within the burn units themselves. Given the degree of burn severity of these trees (no bark) and abundance of more suitable foraging trees outside the sale unit boundary, it is doubtful that nuthatches utilize trees within the salvage units for foraging at a significant level.

Population Summary

Estimated Population at the Forest Level	**Estimated Population at the 6th Level Watershed Level – Post Fire**	**Estimated number of pairs impacted at the Project Level due to the salvage sale.**
4,075 pairs	48 pairs	0

5) MONITORING

Key Monitoring Questions:

A. Are the habitat components that are important to the viability of pygmy nuthatch being maintained as planned in quality, quantity and distribution?

Key habitat components identified in the RGNF Pygmy Nuthatch Assessment include:

- Large green tree component for foraging and snag recruitment process well distributed across the landscape.

Within the analysis area and the Forest as a whole, a large green tree component for foraging and future snag recruitment appears well distributed across the landscape.

- Large snag component (both hard and soft) that reflects natural recruitment rate and patch dynamics. Snag densities that approach 3 per acre averaged over 10 acre areas. Maintenance of at least one snag per 10 acres that represents Structural Class 5 sizes and be at least 50 feet tall.

Ponderosa Pine exists as a narrow band between the pinyon-juniper and mixed conifer zone in the analysis area and in the Forest as a whole. Much of this area is in close proximity to roads and is easily accessible by firewood cutters. Due mainly to firewood cutting, many areas within the Ponderosa Pine zone do not meet the above snag retention numbers. This specific analysis area is more remote and more difficult to access than most Ponderosa Pine zones, with the exception of the lower reaches of FDR 345, and better meets snag maintenance numbers.

- Maintenance of a system that reflects natural disturbance patterns and processes.

The Forest maintains and tries to mimic natural disturbance patterns and processes.

a) Monitoring Needs:

1) Monitor the number, distribution, use and size of Ponderosa Pine snags within the project perimeter and in the adjacent area.

2) Monitor and compare pygmy nuthatch numbers within a) the project perimeter (salvaged stands) b) unsalvaged but burned stands and c) adjacent unburned stands to determine difference in habitat use and potential project impacts vs. wildfire impacts upon pygmy nuthatch distribution.

b). Findings after the first growing season following the Million Fire

1) Seven separate transects were established during late summer/early fall in 2003. These transects were established in the 3 separate types of areas (addressed in #2 above) and in different habitat types according to monitoring protocol followed by the Rocky Mountain Bird Observatory. Establishing these transects were ideas identified in both internal and external scoping.

2) As stated earlier, pygmy nuthatch were noted as being present in areas which experienced a light burn and along the edge of areas more severely burned as expected. Section VII addresses those species observed during transect layout. An available green tree component and burned trees with bark remaining appear to be important.

3). Direct and Indirect Effects

a) Alternative 1 – No Action: This alternative would result in the retention of the burned trees within the proposed harvest area perimeter.

Hermit Thrush

The hermit thrush is particularly adapted to concentrating most of its activities on the forest floor and within the lower canopy levels of coniferous trees. In Colorado, the hermit thrush is considered one of the most common breeders in late successional spruce-fir forests although other habitats are also used (Andrews and Righter 1992). Local populations of hermit thrush in spruce-fir cover types on the Rio Grande National Forest

displayed a strong preference for both mid-successional and older forests as long as canopy closures met or exceeded 40%. However, both young and older forest habitats were used less extensively when canopy closures dropped below this level (Gillihan 1996). Young and Hutto (2002) also found that canopy closure was the most useful variable for explaining differences in hermit thrush abundance in the Northern Rockies.

The majority of the Million Fire burned within hermit thrush habitat. The majority if not all of the pre-fire existing hermit thrush habitat was converted into non-thrush habitat. It will be several decades before the burn area is once again providing suitable habitat for the hermit thrush (see Photo 3.17-6) although some foraging and nesting may occur if the shrub component becomes established.

Photo 3.17-6
Example of hermit thrush habitat prior to the Million Fire.

b) Impact upon Population

The hermit thrush is one of the more well-sampled species by standard Breeding Bird Surveys or other road-based sampling designs due to its loud, recognizable song that is frequently repeated during the breeding season (RGNF Hermit Thrush Species Assesement 2003).

Information from the Colorado Breeding Bird Atlas indicates that coniferous forest was the dominant vegetation type in 82% of blocks sampled, with spruce-fir habitats comprising approximately half of that.

Hermit thrush are documented as occurring in 57 of the 60 blocks (95%) sampled on the Forest, with all but 14 of the blocks located in spruce/fir or mixed-conifer habitats. Gillian (2002) estimated that a reasonable baseline population of hermit thrush on the Rio Grande National Forest is probably around 1 pair per 10 acres in suitable habitat for a total relative abundance as high as 17,060 pairs.

Using this information, it is estimated that the analysis area within LTA's 1 and 3 (4,531 acres) could potentially support a population of 453 pairs of hermit thrush.

Under this alternative, there is no potential for a decrease or increase in hermit thrush populations within the watershed other than those populations, which may have been impacted by the fire itself (see table summary).

a) Alternative 2 – Salvage Harvest and Alternative 3 Salvage Harvest with Slope Limitations:

The Million Fire significantly reduced hermit thrush habitat. It is doubtful that the burned areas will provide adequate hermit thrush for at least several decades. Removal of standing dead trees from within the fire perimeter is not expected to have any further impact upon future thrush habitat. The salvage sale is not expected to impact hermit thrush habitat in unburned areas adjacent to the sale units or their use of this available habitat.
Of the 4,531 acres of hermit thrush habitat within the 6th level watershed, approximately 945 acres burned in the Million Fire and of those acres, 581 acres are within the proposed salvage sale perimeter. These acres are burned and no longer provide adequate hermit thrush habitat. Use of the salvage sale units by hermit thrush can be expected to increase once the shrub and small tree components are established. However, habitat may not be attained until site conditions reach the tree size and canopy closures described by Gillian (1996).

The potential for the action alternatives to impact hermit thrush population viability within the watershed is extremely low given that the acres involved currently are not providing hermit thrush habitat. Salvage of burned trees should not impact the establishment of future shrub and small tree components, in fact limited disturbance may promote earlier establishment of grasses, forbs and shrubs.

b) Impact upon Population

These alternatives and their relationship to hermit thrush and the late successional spruce-fir habitat that it represents is not expected to impact this species viability in the future nor will it cause a significant population shift or change in population numbers within the 6th level watersheds or Rio Grande National Forest as a whole

4). SUMMARY TABLE for hermit thrush, effects upon habitat and population

HERMIT THRUSH	Acres of habitat	Estimated Population Status	Comments
Pre-Fire Suitable Habitat within 6th level watershed analysis area.	4,531 acres	453 pairs within the 6th level watersheds.	Based off of an average home territory of 10 acres per pair.
Post – Fire- Habitat converted into unsuitable habitat within the watersheds for hermit thrush by the Million Fire.	945 acres	359 pairs - Post-fire	Habitat lost for 94 pairs (or 21%) of the population within the watersheds due to the Million Fire.
Alt 1: Additional habitat to be converted into unsuitable habitat for hermit thrush.	0 additional acres	359 pairs, no change	Habitat converted into unsuitable by the Million Fire.
Alt 2: Additional habitat to be converted into unsuitable habitat for hermit thrush.	0 additional acres	359 pairs, no change	581 acres of habitat already converted into unsuitable (by the fire) are involved with this Alternative.
Alt 3: Additional habitat to be converted into unsuitable habitat for hermit thrush.	0 additional acres	359 pairs, no change	581 acres of habitat already converted into unsuitable (by the fire) are involved with this Alternative.

The Million Fire converted 945 acres of suitable hermit thrush habitat into unsuitable habitat within the 6th level watershed. Harvesting 581 of the 945 acres by the action alternatives will reduce the future amount of downed woody debris available in these acres for future use by hermit thrush but will not result in further impacting the future viability of this species in the future.

Population trend at the Project Level: One field season has passed since the Million Fire. Surveys of the burn area and salvage sale units have shown little use by hermit thrush in the salvage units. While setting up monitoring transects (discussed in the monitoring section) biological technicians noted hermit thrush to be common in those areas which burned at a light level or consist of a "mosaic" type of burn. These areas are not within the salvage sale units. No hermit thrush were noted within the salvage sale units themselves but instead were noted along the edge of the burn as predicted. It is doubtful that hermit thrush utilize trees within the salvage units for foraging at a significant level.

Population Summary

Estimated Population at the Forest Level	**Estimated Population at the 6th Level Watershed Level – Post Fire**	**Estimated number of pairs impacted at the Project Level due to the salvage sale.**
17,060 pairs	359 pairs	0

5. MONITORING

Key Monitoring Questions:

A. Are the habitat components that are important to the viability of hermit thrush being maintained as planned in quality, quantity and distribution?

Key habitat components identified in the RGNF Hermit Thrush Assessment include:

- Maintenance of canopy closure of at least 40%.

Lynx denning and winter foraging habitat contains similar definitions (including 40% or greater canopy closure) to hermit thrush habitat and is tracked by Analysis Unit.

- Maintenance of patchy understory conditions and coarse woody debris.

Coarse woody debris is removed as firewood, particularly adjacent to roads, but is typically available in adequate supply in more difficult to access terrain. No thinning contracts, which reduces small understory firs, have been implemented in recent years.

- Maintenance of system dynamics that reflect natural disturbance patterns and processes.

The Forest maintains and tries to mimic natural disturbance patterns and processes.

a) Monitoring Needs:

1) Monitor the establishment of an understory component within the burn and project perimeter.

2) Monitor and compare hermit thrush numbers within a) the project perimeter (salvaged stands) b) unsalvaged but burned stands and c) adjacent unburned stands to determine difference in habitat use and potential project impacts vs. wildfire impacts upon hermit thrush distribution.

b) Findings after the first growing season following the Million Fire.

1) Seven separate transects were established during late summer/early fall in 2003. These transects were established in the 3 separate types of areas (addressed in #2 above) and in

different habitat types according to monitoring protocal followed by the Rocky Mountain Bird Observatory. Establishing these transects were ideas identified in both internal and external scoping.

2) As stated earlier, hermit thrush were noted as being present in areas which experienced a light burn and along the edge of areas more severely burned as expected. Section VII addresses those species observed during transect layout.

IV. CUMULATIVE EFFECTS

Cumulative effects include a combination of the past impacts of activities and events within the analysis areas and other ongoing or planned activities.

Activities and events, which have taken place, are ongoing or are foreseeable future actions include timber sales (including Unit C of the Million Fire Small Sale Salvages), firewood cutting, cattle grazing and various recreational activities including hiking, mountain biking, motorized trail use and hunting. In comparison to other areas, this area is moderately to heavily roaded.

None of the alternatives are precedent setting. The preferred alternative, and associated activities will not automatically trigger other projects, which might have similar effects on this area. Any future actions, which may be proposed by the Forest Service, will be studied and an independent evaluation will be made of the cumulative effects of those actions. There are no other known or anticipated projects in the analysis areas, which cumulatively might detrimentally impact Proposed MIS or their habitat.

The monitoring needs described for each species are designed to help managers examine if the proposed project is helping to meet the Desired Conditions expressed as Goals in the Forest Plan.

V). SUMMARY of ISSUES

Implementation of the action alternatives will have little impact upon the long and short-term recovery of the area for proposed MIS species. The most single impacting event to occur in the analysis areas is the Million Fire. Salvage of burned trees will have some additional impact upon habitat for proposed MIS species (as described below), although limited, due to the majority of the burn not being treated by the salvage (over 94% of the burn will not be salvaged).

Potential Impacts upon snags and cavity nesting birds
There will be fewer snags available within the salvage sale units for snag dependant species such as the pygmy nuthatch. However, ponderosa pine is a small component in the salvage and adjacent unharvested areas and unburned areas will continue to meet or exceed Forest Plan Standards and Guidelines for snag retention.

Maintenance and improvement of big game winter range
In the short term, salvaging burned trees will reduce the amount of hiding cover available in the harvest units particularly for deer and elk but adjacent unburned areas will continue

to function as security areas. In the longer term, the harvested units and burn as a whole should attract these species due to the earlier seral conditions available providing more palatable and nutritionally rich forage.

Hermit Thrush
The Million Fire converted much of the existing Hermit Thrush habitat into non-suitable habitat for this species. Salvage of burned trees will result in less available woody debris on the forest floor in the future in the salvage sale units but will not have a significant impact upon the burn area's potential to support Hermit Thrush in the future.

VII. Species observed during surveys by timber sale personnel, biologists and biological technicians within the Million Burn Boundary.

* Denotes those species observed within the salvage sale units themselves.
-Underlining Denotes MIS species.

Mule deer
* Elk
Chipmunk
Pine squirrel
Cottontail rabbit
Red-tailed hawk
Osprey
American kestrel
* Three-toed woodpecker
* Hairy woodpecker
* Downy woodpecker
* Steller's jay
* Clark's nutcracker
* Mountain chickadee
*Common raven
Brown creeper
Pygmy nuthatch
White-breasted nuthatch
Ruby-crowned kinglet
* Mountain bluebird
Townsend's solitaire
Hermit thrush
* American Robin
White-crowned sparrow
* Dark-eyed junco
Yellow-rumped warbler
Red Crossbill

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3.18 Fire and Fuels Management

Scope of the Analysis

This analysis discusses fire and fuels management. The scope of the analysis includes the 623-acre project area. Fire and Fuels issues outside the project area will be analyzed through the district fuels program.

Past Activities that have Affected the Existing Condition

See the Section 3.4 Salvage/Silviculture for a summary of past harvest activities. Within approximately 200 feet of FDR 345, firewood gatherers had removed much of the larger diameter dead fuels, although the green crowns of live trees sustained a crown fire. The previous exclusion of natural fires had allowed an arguably unnatural accumulation of fuels to build up on the forest floor, resulting in a high intensity fire event.

Existing Condition

The Million Fire killed approximately 95% of the live trees in the proposed project area and burned at a high to moderate intensity crown fire. Most of the area was classified as severe to moderate burn intensity. Most of the duff layer and fuels on the forest floor were consumed. See the Soils Section for soil impacts. The previous exclusion of natural fires had allowed an arguably unnatural accumulation of fuels to build up on the forest floor.

Direct and Indirect Effects

Alternative 1 -- No Action: With no action, there is the potential for build-up of heavy fuels on the forest floor as the fire-killed standing trees fall. Snags left standing could also create a "candle" situation. When standing snags burn, they produce fire brands that can be transported by winds to create spot fires, leading to increased fire spread and behavior. This would be especially true in a young stand of regenerating trees with a "snag" overstory. If fine fuels, weather conditions, and ignition sources are available for a potential future fire event, the heavy fuels that have fallen to the forest floor could increase the severity of the burn and possibly damage soils, watersheds, and the ability of

the area to regenerate. It is acknowledged that research is lacking to support this statement (Starr and McIver 2000). Also, the aspect of the project area is northwest, to northeast, providing more moisture for plant growth, and more fuels.

A mosaic fuel-loading over a geographical area is preferred, allowing for fires to burn at different intensities to create a more diversified and natural forest ecology. Removing the majority of the larger boles from the proposed project area would create a different fuel loading than the rest of the Million Fire area.

Alternatives 2 and 3--Action Alternatives: Since the action alternatives allow for salvage harvest and the slash left in the harvest units would leave a relatively contiguous fine fuels component post-harvest, the potential for another fire event in the project area in the short-term (approximately 10-30 years) is moderate. The only difference between the action alternatives, as relates to fire and fuels management, would be in the acreage treated by salvage.

Cumulative Effects

The risk of a future fire impacting the project area in the short term (approximately 5 to 20 years) is very low. Logging slash would be available, but the absence of a continuous duff or grass component would limit the ability of a fire to spread. If logging slash is lopped and scattered throughout the area and a continuous fine fuel cover (grass/forbs) regenerates, there would be a chance for a low intensity ground fire to carry through the project area.

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