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Environmental Assessment

Lake Fuels Project

Ferron-Price Ranger District, Manti-La Sal National Forest
Emery and Sanpete Counties, Utah

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Lake Fuels Project
Environmental Assessment
Sanpete and Emery Counties, Utah

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1.1 Introduction

The goal of the Lake Fuels project is to affect an immediate change in the potential wildfire behavior by reducing the rate of spread and intensity of fire: maintain vegetation conditions that allow fires to burn with lower intensities in ground fuels, thereby providing a good opportunity for fire crews to stop the fire spread quickly. The Project would reduce the amount of hazardous fuels on approximately 820 acres of the Manti-La Sal National Forest around the Huntington Reservoir and the Lake Canyon Recreation sites in Sanpete and Emery Counties, Utah. A public meeting and field trip was held on Wednesday, June 6, 2007 at 1:00 p.m.

1.2 Need for Action

The District Ranger for the Ferron District of the Manti-La Sal National Forest in conjunction with Sanpete and Emery Counties has determined a specific need on National Forest System lands to address the fuel conditions in the Lake Fuels Treatment Project Area.

- A need to reduce the Fire Regime Condition Class (FRCC) from Moderate to Low at the stand level. Fuel loadings have increased in recent years as a result of Engelmann spruce mortality from a spruce beetle.

The Lake Fuels Project covers the same area as the Lake Vegetation Project Environmental Impact Statement, 2006. As of 2006 the spruce beetle had killed approximately 90 percent of the spruce in the stands proposed for treatment under the Lake Vegetation Project. Because of this changed condition, the Lake Vegetation Project was re-scoped as a fuels reduction project under the Healthy Forest Restoration Act (HFRA). The area has been identified in the Wildfire Protection Plan for both Sanpete and Emery Counties and the Utah Central Region Wildfire Protection Plan.

The proposed action is consistent with the following Healthy Forest Restoration Act Guidelines:

- The Proposed Action was developed collaboratively with Sanpete and Emery Counties *(Draft Emery County Wildfire Protection Plan (ECWPP6) and Central Utah Regional Wildfire Protection Plan – East Side Sanpete County Pages 4-4 thru 4-6.)*

- The stands in the Lake Fuels Treatment Project have been classified as Fire Regime 111, characterized by 35 to 100 year average fire frequency and mixed severity (less than 75 percent of the dominant overstory vegetation replaced). The Fire Regime Condition Class (amount of departure from the natural regime) is moderate (FRCC 2) (Fire Regime Condition Class Analysis, February 28, 2005).

- The project is located in the Huntington Creek Drainage which provides municipal water to the town of Huntington (Foster K., 2008, Lake Fuels Watershed Resource Report).

1.3 Public Involvement

A project initiation document was distributed to Forest personnel on April 30, 2007 (USDA Forest Service, 2007a). A scoping letter for the Lake Fuels Project was signed and sent for public review (scoping) on May 17, 2007 (USDA Forest Service 2007b). A notice of intent to complete an Environmental Assessment (EA) under the authority Healthy Forest Restoration Act (HFRA) was disclosed. The letter was mailed to 453 individuals, organizations, an agencies. Public notice was published in the paper of record, The Sun Advocate (Carbon County, Utah) on May 22, 2007. Comments were requested by June 20, 2007. A public meeting/field trip was conducted on June 6, 2007.

2.0 Issues

Issues were derived from the public, other agencies, organizations and businesses, and Forest Service resource specialists. Issues are defined as a point of discussion, debate, or dispute about environmental effects. From the public comments received several issues were identified. These issues are the basis for the project analysis, project design features, alternatives, and overall disclosure of information in this document and supporting project record. Following review and consideration of recommendations from the interdisciplinary team (IDT), the Forest Supervisor approved the following issues that are analyzed in detail..

- The proposed treatments would not result in lower fire intensity, but would exacerbate fire intensity by exposing ground fuels to greater solar heating and exposure to wind resulting in drier fuels.
  Indicators used:
  - *Spruce-fir and aspen stands treated (acres)*
  - *Large fuel reduction (acres harvested).*
  - *Crown Fire Potential*
  - *Fire Type (surface fire, passive crown fire, active crown fire)*
  - *Expect stand mortality (percent of stand)*

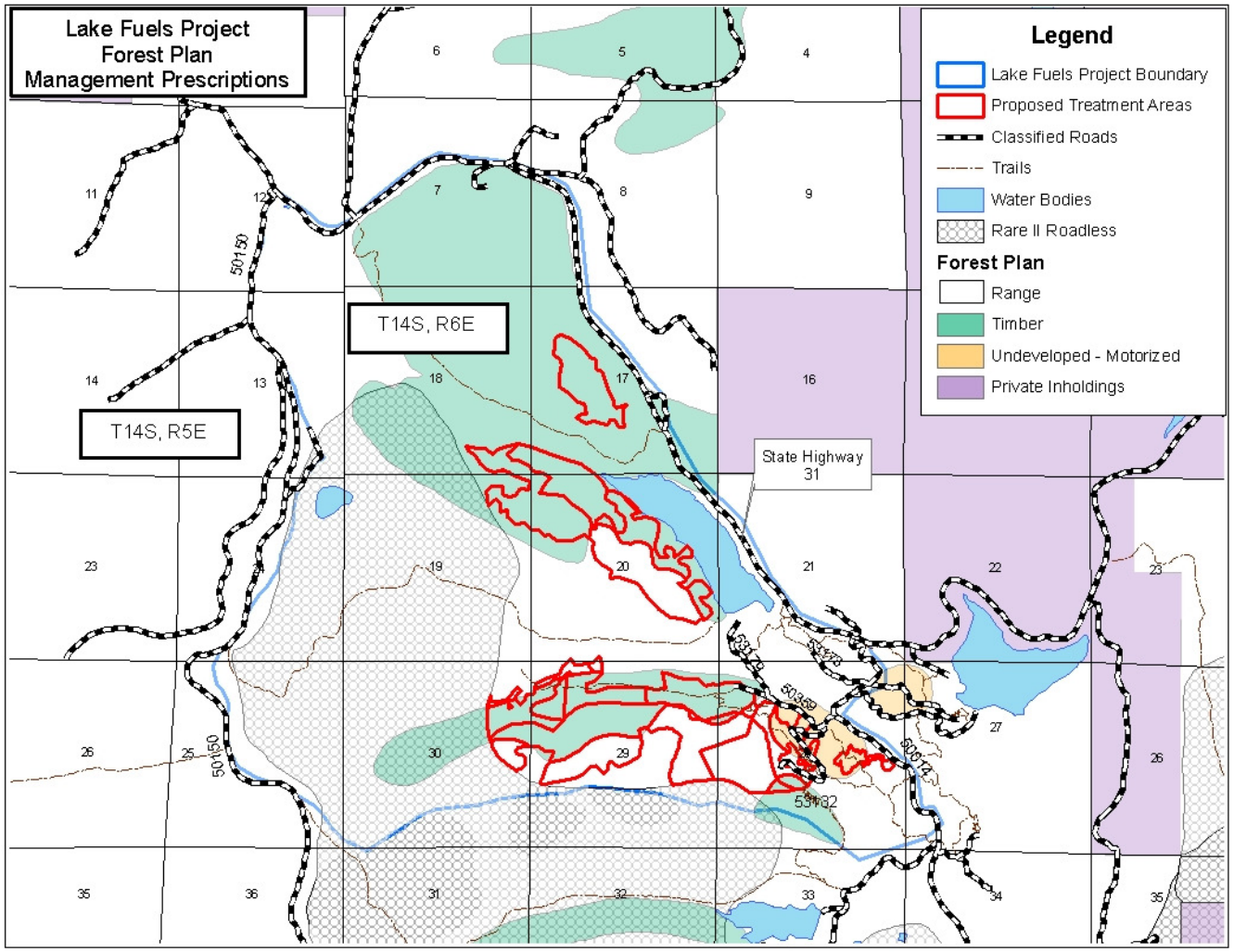
- Activity fuels generated by harvest activities could temporarily increase fire risk.
  Indicators used:
  - *tons per acre of <3" material*
  - *Slash treatment (acres) – fine fuel reduction (Changes to Fuel Model)*

- Proposed activities may temporarily displace dispersed recreation users within the project area, particularly on the roads, trails and developed dispersed sites in the Millers Flat area.
  - *Recreation Visitor Days (RVD's)*

Other Issues are issues that were considered, but are not be carried forward in detailed analysis within the Environmental Assessment.

There was one other issue identified thru public scoping related to potential impacts to view sheds. The effects to view sheds were analyzed by a landscape architect for the 2003 Lake EIS, Alternative 3. His determination was that "The main difference in change would be from a mature-appearance in the spruce/fir stand to a younger appearing stand. The aspen regeneration would take a few years to sprout and would fill the clearings with young vigorous growth" (Lake EIS Visual Quality Report, 2004, Doc. # 22 Project record, Supplemental Visual Quality Report, 2008). Essentially there would be no change in the view shed and this issue is outside the scope of this analysis and will not be discussed further.

Map 1 – Management Unit Designations.



2.2 Alternatives

2.2.1 Alternative 1 – No Action

No actions would be initiated for the treatment of vegetation on National Forest System lands in the analysis area. Current management practices, such as road maintenance, firewood cutting, recreation, and fire suppression would continue.

2.2.2 Alternative 2 – Proposed Action

The project proposes the following activities, specific design features for this project are detailed in Appendix B. See Map 2 for the location of the proposed treatment units and road access.

- Harvest approximately 6 million board feet of spruce and subalpine fir timber utilizing helicopter logging on approximately 420 acres and ground based logging systems (tractor) on approximately 400 acres. Some aspen would be harvested from areas accessible to ground based logging systems. See Map 2.
- In the Engelmann spruce/subalpine fir type remove most of the dead or infested trees on 675 acres. All of these stands would be planted with Engelmann spruce to meet stocking requirements. Gopher baiting approximately 675 acres to protect planted seedlings. See Map 3.
- Treat approximately 80 acres in aspen stands through small clear cuts in patches less than 10 acres in size and enhance the aspen component in others by removing the conifer element on approximately 65 acres. Aspen would be regenerated by coppice sprouting on approximately 145 acres. See Map 3.
- Construct 2.92 miles of temporary road and 0.07 miles of new system road. Approximately 2.2 of these miles would use the alignment and road prism of reclaimed roads that were ripped, seeded and water-barred but not restored to original ground contour. Upon completion of project activities, 0.07 miles of new road would remain on the system as National Forest System Roads with a maintenance level 2. This segment already exists as an unauthorized road and provides access to existing dispersed camping sites. The 2.92 miles of temporary road would decommissioned. See Map 2.
- Utilize approximately six temporary helicopter landings one acre in size and ten temporary tractor landings of approximately ¼ acre each to deck logs during the logging operation. See Map 2.
- Fuels reduction activities will occur on all 820 acres treated using various methods including, but not limited to, thinning, piling and burning, broadcast or jackpot burning, or chipping. See Map 3.
- Reduce fuels by removing approximately 50 percent of the dead Engelmann spruce from approximately 15 acres within the riparian buffer of Lake Fork Creek and Huntington Reservoir. No ground based equipment will be used within the

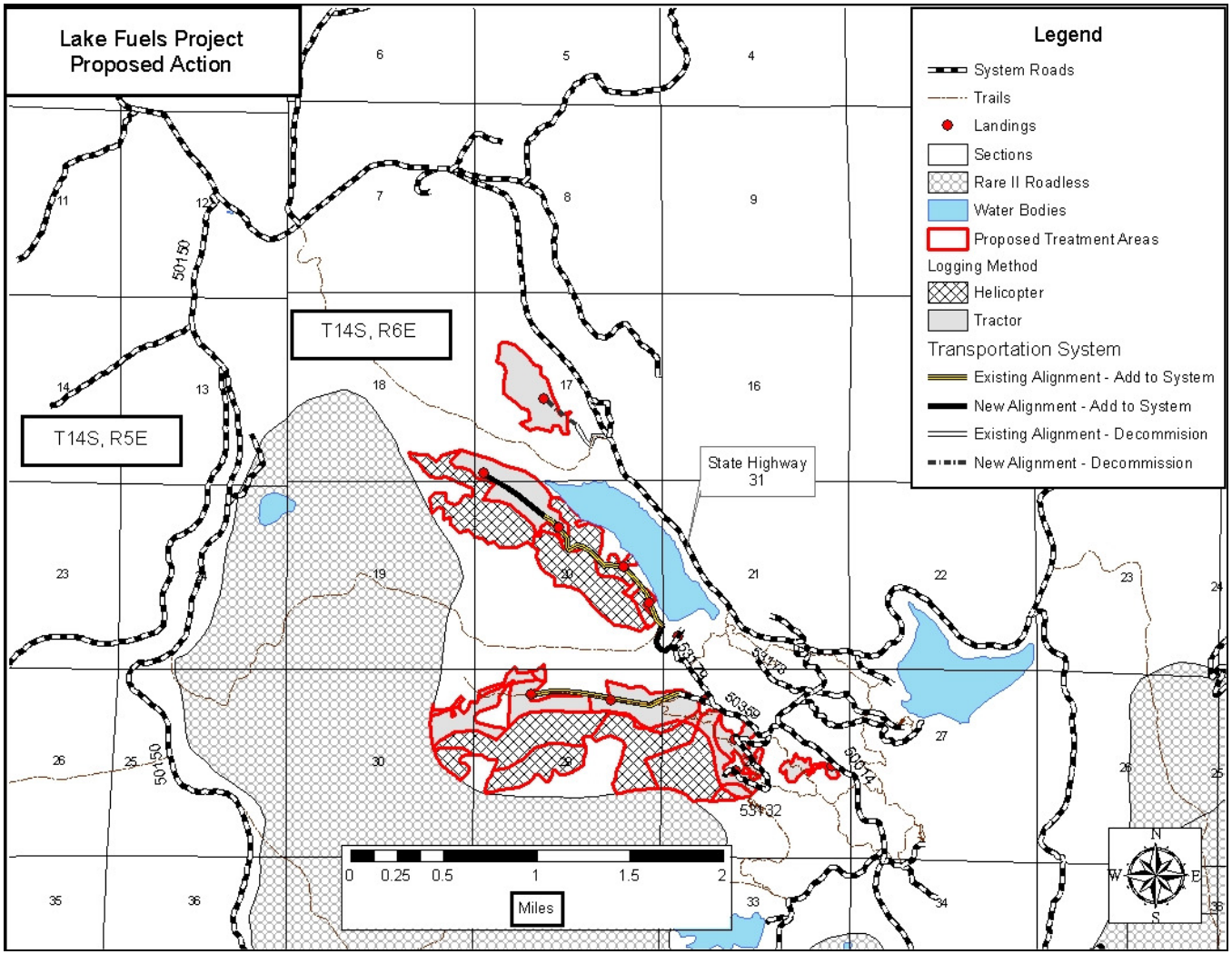
buffer. Fuels treatments in this area would be limited to hand treatments such as piling and burning.

- Take no actions within inventoried roadless areas.

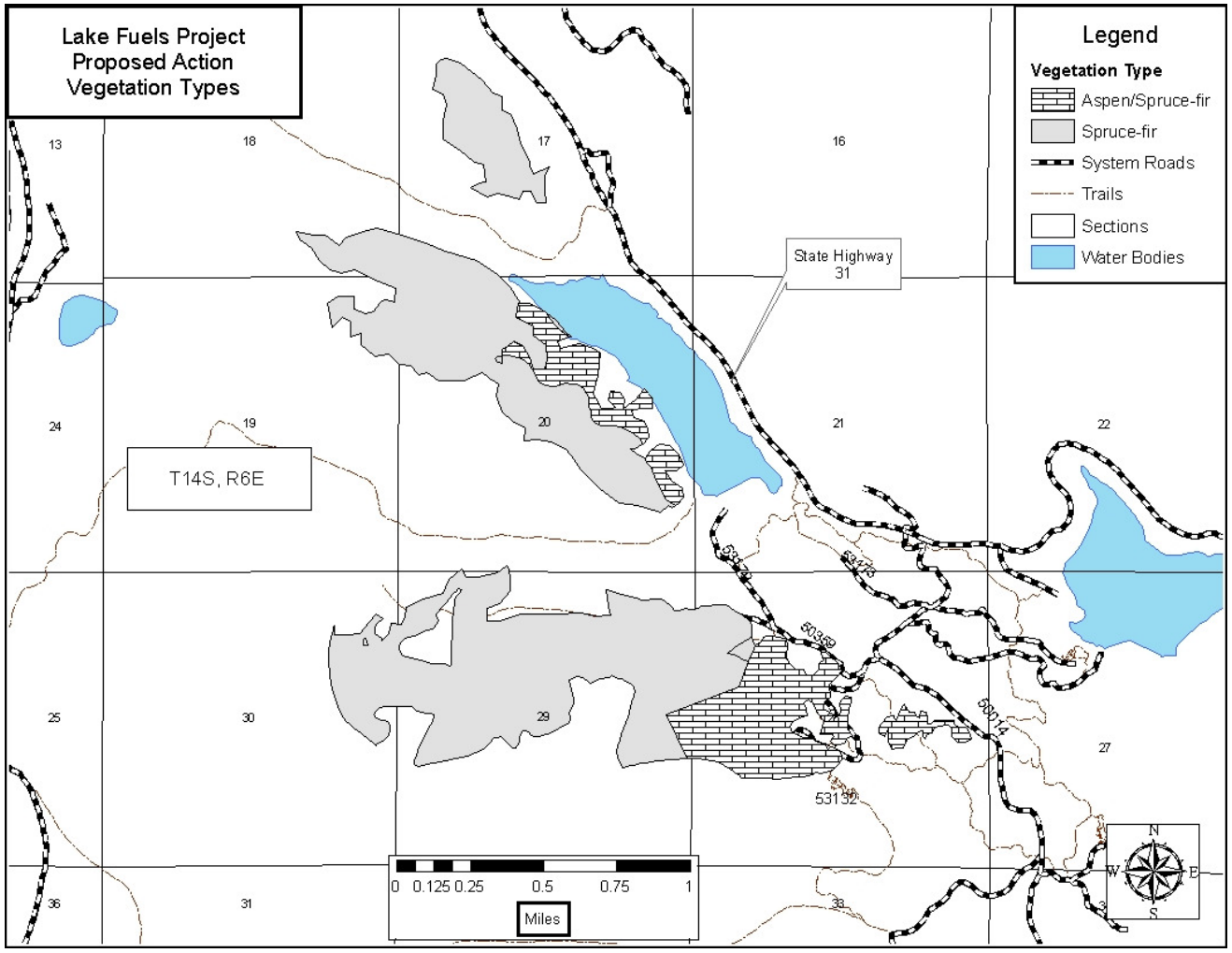
2.2.3 Other Alternatives Considered

No significant issues were identified; therefore, no alternatives other than the proposed action and the no action alternative have been fully developed and analyzed.

Map 2 – Proposed Action – logging systems, access and landings.



Map 3 - Proposed Action – Vegetation Treatments.



3.0 Environmental Consequences

This section describes the environmental impacts of the proposal in relation to whether there may be significant environmental effects as described at 40 CFR 1508.27. Further analysis and conclusions about the potential effects are available in the resource specialist reports and other supporting documentation located in the project record. The following are discussions of resources that have relevance to a determination of significance.

3.1 Fuels

Affected Environment

Historically, high intensity fire activity in spruce-fir stands result in stand replacement events. Normal fire return intervals in this forest type are generally from 250 to 300 years. During normal weather conditions fire does not carry well through existing fuels in spruce-fir stands. The higher fuel moistures result in a lower probability of fire starts. Under extreme burning conditions, fire potential exists during all stages of forest community development in the spruce-fir zone. Widespread stand replacing fires did occur in the Rocky Mountain Region in the last half of the 19th Century, when spruce beetle-killed trees were common, and the lack of fires since that period suggest that spruce beetle disturbances are a pre-cursor of large fires. However, the situation is complicated by the high frequency of human-caused fires during that time and it is difficult to determine whether spruce beetles did or did not increase the susceptibility of these forests to natural fires.

Large, high intensity stand replacement fires can occur in spruce-fir stands under the extreme conditions of drought, high winds, high temperatures and low humidity. An example of this occurred in 2002 on the Sanford fire, Dixie National Forest. This was a prescribed burn in a lower elevation vegetation type that escaped the planned burn area due to an unusual wind event (45 MPH winds), the fire eventually grew and gained elevation and burned into spruce-fir stands. The conditions in the spruce-fir stands were the following: fuel loadings were high due to spruce beetle mortality (some of the dead spruce had fallen); 1000-hour fuel moistures were below 10 percent; average humidity's were below 20 percent; and winds were greater than 40 MPH.

Severe and extreme drought conditions occur 3 to 5 percent of the time in central Utah. Coupled with lower than normal fuel moistures, high fuel loadings, high winds, and steep terrain, an increase in stand replacement fires could be expected over time.

Crown fire potential is a key element for stand-replacement wildfires. Stands within the project area are dominated by mature spruce and sub-alpine fir and have significant amounts of fine fuels in the lateral twigs, which when dead, curl against the larger branches or trunk, frequently along the entire length of the tree. This along with any smaller live trees, especially sub-alpine fir creates a vertical continuity of fuels commonly called ladder fuels. These ladder fuels create a potential risk of a ground fire transitioning to a crown fire. Dead trees are often closely intermingled with live vegetation and easily spread fire to the overstory crowns during dry weather. The increased threat of crown fire remains until the dead needles and/or the fine branches fall from the tree.

The spruce in the Lake Fuels Project Area is over 90 percent dead and most of the needles have fallen. The fine branches are still evident on the standing dead spruce. These dead trees are intermingled with the remaining sub-alpine fir throughout the stands (Cote S., 2008, Lake Fuels Report, Pages 4 and 5).

Issue

- The proposed treatments would not result in lower fire intensity, but would exacerbate fire intensity by exposing ground fuels to greater solar heating and exposure to wind resulting in drier fuels.

  Indicators used:
  - *Spruce-fir and aspen stands treated (acres)*
  - *Large fuel reduction (acres harvested).*
  - *Crown Fire Potential*
  - *Fire Type (surface fire, passive crown fire, active crown fire)*
  - *Expect stand mortality (percent of stand)*

Direct/Indirect Effects

3.1.1 Fuel Loading – Large Fuels Reduction

Direct and Indirect Effects

Alternative 1:

Alternatives 1 will not remove any spruce and fir and will not increase fuel loading from harvest activities. Fine and large fuel loadings in both the spruce-fir and aspen-mixed conifer are elevated and do not drop to manageable levels for the 50 years that were modeled. As fine fuel hazard is decreases over time, stand structure and large fuel loading is increasing. This alternative has the highest probability of an escaped fire and increased chance for a stand replacement fire. Over time, due to the numerous large snags, large down woody debris and heavy surface fuels, fires would be difficult to control, and pose extreme safety hazards to firefighters (Cote S., 2008, Lake Fuels Report, Page 9). In the last five years the North Zone of the Manti-La Sal has had two Wildland Fire Use (WFU) fires and one escaped prescribed fire burn significant acres in the spruce-fir zone; these are Sixmile WFU, White Knoll WFU, and Jungle prescribed fire (Cote S., 2008, Lake Fuels Report, Page 3).

Alternative 2:

Alternative 2 would remove most of the standing dead trees in the spruce stands; fuels treatment would consist of jackpot burning, chipping, hand piling and lop and scattering of slash. The stands classified, as aspen-mixed conifer would have most of the standing dead spruce and ladder fuels removed; merchantable sub-alpine trees in the tractor units would be harvested, the non-merchantable sub-alpine fir and slash would be treated by jackpot burning in 100 percent of the stand. Figure 1 displays the acres of large fuels reductions by alternative and vegetation type (Cote S., 2008, Lake Fuels Report, Pages 9-10).

Figure 1 – Acres of large fuel reductions by alternative and vegetation type treatments.

Vegetation Types	Large Fuel Treatments	Alt. 1,	Alt. 2
Spruce-Sub-alpine fir	Treated	0	675
	Untreated	1,273	598
Total Acres		**1,273**	**1,273**
Aspen-Mixed Conifer	Treated	0	145
	Untreated	216	71
Total Acres		**216**	**216**

Following harvest and completion of slash treatment the average total fuel loading would decrease as depicted in the following charts. As fuel loadings decrease fire risk will decrease over time at different rates is indicated by the flame lengths. Figures 2 and 3 compare flame lengths for moderate and severe conditions for both vegetation types. The threshold used for comparison is 4 feet; flame lengths exceeding 4 feet may exceed the capabilities of initial attack crews. Figures 2 and 3 illustrate the relative changes to flame length over the next 50 years by alternative, vegetation type, and weather conditions (Cote S., 2008, Lake Fuels Report, Page 10).

3.1.2 Firefighter Safety

Direct and Indirect Effects

Alternative 1:

Alternative 1 with no planned fuel treatments the fuel loadings increase in each individual stand, the potential for escape from initial attack resources and for larger than normal wildland fires will also increase. The high fine fuels will increase the rate of spread until the fine fuels are reduced by decomposition and compaction over time. The number of dead trees and potential large down fuel component in the future will decrease fire fighter access, increase time needed to control a fire, limit defensible space and expose firefighters to hazardous dead trees (Cote S., 2008, Lake Fuels Report, Page 13).

Alternative 2:

Following harvest and completion of slash treatment under Alternative 2 the average total fuel loading would decrease as depicted in the following charts. As fuel loadings decrease fire risk will decrease over time at different rates is indicated by the flame lengths. The following charts compare flame lengths for moderate and severe conditions for both vegetation types. The threshold used for comparison is 4 feet; flame lengths exceeding 4 feet may exceed the capabilities of initial attack crews. Figures 2 and 3 illustrate the relative changes to flame length over the next 50 years by alternative, vegetation type, and weather conditions (Cote S., 2008, Lake Fuels Report, Pages 13-15). The reduced flame lengths would provide a better opportunity for firefighters to safely control a wildfire using ground forces, and reduce the probability of having fire escape initial attack.

Figure 2 – Flame Lengths in Spruce-fir Type by Alternative over the next 50 Years with Moderate weather conditions.

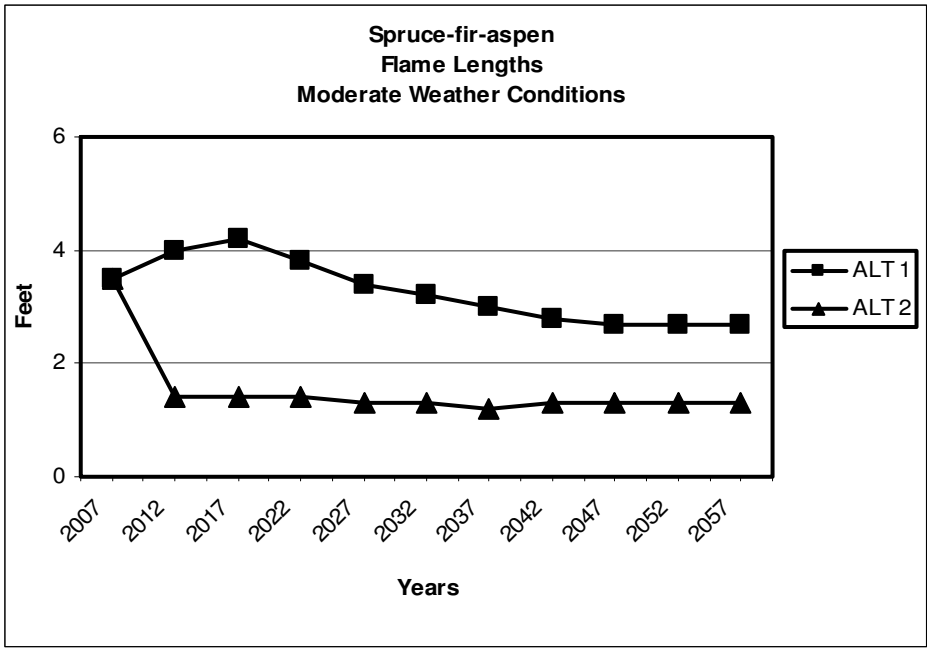
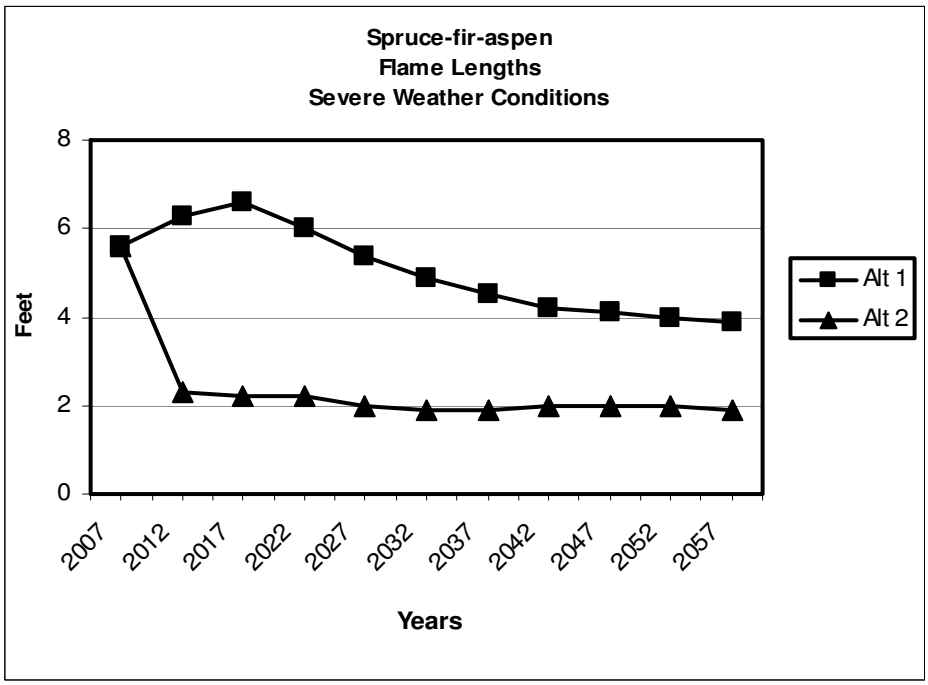


Figure 3– Flame Lengths in Spruce-fir Type by Alternative over the next 50 Years with Severe weather conditions.



3.1.3 Crown Fire Potential

Fire Type – Crown fire potential is a key element for stand-replacement wildfires; two indicators will be used to evaluate the alternatives, Type of fire and potential tree mortality by percent. Two types of fire resulted from the modeling; Surface fire - (fire that burns surface litter, dead woody fuels, other loose debris on the forest floor, and some small vegetation). Passive crown fire - (some crowns will burn as individual trees or groups of trees, ignited by the passing front of the fire). The second indicators are potential tree mortality by percent. Crown fire potential and potential tree mortality will be used to compare the alternatives under both moderate and severe fire conditions over 60 years (Cote S., 2008, Lake Fuels Report, Page 15).

Direct and Indirect Effects

Alternative 1:

The no treatment strategy of Alternative 1 results in a passive crown fire with 70 percent mortality throughout the 50 years modeled. As stated in the introduction: Large, severe stand replacement fires can occur in spruce-fir stands under the extreme conditions of drought, high winds, high temperatures and low humidity. No treatment under Alternative 1 would result in more mortality and is projected to result in passive crown fires by 2032. Figure 5 displays the changes in fire type and stand mortality over the next 50 years for both alternatives (Cote S., 2008, Lake Fuels Report, Page 16).

Alternative 2:

Under the Moderate Fire Conditions, harvest and fuel treatment in all vegetation types result in less wildfire related mortality due to a large fire than the no action alternatives and a large fire is projected to stay as surface fire after all treatments are complete. Figure 4 displays the changes in Fire Type over the next 50 years under Moderate weather conditions.

Figure 4– Changes in fire type under moderate weather conditions over the next 50 years in the Spruce-fir Vegetation Type.

	Alternative 1		Alternative 2	
Year	Type of Fire	Percent Mortality	Type of Fire	Percent Mortality
2007	Surface	47	Passive	48
2012	Surface	49	Surface	28
2017	Surface	51	Surface	27
2022	Surface	49	Surface	27
2027	Surface	45	Surface	27
2032	Passive	44	Surface	29
2037	Passive	42	Surface	30
2042	Passive	41	Surface	27
2047	Passive	46	Surface	26
2052	Passive	46	Surface	26
2057	Passive	40	Surface	27

Under the severe fire conditions there are only minor differences in fire related mortality until fuels treatments are completed. Alternative 2 indicates a surface fire with reduced mortality under severe conditions through 2057 as displayed by the fire model (Cote S., 2008, Lake Fuels Report, Pages 15-16).

Figure 5– Changes in fire type under severe weather conditions over the next 50 years in the Spruce-fir Vegetation Type.

	Alternative 1		Alternative 2	
Year	Type of Fire	Percent Mortality	Type of Fire	Percent Mortality
2007	Passive	70	Passive	72
2012	Passive	78	Surface	28
2017	Passive	84	Surface	27
2022	Passive	78	Surface	27
2027	Passive	75	Surface	27
2032	Passive	78	Surface	29
2037	Passive	77	Surface	31
2042	Passive	76	Surface	27
2047	Passive	82	Surface	27
2052	Passive	83	Surface	27
2057	Passive	78	Surface	27

Issue

- Activity fuels generated by harvest activities could temporarily increase fire risk.
  Indicators used:
  - *tons per acre of <3" material*
  - *Slash treatment (acres) – fine fuel reduction (Changes to Fuel Model)*

3.1.4 Fuel Loading – Fine Fuels Reduction

Direct and Indirect Effects

Alternative 1:

This alternative does not propose to reduce fine fuel loadings within the project area (Cote S., 2008, Lake Fuels Report, Page 10). Fine fuel loadings will increase over time and a discussion of the effects is found under Firefighter Safety on Page 12 of this document.

Alternative 2:

Alternative 2 proposes to treat the fuels by chipping activity fuels, jackpot burning, hand-piling and lop and scatter. Figure 6 displays the amount of fine fuel treatments proposed by each alternative.

Figure 6 – Acres of Fine (<3-inch) Fuel Treatments.

Vegetation Types	Fine Fuel Treatments	Alt. 1	Alt. 2
Spruce-Sub-alpine fir	Jackpot Burn	-	143
	Chipping	-	190
	Hand Pile	-	15
	Lop/ Scatter	-	232
Total Acres			580
Aspen-Mixed Conifer	Lop/scatter	-	0
	Jackpot burn	-	145
Total Acres		0	145

Short Term – 5 years after harvest

The fine fuel loadings could exceed the 12-tons/acre thresholds in the short term for fuel model 10[1](FM 10) in both the spruce-fir and aspen vegetation types in Alternative 2. This will not occur at one time in all the treatment units. The units would be logged over two or more operating seasons and slash treatment operations would begin in individual units in the year following harvest. Fuel levels would be declining as fuel reduction treatments are completed for the individual stands and remain a fuel model 8[2] (FM 8). Under Alternative 1 fine fuels loading is expected to increase and change the stands from a fuel model 10 to a fuel model 12[3] (FM 12) which is more likely to support a stand replacing wildfire. Figure 7 displays the base line fine fuel level (Alternative 1) and the short-term increase in the average fine fuels prior to fuel treatments in Alternative 2.

Under Alternative 2, fuel loadings decreases after 5 years, changing the stands from a FM10/12 to a FM 8, which has less potential for a stand replacing wildfires.

[1] Fuel Model 10 - The fires burn in the surface and ground fuels with greater fire intensity than the other timber litter models. Dead-down fuels include greater quantities of 3-inch (7.6-cm) or larger limbs resulting from over maturity or natural events that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees are more frequent in this fuel situation, leading to potential fire control difficulties. Any forest type may be considered if heavy down material is present; examples are insect- or disease-ridden stands, windthrown stands, overmature situations with deadfall, and aged light thinning or partial-cut slash (Anderson, Hal E. 1982, Aids to determining fuel models for estimating fire behavior).

[2] Fuel Model 8 - Slow-burning ground fires with low flame lengths are generally the case, although the fire may encounter an occasional "jackpot" or heavy fuel concentration that can flare up. Only under severe weather conditions involving high temperatures, low humidity's, and high winds do the fuels pose fire hazards. Closed canopy stands of short-needle conifers or hardwoods that have leafed out support fire in the compact litter layer. This layer is mainly needles, leaves, and occasionally twigs because little undergrowth is present in the stand. Representative conifer types are white pine, and lodgepole pine, spruce, fir, and larch (Anderson, Hal E. 1982, Aids to determining fuel models for estimating fire behavior).

[3] Fuel Model 12 - Rapidly spreading fires with high intensities capable of generating firebrands can occur. When fire starts, it is generally sustained until a fuel break or change in fuels is encountered. The visual impression is dominated by slash and much of it is less than 3 inches (7.6 cm) in diameter. The fuels total less than 35 tons per acre (15.6 t/ha) and seem well distributed. Heavily thinned conifer stands, clearcuts, and medium or heavy partial cuts are represented. The material larger than 3 inches (7.6 cm) is represented by encountering 11 pieces, 6 inches (15.2 cm) in diameter, along a 50-foot (15-m) transect (Anderson, Hal E. 1982, Aids to determining fuel models for estimating fire behavior).

Figure 7 – Short Term fine fuel loading for the No action Alternative 1; Alternative 2 after harvest prior to jack pot burning, hand piling, chipping and lop and scatter treatments

Fine Fuels	Alternative 1 Fuel Load, < 3 in. Tons/acre	Alternative 2 Fuel Load, < 3 in. Tons/acre
<5 Years	11.2	17.9
> 5 Years	14.6	5.1

Long Term – 50 years after treatment

After the fuels treatments are complete under Alternative 2 the fine fuels (<3 inches) will be below five tons per acre and be considered a fuel model 8. Fine fuels will increase until 2012 for Alternative 1 and will be above the 12-tons/acre thresholds for a fuel model 10. After 10 years fine fuels will decline but will still be above 5 tons per acre for the fifty years. At the same time the large fuels will be increasing due to the fall rate for dead spruce and Alternative 1 will remain at a fuel model 10 (Cote S., 2008, Lake Fuels Report, Pages 10-13).

Cumulative Effects:

There are no cumulative effects beyond what has been described under direct and indirect effects. There was a timber sale in portions of the proposed treatment areas about 20 years ago. The treatment areas are regenerated and no continuing effects were identified during field surveys for this project. There are no additional slash or harvest treatments ongoing or planned within the project area. For fine fuel and large fuel reduction, predicted Rate of Spread (ROS) and potential for Initial Attack (IA) escape there will be no change from what has been previously discussed.

Expected fire behavior will generally be confined in the stands containing dead spruce and sub-alpine fir. It could be anticipated to experience high severity and intensity wildfires burning in blocks ranging from 100 to 200 acres in size across the project area in the immediate years following an epidemic.

Reducing the natural buildup of fuels by harvesting and implementing slash disposal mitigations, and breaking up the continuous fuels and live over story canopy within stands would reduce the risk for a large intense wild land fire in each treated stand. The stands would be susceptible to intense, wild land fires when the following are present: low fuel moistures, low humidity's; high temperatures; and wind. The probability of these events occurring is low in any given year. However, over time, the probability is increased due to the gradual increase in large fuel loading from the insect killed spruce as they fall down over the next 50 years.

As crown spacing is increased it is presumed that there will be an increase of grasses and forbs including introduced species. Monitoring of wildfires has found increases in introduced species including noxious weeds. Low burn intensities have generally benefited the native species, while high severity fires create conditions ideal for non-native plant species. Native species will in turn attract wildlife grazing and increased domestic grazing into the area with a corresponding reduction in fine herbaceous fuel loadings; which will mitigate the effect of higher fine fuel loadings and increased exposure to local wind influences from the loss of the live tree canopy.

The proposed timber management activities in the project area have potential for reducing both present and future fuel loadings. If the pattern of cutting follows overlapping and staggered placement the treatments also have the ability to slow both ground and crown fires on these slopes. This would allow time and space to effectively fight a fire during extreme conditions. An example of this type of treatment is in the large blow down treatments in Michigan as developed by Mark Finney.

Activity fuels should be treated 2 to 5 years following timber harvest, through a combination of jack pot burning, chipping, hand piling and lop and scatter. To help mitigate increased short-term fire risk effects jackpot burning should reduce fuel loading to 5 tons per acre over 50 to 60 percent of the treated acres. Lop and scatter and chipping treatments will be used in some areas to break up fuel orientation, concentrations, continuity and lessen the effects of fire duration on soils where appropriate. Lop and scatter will not affect the fuel loading in those areas and would be expected to follow the 5 to 9 years for the decay processes in obtaining lower fire risk (Cote S., 2008, Lake Fuels Report, Pages 16-18).

3.2 Recreation

Issue:

- Proposed activities may temporarily displace dispersed recreation users within the project area, particularly on the roads, trails and developed dispersed sites in the Millers Flat area.
    - *Recreation Visitor Days (RVD's)*

Affected Environment

The planning area for the proposed Lake Fuels Project encompasses the headwater drainages of Spring Creek and Lake Canyon, which constitute the upper reaches of the Left Fork of Huntington Creek. Huntington Reservoir, a popular fishery, also lies within the project area boundary. Skyline Drive (NFSR 50150), a popular recreation road during the summer and fall months, forms the project area boundary on the west. Utah State Highway (U-31) borders the project area on the north and east sides. U-31 is a double laned, paved highway connecting the communities Fairview and Huntington, Utah via Huntington Canyon. It is a designated National Scenic Byway (Huntington-Eccles Canyon National Scenic Byway) and is open year round to travel. The southern boundary of the project planning area extends east from Skyline Drive, down the crest of the ridge separating Lake Canyon and Rolfson Canyon, and connecting to Millers Flat road (NFSR 50014) just north of the intersection with the road to Rolfson Reservoir (NFSR 50269).

Because of its year round accessibility, rolling terrain, availability of water resources, variety of recreation opportunities, and outstanding mountain scenery, the Lake Canyon area is a natural setting for outdoor recreation and is one of the most popular areas on the Forest. The area provides a year round assortment of recreation activities ranging from camping, fishing, ATV travel, family reunions, and hiking in the summer; to viewing autumn colors and hunting in the fall; to ice fishing, snowmobiling, cross country skiing, kite boarding and other snow play activities in the winter and early spring. Local residents from both Carbon and Emery Counties to the east and Sanpete Valley to the west have a long history of recreation use in the area. There are also many visitors from the urban areas along the Wasatch Front.

Much of the area within the planning boundary for the Lake Fuels project is roadless and/or of roadless character which provides a significant region for semi-primitive outdoor experiences including camping, hiking, hunting, and fishing. Approximately 1680 acres of the Rolfson-Staker designated roadless area

lie within the project boundary. There are an additional 2000 acres in the analysis area that are greater that ¼ mile from an existing open road that were not included in the designated roadless area.

The Lake Canyon area receives high recreation use during the summer, fall, winter, and early spring seasons. The highest concentration of recreation activity within the proposed project area is located in the southeast corner of planning area. Approximately 760 acres of the Lake Canyon Recreation Area is contained within the project boundary. The area includes five group sites, 46 family sites, and over 10 miles of OHV trail. The remainder of the analysis area receives moderate recreation use throughout the year in the form of fishing, hunting, hiking, back country skiing, kite boarding and snowmobiling.

There are two ROS (Recreation Opportunity Spectrum) classifications pertinent to the project area. Areas along U-31, Miller Flat Road, and South Skyline Drive are classified as Roaded Natural Appearing. This designation provides for slightly less isolation from the sights and sounds of humans. The opportunity for a high degree of human interaction with the natural environment and both motorized and non-motorized recreation is provided.

The rest of the project area is classified as Semi-Primitive Motorized. This designation provides some isolation from the sights and sounds of humans. It should also provide the user with a degree of interaction with the natural environment and the ability to use motorized vehicles in the area (Broadbear B., 2008, Lake Fuels Recreation Report, Pages 1 and 2).

Direct and Indirect Effects

Currently the estimated number of *Recreation Visitor Days (RVDs)* in Lake Fuels project area is 31,500 per year. This is comprised of approximately 25,000 RVD's during the summer and fall months (May thru October) and 6,500 RVD's during the winter months (November thru April). Additional demand for summer/fall recreation experiences such as those provided in the Lake Canyon Recreation Area will continue to grow each year. This visitation will most likely be absorbed by undeveloped dispersed camping areas further south along the Miller Flat road. Winter use has tended to stabilize over the past few years with the exception of kite boarding which has experienced tremendous growth. This use is taking place in an area known as the Big Drift on the northern edge of the project boundary.

Alternative 1:

Under the No Action alternative there would be no harvest operations, no temporary road construction, no follow-up planting activities, no prescribed burning or any other activities related to the Lake Fuels project. Visitors would not be displaced or restricted from using camping sites, roads, or trails within the area. Therefore, implementation of Alternative 1 would have no direct effect on recreation activities and *Recreation Visitor Days* would remain unchanged (See figure 8 –Direct and Indirect Effects by Alternative).

Indirect effects of the No Action alternative on recreation use in the Lake Fuels project area are those that would naturally evolve over time given no treatment to the forest stands. Beetle infestation has resulted in die-off of a high percentage of spruce in the area. Dead spruce in these stands will be solid and firmly anchored into ground for a while, but as time passes various rots and fungi will work to weaken both the structural strength of the tree stem above the ground as well as the root system holding the tree upright. As this happens trees will become more susceptible to wind throw or breaking off and falling over.

Roads and camping sites in the project area are generally located away from the proposed harvest units. Dead spruce near campsites of the Lake Canyon Recreation Area were harvested in 2006, so there is minimal concern for visitor safety. If additional trees located near campsites die, they would be removed under hazard tree guidelines. The obvious availability of nearby dead spruce may entice some campers, or others familiar with the area to gather campfire fuel or to cut and haul loads of firewood home, resulting in exposure of some visitors to hazard tree conditions. A small increase in RVD's (probably 5% or less) associated with fuel wood harvest may occur. Non-motorized trail #5382 in the project area could be blocked by numerous dead falls, increasing trail maintenance costs (approximately +20%) and resulting in off-trail use (approximately 200 RVD's) as visitors try to avoid down trees (Broadbear B., 2008, Lake Fuels Recreation Report, Page 4).

Alternative 2:

Alternative 2 of the Lake Fuels Project proposes to treat approximately 820 acres in the spruce/fir and aspen /fir stands. The planned harvest units are located in the eastern portion of the project planning area. Treatment areas are visible from the Huntington-Eccles Canyon National Scenic Byway and are located in close proximity to the Lake Canyon Recreation Area in the southeast corner of the analysis area.

Under alternative 2 approximately 420 acres are to be harvested using helicopter logging and the remaining 400 acres would be removed using ground based logging systems. While logging operations are in progress the public would be restricted from accessing timber harvest units. Trees harvested in these operations would be hauled out of the project area to U-31 using several classified Forest System Roads (FSR's). From there they would proceed either north or south on U-31 depending on the location of the purchaser's destination mill. Segments of two non-motorized Forest System Trails (FST) would be used to access and haul timber from the sale units. Approximately 0.1 mile of trail #5380 and 0.9 mile of trail #5382 would be temporarily converted to work roads. Logging operations, including log hauling, would not be allowed on weekends and holidays.

Direct effects during the course of logging operations include:

- Use of non-motorized FST #5380 could continue as the trail diverges from the temporary work road in the northern harvest unit after the first 0.1 mile. There should be no displacement of use.

- Recreational use of non-motorized FST #5382 in the southern harvest area would be temporarily curtailed. This use would probably be displaced to non-motorized FST #5381 which would remain open during harvest operations. Use of both trails is light with only an estimated 400 RVD's being displaced from one trail to the other.

- Arapeen trail #17 (FST #5197) is a motorized OHV trail within the Lake Canyon Trail System. This ½ mile OHV trail is also located within the southern harvest unit and would be closed during harvest operations. Lake Canyon OHV trails are the heaviest used motorized trails on the Forest. Since construction in 2004, an average of 4245 riders have used these trails each season. Closure of Arapeen trail #17 would not change overall trail system RVD's, but temporarily concentrate use onto the remaining open mileage. No other OHV trails in the Lake Canyon area would be closed during harvest operations.

- If wintertime operations take place, snowmobile and other winter users of the area would be temporarily displaced to areas further south along the Miller Flat Road. Estimated number of wintertime users displaced is 8380 RVD's.

- Lake Canyon Recreation sites #27 and #28 would be closed during harvest operations for public safety. These two sites lie near the western terminus of NFSR 50359. No other camping sites in the Lake Canyon recreation area would be closed during harvest operations. Approximately 500 RVD's would be displaced from these two sites to other sites in the Lake Canyon Recreation Area or to dispersed campsites further south on the Miller Flat Road.

- Some visitors may temporarily avoid the harvest areas due to noise from logging operations, heavy truck traffic and dust. Estimated number of visitors avoiding the area is 2,000 RVD's.

- With close proximity of harvest operations to U-31, some visitors would be curious about what is taking place and want to observe operations, especially helicopter logging methods. Estimated number of RVD's wanting to view operations is 3,000.

- The current mix of recreation traffic with logging operations traffic would create some delays, incidents of traffic congestion, and potential safety concerns particularly along the Miller Flat Road, at the junction with U-31, and along U-31 as log trucks pass by the entrance to numerous recreation areas. Estimated number of RVD's impacted by logging operations traffic during summer/fall operations is 11,340. Estimated number of RVD's impacted by logging operations during winter operations is 630.

- Closure of Arapeen Trail #17 and campsites #27 and #28 will require placement of signage and monitoring to ensure the public does not use the trail or campsites. This would require an increased law enforcement presence of approximately 10%.

Indirect effects following logging operations include:

- Post harvest fuels treatments over 80% of the area will result in a short-term increase in available firewood, but long-term supply will be reduced as this smaller diameter material is removed or decays. Hazards to the public associated with dead and dying trees further removed from the recreation sites would be mitigated. There should be no noticeable change to RVD's .

- Tree harvest would similarly mitigate future deadfall across trails in the project area. Maintenance costs would potentially be lower over time (approximately -20%) with these trees no longer present. Off-trail travel to avoid down trees would seldom be necessary. There should be no effect to RVD's.

- Despite post-harvest design features common to the action alternative such as signage, barrier installation, and lop and scatter methods of slash disposal, some motorized OHV operators may violate travel restrictions and push user created routes into closed harvest units. An increased law enforcement presence (about 30%) would be necessary during summer weekends and the opening weekends of the fall hunts for two years following timber harvest to enforce closed areas. There is no expected effect to RVD's (Broadbear B., 2008, Lake Fuels Recreation Report, Pages 4 - 6).

Figure 8 -Direct and Indirect Effects by Alternative to Recreation Visitor Days (RVD's).

	Alt – 1 Direct	Alt – 1 Indirect	Alt – 2 Direct	Alt – 2 Indirect
Anticipated Effects:				
Restricted access during logging operations resulting in displacement of trail use	N/C	N/C	400	N/C
Restricted access during logging operations resulting in displacement of winter use	N/C	N/C	8380	N/C
Restricted access during logging operations resulting in campsite closure and displacement	N/C	N/C	500	N/C
Public safety—hazard trees falling in areas away from recreation sites	N/C	More exposure	No access	Less exposure
Fuelwood gathering	N/C	+5%	No access	N/C
Trail maintenance costs associated with deadfall in project area	N/C	+20%	No access	-20%
Off-trail travel due to deadfall	N/C	200	No access	N/C
Other conflicts with logging operations (congestion, noise, dust) resulting in visitor displacement	N/C	N/C	2000	N/C
Curiosity/interest in viewing helicopter operations	N/C	N/C	3000	N/C
Public safety on Forest System roads and U-31	N/C	N/C	11,970	N/C
Law enforcement presence	N/C	N/C	+10%	+30%

Cumulative Effects:

Visitation in the Lake Fuels project area during the summer and fall months is approximately 25,000 RVD's per year. Utah's demographics, coupled with the imminent retirement of millions of baby boomers nationwide all point towards increasing demand for recreation opportunities. The Lake Fuels project area and larger Miller Flat road corridor and South Skyline Drive areas provide ready access off of U-31 to nearby fisheries, reliable winter snows, big-game hunting, camping and trail opportunities. This landscape will undoubtedly receive more recreation attention and use over the foreseeable future, regardless of the presence or absence of the Lake Fuels project.

The cumulative effect of implementation of this project when added to increasing recreation demand is to inadvertently give this demand a direction. By creating a more open landscape through timber harvest, public demand for additional camping and trail opportunities may well be focused towards the harvest areas. Indirect impacts such as illicit OHV travel and subsequent need for law enforcement are foreseeable. Demand for additional camping sites and motorized and non-motorized trail opportunities

(both summer and winter) which take advantage of the post-harvest landscape are probable (Broadbear B., 2008, Lake Fuels Recreation Report, Page 7).

3.3 Wildlife

Management Indicator Species

3.3.1 Elk and Mule Deer

Affected Environment

Elk are common in most mountainous regions of Utah, where they can be found in mountain meadows and forests during the summer and in foothills and valley grasslands during the winter. Dense brush understory is used for escape and thermal cover. Elk are primarily grazers, but also consume forbs and may browse on willow, aspen, oak, etc., where grasses are unavailable. The elk rut occurs from late August to November, and calving takes place during late spring and early summer in areas that provide dense cover with brushy vegetation near openings, available water, and seclusion from human impacts.

On the Wasatch Plateau, elk tend to occupy the higher elevation aspen and mixed conifer habitats from spring through early fall, and then move to lower elevation mixed shrub, pinyon/juniper, and sagebrush habitats for winter range. Elk generally occupy winter range from about the beginning of December through mid-April, but this varies depending on the severity of the winter. The entire project area is contained within Big Game Management Unit 16 – Central Mountains and is identified as crucial summer range. The Manti elk herd population has been increasing steadily since 2003 but is currently below the management unit objective of 12,000 animals (Dyke S., 2008, Lake Fuels Wildlife Report, Page 9).

Mule deer are common state-wide in Utah, where they can be found in many types of habitat ranging from open deserts to high mountains to urban areas. Mule deer often migrate from high mountainous areas in the summer to lower elevations in the winter to avoid deep snow. Mule deer prefer a mosaic of various aged vegetation that provides woody cover, meadow and shrubby openings, and free water. Vegetation cover is critical for thermal regulation in winter and summer, and to provide escape cover. They browse and graze, and prefer tender new growth of various shrubs, many forbs, and a few grasses.

Their populations throughout Utah have historically fluctuated, periodically affected by drought and severe winter weather. Populations in eastern Utah declined in the early to mid 1990s, but showed signs of recovery in the late 1990s. The decline was attributed to severe drought conditions from 1988 through 1992, which was followed by a severe winter in 1992-93. Other factors contributing to fluctuating mule deer populations include predators, habitat changes, and competition with elk. The Manti deer herd population has been increasing steadily since 2002 but remains below the management unit objective of 32,000 animals (Dyke S., 2008, Lake Fuels Wildlife Report, Page 9).

Rutting season occurs in late fall through early winter. Fawning peaks generally occur from late April through mid June. Fawning occurs in moderately dense shrublands and forests, dense herbaceous stands, and high elevation riparian and mountain shrub habitats that have available water and abundant forage. The entire project area is contained within Management Unit 16 – Central Mountains and is identified as crucial summer range for mule deer. Movement of the deer and elk herds that use the project area is generally within three 6th field watersheds, Lake, Rolfson, and Staker (Dyke S., 2008, Lake Fuels Wildlife Report, Pages 8 and 9).

Cover/Forage and Open Road Density

Optimum deer and elk habitat is the amount and arrangement of cover and forage areas that result in the maximum possible proper use of the maximum possible area by the animals. This is the cover to forage ratio (cover:forage). The Forest Plan states on III-19 that the optimum habitat mix for the daily normal range is 25 percent hiding cover, 15 percent thermal cover, 10 percent hiding or thermal cover, and 50 percent forage. Within the project area, spruce/subalpine fir stands provided hiding/security cover before they were killed by spruce beetles. Grasses, shrubs and forbs found in openings and previously harvested areas provide forage. Aspen stands function as both forage and cover. At the time the Lake Vegetation EIS was written, the project area contained about 51 percent hiding and thermal cover and 49 percent forage; this met Forest Plan direction. Since about 90 percent of the conifer trees are now dead, they do not function any longer as thermal cover and are much less effective as hiding cover without their green needles and canopy. Security cover is considered adequate when 90 percent of a standing elk or deer is hidden by vegetation at a distance of 75 yards or less. Ideal summer thermal cover consists of sapling trees or shrubs at least 5 feet tall with 75 percent closure of the canopy.

Hiding cover effectiveness was analyzed using a postprocessor (Multi Story Elk Hiding Cover) for the Forest Vegetation Simulator. Results show that the treatment stands do not currently meet the criteria for hiding cover after the beetle-caused mortality.

Aspen comprises approximately 27 percent (about 1,480 acres) of the project area. These stands of aspen should be functioning as hiding cover and summer thermal cover for elk and deer. The aspen stands in the project area are being encroached by spruce/subalpine fir, and there is a general lack of aspen regeneration. Aspen is an important habitat component for deer and elk as it provides both forage and cover, and is used as calving and fawning areas. These stands need to be disturbed by harvest and/or fire in order to stimulate regeneration. Based on the above discussion it is estimated that the project area is currently about 27 percent cover and 70 percent forage. The remainder is bare rock and water.

Potential impacts to deer and elk are likely to be similar, therefore analysis of effects for these two species are summarized together (Dyke S., 2008, Lake Fuels Wildlife Report, Pages 8 and 9).

Direct and Indirect Effects

Alternative 1:

If no action were taken, the existing cover and forage would remain over a longer period than if dead trees were harvested and stands replanted. Over the long-term (more than 5 years), cover would be reduced even further as dead trees rot and fall. The cover:forage ratio would continue to be out of compliance with current Forest Plan direction, and would take longer to recover than if the beetle-killed stands were to be harvested and replanted, and aspen stands disturbed to stimulate regeneration.

Long-term loss of large trees and canopy cover from beetle caused mortality, has opened the forest floor and allowed for shrubs, forbs and grasses to develop. This improves forge availability while reducing cover. However, forage is not limiting in the project area. Natural regeneration of spruce in spruce/fir stands would take longer (approximately 20 years), than if the stands were harvested and replanted, approximately 5 years. Aspen stands would continue to be lost to encroachment and decadence (Dyke S., 2008, Lake Fuels Wildlife Report, Page 9).

Direct and Indirect Effects

Alternative 2:

Salvage harvest would not directly affect the cover:forage ratio in the short-term (0 – 4 years). The cover:forage ratio would continue to be out of compliance with the Forest Plan standards and guidelines for approximately 10 years, until natural regeneration and planted stock become large enough to function as hiding cover. Disturbed aspen stands would regenerate and provide functioning cover in approximately five years.

The proposed project is found in big game crucial summer range but the quality of the area has been reduced and the proposed project in the long term would create better habitat. Project related noise disturbance during implementation would reduce the sense of security and would likely result in avoidance of areas in close proximity to project activities. This effect would not be expected to last past project related activities. Noise disturbance from helicopter logging spans a greater area than ground-based logging due to the aerial transport of logs from the harvest unit to the landing area. Alternative 2 would treat approximately 430 acres in three units through helicopter harvest methods.

Presently, habitat in and around the project area is not used to a great extent by deer/elk due to the amount of dispersed recreation activity in the area. Disturbance from harvest activities wouldn't impact wildlife anymore than they already are, with the exception of those outer edges of the project area furthest from the recreation activity. Disturbance in these areas would be short-term and any wildlife use that occurs there now should resume following completion of harvest activities (Dyke S., 2008, Lake Fuels Wildlife Report, Pages 9-11).

Cumulative effects:

There are no other proposed fuels projects within the cumulative effects boundary. Therefore there is no additional planned changes to the cover forage ratio.

Road closures have been implemented as part of two separate projects that were done to control noxious weeds and re-vegetate areas in the cumulative effects analysis area. These closures have resulted in decreasing the open road density and increasing habitat effectiveness for deer and elk. However, some unauthorized OHV use is still occurring on some sections of closed road. Where this occurs, it would negate any benefits of having "closed" the roads. It is not possible to quantify effects of illegal OHV use on road density and disturbance to big game.

Pads and roads from past oil and gas drilling have been reclaimed and re-vegetated and should not add to effects of the Lake project. Effects of future oil and gas drilling would be improved access to the area resulting in possible increased use and disturbance to big game. Future hazard tree removal around developed dispersed sites would add traffic on area roads and intermittently increase disturbance to big game using the area (Dyke S., 2008, Lake Fuels Wildlife Report, Pages 10-11).

3.3.2 Golden Eagle

Affected Environment

Preferred habitat is generally open country, in prairies, arctic and alpine tundra, open wooded country, and barren areas, especially in hilly or mountainous regions. Golden eagles nest on rock ledges of cliffs or in large trees. Eagles are opportunistic feeders, and feed on a variety of prey, including small rodents, hares and rabbits.

No Golden eagles are known to nest within the analysis area, nor is any suitable nesting habitat available. Although no golden eagles were detected during the raptor surveys, the project area may

provide foraging opportunities. Active nests on the Manti division of the forest have been declining since 1999. This is believed to be a result of the drought and reduction of prey base. Prey species such as jackrabbits, cottontail rabbits, and prairie dogs have also been declining in numbers, in part due to a cyclic population dynamic, and in part due to drought (Dyke S., 2008, Lake Fuels Wildlife Report, Page 12).

Direct and Indirect Effects

There are no documented sightings of golden eagles in the project area. There is no suitable nesting habitat. Any use of the project area would be incidental foraging. Foraging habitat would increase within the treated aspen stands. Since there is no suitable nesting habitat in the project area, breeding behavior would not be affected. Although there could be some use of the project area for foraging, eagles would likely avoid the area during project implementation.

Since gopher control treatments would be implemented, it is possible that a golden eagle could consume a treated gopher. However, gopher control would utilize underground methods, which results in minimal hazards to non-target wildlife. Treatment of gophers would only occur where needed to re-establish new tree seedlings Although there could be some use of the project area for foraging, eagles would likely avoid the area during project implementation. (Dyke S., 2008, Lake Fuels Wildlife Report, Pages 12-13).

Cumulative effects:

No measurable effects to golden eagles are expected as a result of implementing this project; therefore no cumulative effects are anticipated (Dyke S., 2008, Lake Fuels Wildlife Report, Page 13).

3.3.3 Macroinvertebrates

Affected Environment

Aquatic macroinvertebrates include insects, such as mayflies, stoneflies, caddis flies and diptera (two-winged flies). They provide an ecological link between microscopic prey organisms and fish. Aquatic insects go through a series of life stages in a stream. Insects with incomplete metamorphosis (mayflies and stone flies) go through three stages: egg, nymph and adult. Insects with complete metamorphosis (caddis flies and dipterans) go through four stages: egg, larva, pupa and adult. The majority of their life is spent in the nymph or larva stage. While growing they go through a variety of stages called instars. The nymphs and larva emerge from the water as winged adults. The adults reproduce (lay eggs), completing the cycle.

The most resistant life stage of many aquatic insects is the egg. Eggs of many aquatic insects can survive dry conditions for many months, and extended hatching periods are common to many stream insects (Hynes 1972). Aquatic insects also have a variety of life cycles with a few having multiple generations per year, and some take more than a year for each generation. Even with species that have annual generations, there may be overlapping generations (Hynes 1972). These factors increase the likelihood that the more resistant egg stages are present over prolonged periods, reducing the impacts of short-term environmental disturbances. These cyclic and highly variable populations also mean that monitoring of individual taxon populations is not feasible for land management monitoring purposes.

The 1986 Forest Plan's monitoring and evaluation program includes aquatic macroinvertebrates as a management indicator species and calls for monitoring at baseline stations or as needed for select project activities. Most of the baseline stations are at or near the Forest boundary. The Forest Plan was amended in 2006 to update the protocols used to collect macroinvertebrate data and to change the method used to analyze the data. The 2006 amendment did not alter the language regarding

macroinvertebrate monitoring as an optional technique for selected projects. No site-specific surveys of aquatic macroinvertebrates have been conducted and no site-specific monitoring is proposed for this project. Monitoring will continue at baseline stations to characterize Forest-wide conditions; data analysis will be in cooperation with the Utah Division of Water Quality.

36 CFR 219.14(f) states that site-specific monitoring [for management indicator species] or surveying of a proposed project or activity area is not required, but may be conducted at the discretion of the Responsible Official. The Forest Plan, as amended, is consistent with this direction (Jewkes, P., Lake Fuels Aquatic Report, 2008, Pages 9 and 10).

Direct and Indirect Effects

Alternative 1:

There would be no direct or indirect impacts as a result of the Alternative 1 (No Action) alternative. There would be no harvest activities within the project area or within streamside edge of the SMZ. No treatments in the area could result in a high intensity, high severity fire which could lead to a large accumulation of ash within the stream which could cause an increased mortality in the populations of macroinvertebrates in the streams. High intensity, high severity fire could increase temperatures and reduced long-term woody debris in the stream affecting macroinvertebrate populations within the streams (Jewkes, P., Lake Fuels Aquatic Report, 2008, Page 14).

Alternative 2:

Site preparation, timber harvest and salvage cutting would have no direct effects on macroinvertebrates because harvest would not occur within stream channels and riparian habitats would be protected from ground disturbing equipment. Indirect effects could include a minimal increase in sedimentation due to a temporary reduction in herbaceous and shrubby vegetation outside the riparian zone. Habitat would be protected by utilizing design features that require a 100 foot buffer on all perennial streams and springs and a 50 foot buffer on all intermittent streams. No ground disturbing equipment would be allowed within the buffer. Buffer zones of this width have been proven effective in filtering sediment from timber harvest activity and reducing measurable effects to aquatic resources.

Prescribed fire may be implemented on a portion of the project area but will have no direct effects on macroinvertebrates. Indirect effects would vary due to fire intensity, aspect and slope, and all burns remove some degree of forest floor cover. The reduction in leaf litter and herbaceous plant cover may result in potential for increased sedimentation and enhanced nutrient content of river water. Water yield would likely increase slightly due to reduced transpiration and raindrop interception by herbaceous plants. Neither of these possible effects would likely be to the extent that it would change conditions for macroinvertebrate habitat.

Construction of temporary roads, skid trails and log landings would have no direct effects on macroinvertebrates. Indirect effects would include the removal of vegetative cover and soil disturbance as these areas are established, shaped and drainage structures installed. These activities have the potential to increase sedimentation, concentrate runoff, possibly alter surface and subsurface flow and potentially impact water quality. The potential for sedimentation will be reduced by re-vegetating exposed soils outside the needed roadbed, establishing sedimentation traps in drains leading to streams and not establishing roads within streamside corridors (Appendix B, Pages2 and 3).

Macroinvertebrates within the project area are dependent upon high water quality levels and low levels of siltation. Soil and water conservation practices (SWCP's) are incorporated in the project design and requirements. With implementation of the design features and SWCP's direct and indirect effects are

expected to be minimal and limited in scope, intensity, and duration (Jewkes, P., 2008, Lake Fuels Aquatic Report, Pages 13 and 14).

Cumulative Effects

Measurable direct or indirect effects to macroinvertebrates are negligible; therefore cumulative effects are negligible (Jewkes, P., 2008, Lake Fuels Aquatic Report, Page 14).

3.3.4 Migratory Birds - Williamson's sapsucker

Affected Environment

Williamson's sapsucker occurs in western North America, where it ranges from southern British Columbia to central Mexico. It is found in Utah mainly in the mountainous areas of the eastern two-thirds of the state, where it is an uncommon breeder. On its breeding grounds, the habitats used by this species are middle - to high - elevation coniferous forests and mixed deciduous-coniferous forests containing aspens. Williamson's sapsuckers feed on insects, especially ants, and the sap of conifers and aspens. This woodpecker is a primary cavity excavator using typically an aspen or a conifer, usually three to sixty feet above the ground. The principal threat to this species in Utah is loss of habitat through timber harvest. The population trend in the state is not known. There have not been formal surveys done for this species, and there are no documented occurrences in the project area. Furthermore, Utah Natural Heritage data do not show any confirmed or probable breeding activity in Emery or Sanpete Counties (Dyke S., 2008, Lake Fuels Wildlife Report, Pages 14 and 15).

Direct and Indirect Effects

Alternative 1:

Potential habitat for this species in the analysis area has declined due to the high mortality of conifer trees. Dead trees do not produce the sap that is a food source for sapsuckers. It is unknown how or if conifer mortality has influenced forest ant populations (Williamson's sapsuckers main food source). Since Williamson's sapsuckers do not likely breed in the project area, the high snag densities resulting from beetle killed trees would have no effect on nesting habitat availability. Recovery and regeneration of forested stands would take longer under the no action alternative than if the dead trees were harvested, spruce re-planted, and aspen disturbed to stimulate regeneration (Dyke S., 2008, Lake Fuels Wildlife Report, Page 13).

Alternative 2:

Aspen regeneration treatments would remove some of the large aspen that could be used for sapsucker foraging. However, over the long-term, these treatments would benefit sapsuckers by ensuring the persistence of the aspen component in the project area. Approximately 225 acres of aspen would be treated to provide for aspen regeneration. Noise disturbance from harvest activities, and road construction and maintenance could cause disturbance and cause sapsuckers to avoid the area. This impact would not last past project implementation activities. Removal of dead spruce trees and re-planting the stand would result in stand recovery and regeneration over a shorter time frame than if the stands were left to decay, decompose and regenerate on their own. It is unknown if sapsuckers breed in the area. If there are breeding pairs within the proposed project area breeding behavior would not be affected because no project activity would be allowed until after nesting is completed. Impacts to foraging habitat and behavior would likely be negligible. As part of this proposed action there has been special design features (Appendix B, Page 5) for cavity nesting species; such as nest trees with cavities will be protected and provide habitat for cavity nesting species, 300 snags per 100 acres with a 18 inch

DBH and 30 feet height. These design features will continue to provide suitable habitat for Williamson's sapsucker and other cavity nesting species (Dyke S., 2008, Lake Fuels Wildlife Report, Pages 13-14).

Cumulative Effects:

The cumulative effects area for Williamson's sapsucker is the project area boundary. It is unknown if this area has any breeding territories. The adjacent Rolfson/Staker Roadless area, and untreated spruce/fir stands outside the roadless area would continue to provide habitat for Williamson's sapsuckers. There are approximately 4,575 acres of Williamson's sapsuckers habitat in the cumulative effects area. After implementation of this project, there would be about 4,490 acres remaining. Abundant snags would be present in the cumulative effects area, even after harvest of proposed stands.

Development of a road system has allowed for easy access and higher recreational use. Impacts from recreational activity combined with project activities can cause disturbance to sapsuckers and may affect breeding and foraging behavior. Combined effects may cause sapsuckers to be displaced from the project area and seek foraging and nesting opportunities elsewhere. The combined impact of recreational use and project activities is not likely to cause sapsucker mortality or reduce their reproductive success (Dyke S., 2008, Lake Fuels Wildlife Report, Page 14).

Rationale for determination:

- Foraging habitat would be removed by timber harvest. However, large areas of foraging habitat would remain in the project area and cumulative effects area.
- Regeneration treatments in aspen stands would remove potential nest trees in the short-term, but would provide for long-term maintenance of aspen.
- Under Alternative 1 increased snags would not benefit current populations but would only increase other hazards and risks (Dyke S., 2008, Lake Fuels Wildlife Report, Page 14).

3.4 Threatened or Endangered Species

3.4.1 Canada Lynx

Direct, Indirect and Cumulative Effects

The USFWS has concluded that lynx occurring in Utah are dispersers rather than residents because there is no evidence of lynx reproduction in Utah and most of the few existing records correspond to cyclic population highs. Also, the boreal forest habitat in Utah is remote and far from source lynx populations.

- There are no large contiguous blocks of forested habitat on the Wasatch Plateau; the Plateau contains only marginal habitat for lynx.
- There are no contiguous stands of conifer in the project area and the lynx habitat is marginal.

Implementation of either alternative would have no effect lynx or lynx habitat because of the discontinuous stands of conifer in the project area, that only provide marginal habitat. Since there would be no direct or indirect effects to Canada lynx, no cumulative effects would occur (Albrecht K., 2008, Lake Fuels BABE Report, Page 19).

3.5 Sensitive Species

3.5.1 Bald Eagle

Affected Environment

Bald eagle nests are typically located in multi-storied (uneven aged) coniferous forest stands that contain elements of old growth structure, and are located near bodies of water that support prey species. Nest trees are generally one of the largest trees in the stand, which provides a good view of the surrounding area (Spahr et al. 1991). Both males and females help construct large, conspicuous stick nests in which may be used year after year. Prey species commonly include fish, waterfowl, jackrabbits, and carrion.

Important perch sites generally have three fundamental elements: a direct view of potential food sources, located within 50 meters of water, and are located in areas isolated from human disturbance. Roost sites generally provide thermal cover or shielding from wind, and are isolated from human disturbance.

During the winter, bald eagles tend to concentrate wherever food is available, which often is in areas that have open water where fish can be caught and there are wintering concentrations of waterfowl. In some regions, such as Utah, bald eagles may also winter in upland habitats where they feed on small mammals and deer carrion. In wintering areas, bald eagles often roost in large groups. These communal roosts are generally located in mature forest stands that provide protection from harsh weather.

There are only a few known nesting pairs of bald eagles in Utah. There is a bald eagle nest site located approximately 28 miles from the proposed project area, and located approximately 7 miles from the Natioanl Forest System land. A nesting pair had been observed at this site during the nesting and fledgling period for several years prior to 1997. This nesting territory was not occupied in 2001 or 2002. The nest was blown out of the tree in the winter of 2003, and a pair built a new nest approximately ½ mile southeast of the old one, but did not nest successfully in 2003. The pair worked on the nest again in early 2004, but did not nest. A 1997 study by N. Boschen indicated that the pair did not forage on national forest system lands; nesting adults and fledglings were found to forage within a 5 mile radius of the nest tree.

No bald eagles are known to nest on Manti-La Sal NF managed lands. Most bald eagle sightings on the Forest have been at Joe's Valley Reservoir and Huntington Canyon during late fall and early winter prior to freeze over. The project area and surrounding habitat could be used by bald eagles in the late fall and prior to freeze over (Albrecht K., 2008, Lake Fuels BABE Report, Page 15).

Direct and Indirect Effects

Alternative 1:

No effects are expected from the no action alternative. There would be no change in potential spring or fall perching or foraging habitat, and no disturbance related to project activities (Albrecht K., 2008, Lake Fuels BABE Report, Page 20).

Alternative 2:

Bald eagles are not known to use the project area either for foraging or winter roosting. If eagles should use the area for foraging during migration, helicopter flights might disturb their foraging activities. This effect would be mitigated through project design features (Appendix B). There would still be an

adequate number of large trees that could be used for perching after project implementation. Consumption of treated gophers is an unlikely possible effect. Underground baiting would be used only where needed. This method presents minimal hazards to non-target wildlife (Albrecht K., 2008, Lake Fuels BABE Report, Pages 19-20).

Cumulative Effects:

Use of facilities and other activities may increase disturbance to eagles, or discourage use of the area during spring and fall migration. However, these types of impacts would be negligible as the project area is not an important use area for eagles, and there are many roosting and foraging opportunities elsewhere along migration routes.

Hazard tree removal around developed dispersed recreation sites will remove some trees that could be used as perch trees, but these sites would not likely be used by eagles due to the human activity. Vegetation removal to establish new roads likely remove some suitable perch trees, and establishment of a transportation system has increased use of the area. Impacts to eagles from the transportation system are negligible since eagles would only use the area on a transitory basis (Albrecht K., 2008, Lake Fuels BABE Report, Page 20).

Implementation of Alternative 2 would not adversely affect bald eagle habitat or bald eagles (Albrecht K., 2008, Lake Fuels BABE Report, Pages 20-21).

3.5.2 Northern Goshawk

Affected Environment

There are three designated goshawk territories outside of, but adjacent to the project area. Post-fledging family areas (PFAs) have been delineated and mapped using forest vegetation cover types. Two PFAs are approximately 1 mile from the nearest harvest units, and the third PFA is within a mile and a half, however the Rolfson territory is the only terrritory where the home range extends into the project area. There is very limited existing habitat within the project area because the majority of the forested stands are comprised of conifer of which 90 percent have been beetle killed. Canopy cover in the conifer stands is not conducive to goshawk nesting and or foraging.

The Rolfson territory has been monitored since 1993 when the territory was first discovered. This territory has not had an active nest since that time. Surveys for the Lake Vegetation Project have not indicated any new goshawk activity. The Rolfson nest is approximately 1.2 miles from the nearest harvest units and the Rolfson PFA's are approximately .7 miles from the nearest harvest units. The spatial relationship between the goshawk PFAs and the project area is shown in figure 2. All three PFAs have been monitored numerous times in the past several years. Monitoring data suggests that there might only be one or two distinct territories, since the nest sites are very close together, habitat is relatively sparse, and no two nests have been occupied during the same year.

The project area was surveyed in 2001 and 2002. No goshawk detections were noted in either year. The project was re-surveyed in 2007 and 2008 and no detections were noted either year. Project survey data suggests that goshawks do not use the project area on a frequent basis (Lake Fuels BABE, 2008, Pages 15 thru 17).

Direct and Indirect Effects

Alternative 1:

The beetle epidemic has progressed and caused large scale mortality of spruce, the more open conditions of the stands have resulted in more shrubs, grasses and forbs developing in the understory. The change in vegetation caused by beetle mortality has started to increase habitat for small mammal prey species. Habitat for woodpeckers, a main prey species for goshawks, has remained optimum but is expected to decrease as the stand continues to die, and no longer provides habitat for the spruce beetle. In stands with an aspen component, die off of spruce did not encourage aspen sprouting, the remaining conifers are overtopping the aspen and aspen continues to decline.

Mature spruce trees have died on about 1273 acres which is approximately 90% of the project area from spruce beetle epidemic. Goshawks have been shown to continue using areas for nesting where there is substantial insect related mortality. However, the quality of the habitat is much lower. Canopy cover has been reduced to 30% to 50% on most of those acres. Regeneration and recovery of mature stands would take substantially longer than if the stands were harvested and replanted.

Basal area in spruce stands since the beetle epidemic have been drastically reduced, ranging from about 30 to 70; openings resulting from large scale mortality are generally greater than 5 acres, and there is a very high density of snags, approximately 54 per acre. The spruce beetle epidemic has caused less nesting habitat, more foraging habitat, and an increased risk of high intensity fire due to the accumulation of dead wood (Albrecht K., 2008, Lake Fuels BABE Report, Page 22).

Alternative 2:

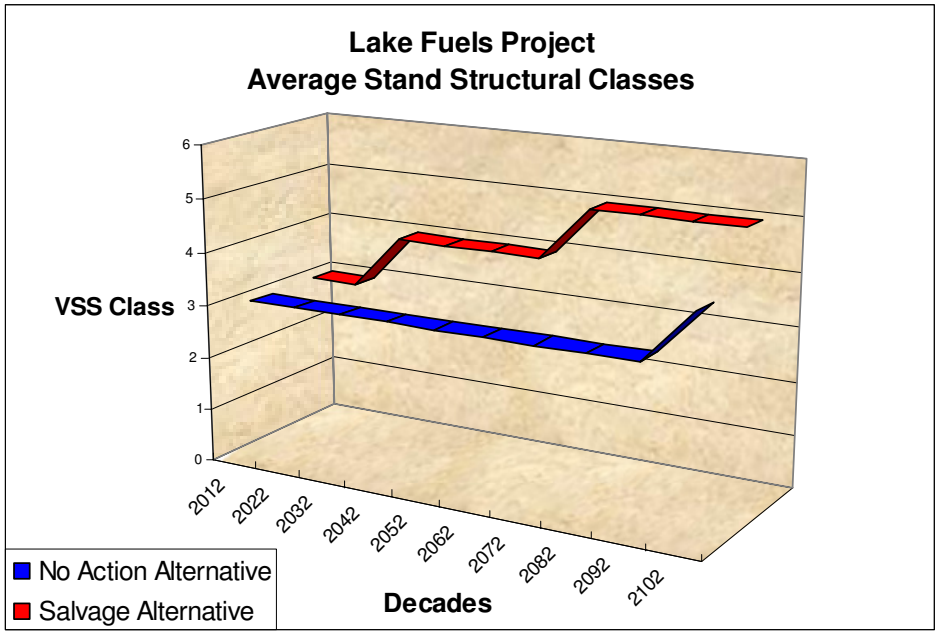
The proposed action would not change the current Vegetative Stand Structure (VSS) class of the spruce-fir stands. No impacts are expected for northern goshawk nesting habitat, because no known nests are in the treatment areas and existing nesting habitat is marginal. If there are any birds in the area, foraging impacts are expected to displace these birds to adjacent areas. The density of the mature/old stage stand structure is important to the northern goshawk, the percentage of mature trees is currently 0% due to the beetle epidemic but a mature foreest will be reached in less than 100 years (D.Cote, 2008, Lake Fuels Vegetation Report, Pages 16 and 17) under the proposed action because planting of trees will occur. See Figure 9 for a comparison of the stand recovery by alternative.

Snag and woody debris would be retained according to the guidelines of the goshawk amendment (Appendix B, Page 5) in order to further provide habitat for goshawk prey species. Aspen treatments that would be implemented under this alternative would have a long-term benefit to goshawks by ensuring that this important habitat component is maintained. Short term impacts are expected within the aspen stands to goshawk prey species and habitat.

Mature spruce trees have died on about 1273 acres which is approximately 90% of the project area from spruce beetle epidemic. Goshawks have been shown to continue using areas for nesting where there is substantial insect related mortality. However, the quality of the habitat is much lower. Canopy cover has been reduced to 30% to 50% on most of those acres. Regeneration and recovery of mature stands (VSS

5[4]) would take substantially longer than if the stands were harvested and replanted (Lake Fuels BABE, 2008, Page 22).

Figure 9– Comparison of stand structure recovery by alternative (Cote D., 2008, Lake Fuels Vegetation Analysis Report).



Basal area in spruce stands since the beetle epidemic have been drastically reduced, ranging from about 30 to 70; openings resulting from large scale mortality are generally greater than 5 acres, and there is a very high density of snags, approximately 54 per acre. The spruce beetle epidemic has caused less nesting habitat, more foraging habitat, and an increased risk of high intensity fire due to the accumulation of dead wood.

Habitat for prey species such as woodpecker would be reduced due to removal of dead spruce. Habitat for other prey species such as small mammals would increase as grasses and shrubs develop under the opened canopy. Noise disturbance from vegetation treatment, road construction, and maintenance could cause avoidance of areas being worked in. This effect would not last past harvest related activities.

Despite repeat surveys, no goshawk nesting areas have been discovered in the project area. Additional surveys would be conducted prior to harvest of each unit (Albrecht K., 2008, Lake Fuels BABE Report, Page 21).

Cumulative effects:

The cumulative effects area for goshawk is the Lake and Rolfson 6th level watersheds. This area encompasses the current breeding territories in the vicinity of the project area. The most important activities affecting goshawk habitat are the effects from the spruce beetle epidemic, past timber harvest, and fire exclusion. Two small aspen clearcuts (about total 10 acres) were created in the early 1990s that

[4] Vegetation structure for Engelmann spruce stands was determined using the Characteristics of Old-Growth Forest in the Intermountain Region, Hamilton 1993 and the Vegetative Structural Stages, Calculations and Description (VSS), 1992 (Cote D., 2008, Lake Fuels Report, Page 2).

have successfully regenerated. Aspen regeneration is a benefit to goshawks and this aspen stand improvement combined with aspen improvement in the Lake project would increase habitat diversity for goshawks. The spruce beetle epidemic has changed the habitat over thousands of acres, decreasing the amount of potential nesting habitat. The infestation of spruce beetles has drastically affected the canopy cover in mature forests reducing potential nesting habitat for goshawks. Regeneration of the stands would take substantially longer than if the stands were harvested and replanted. The proposed project would help recover canopy cover and nesting habitat much sooner than if left untreated (Albrecht K., 2008, Lake Fuels BABE Report, Page 22).

3.5.3 Northern Three-toed Woodpecker

Affected Environment

Three-toed woodpeckers depend on live and dead trees for both nesting and foraging. They require soft wood for excavation because of morphological adaptations associated with three toes on each foot, therefore, presence of heart rot is important. Because this species requires snags for feeding, perching, nesting, and roosting, it is threatened by activities such as logging and fire suppression, which remove or eliminate snags. Studies indicate that outside of large bark beetle infestations, three-toed woodpeckers maintain low population levels by foraging on beetle infested fallen trees and cull logs, and in areas where beetles are present at endemic levels. Three-toed woodpeckers are thought to be the most efficient bark beetle forager of the woodpeckers, important in keeping infestations to an endemic level. They remove the beetles themselves, and by flicking bark off from trees, they remove beetle habitat and reduce their ability to survive.

Spruce beetles and other bark beetles are a very important year-round food source, and have a great effect on the woodpecker's abundance, distribution, and long-term viability. Spruce bark beetles have been at epidemic levels across large areas of the forest. The beetles have advanced north past the project area. The project area was surveyed for three-toed woodpeckers in 2001 and 2002. Although no nests were located, several detections were noted. The project area was resurveyed in July 2008 and no detections were made. Within the spruce/fir stands snag densities are estimated at 54 per acre within the project area. Territory size for three-toed woodpeckers varies according to the density of dead or beetle-infested trees. The average breeding territory in Utah is 106 acres. No population trend data was located for Utah (Albrecht K., 2008, Lake Fuels BABE Report, Pages 17 and 18).

Direct and Indirect Effects

Alternative 1:

Spruce beetle population have declined since approximately 90 percent of the Engelmann spruce has died. Woodpecker populations are likely remain in the project area but at lower population levels. However, the remaining conifers would eventually out-compete aspen. Snag densities would increase dramatically if no harvest or salvage activities took place. It is estimated that snag densities in spruce/fir stands would increase to 54 snags per acre after the beetle infestation reached its peak. Snag densities that are elevated so dramatically would far exceed the requirements for cavity nesting species and would only serve to increase high intensity fire risk (Albrecht K., 2008, Lake Fuels BABE Report, Page 26).

Figure 10 - Estimated snag densities greater than 12 inches in diameter (average snags per acre) by alternative.

	Alternative 1	Proposed Action
Treated stands		
Spruce/fir	54	3
Aspen/Mixed conifer	68	3
Untreated stands		
Spruce/fir	54	54
Aspen/Mixed conifer	68	68

Alternative 2:

Under the proposed action, 820 acres of spruce-fir would be harvested. The Rolfson-Staker Roadless area partially falls into the Lake project area. The East Mountain Roadless area is to the southeast of the project area. Both of these areas have been and are being affected by the spruce beetle epidemic. Since there is no timber harvest planned in inventoried roadless, these areas will provide a continued source of foraging areas for the three-toed woodpecker. Proposed aspen treatments would benefit three-toed woodpeckers in the long-term by promoting and maintaining this important nesting habitat. Intermountain Region guidelines for three-toed woodpeckers (Spahr et al. 1991) recommend leaving 42-52 snags per 100 acres (about 4 to 5 per acre) in logged areas and emphasized that snags should be left in clumps rather than isolated patches. Snag densities would be approximately 3 per acre in treated stands (Refer to Design Features in Appendix B), which is consistent with current snag management guidelines. In untreated spruce/fir stands, estimated snag densities would be approximately 54 per acre until dead timber starts to fall. With the number of acres that would remain untreated in the project area due to the roadless area, and other stands not selected for treatment, snag densities would exceed requirements for three-toed woodpeckers and other cavity nesting species (Albrecht K., 2008, Lake Fuels BABE Report, Page 25).

Cumulative effects:

The cumulative effects area for the three-toed woodpecker is the project area boundary. This area is large enough to support several breeding territories for this species. The Rolfson/Staker Roadless area, and untreated spruce/fir stands outside the roadless area would continue to provide optimum habitat for three-toed woodpeckers. Abundant snags would be present in the cumulative effects area, even after harvest of proposed stands. There has not been any salvage harvest in the cumulative effects area. Most of the past timber harvest was done long enough ago that the stands are now functioning as potential nesting habitat. Two small aspen clearcuts (about total 10 acres) were created in the early 1990s that have successfully regenerated. Aspen regeneration is a benefit to three-toed woodpeckers.

Oil and gas drilling done from the 1950's through the 1980's would not add impacts to three-toed woodpeckers. Minor surface disturbance from an existing natural gas pipeline would not add impacts. Hazard tree removal around developed dispersed recreation sites will remove timber on approximately 100 acres. This activity will likely cause avoidance of the area being worked in, and would likely remove foraging trees for three-toed woodpeckers. Spraying of selected trees to prevent spruce beetle infestation would also impact the prey base for three-toed woodpecker.

Livestock grazing would not cause additional effects, as it would not be expected to affect mating, breeding, or foraging behavior, nor cause a change in reproduction.

Development of roads for recreation, timber operations, grazing and private land access has been ongoing since the late 1800's. Vegetation removal to establish new roads likely removed some suitable woodpecker habitat, and establishment of a transportation system has increased use of the area. Development of a road system has allowed for easy access and higher recreational use. Impacts from recreational activity combined with project activities would cause disturbance to woodpeckers and may affect breeding and foraging behavior. Combined effects may cause woodpeckers to be displaced from the project area and seek foraging and nesting opportunities elsewhere. The combined impact of recreational use and project activities is not likely to cause woodpecker mortality or reduce their reproductive success (Albrecht K., 2008, Lake Fuels BABE Report, Pages 25 – 27).

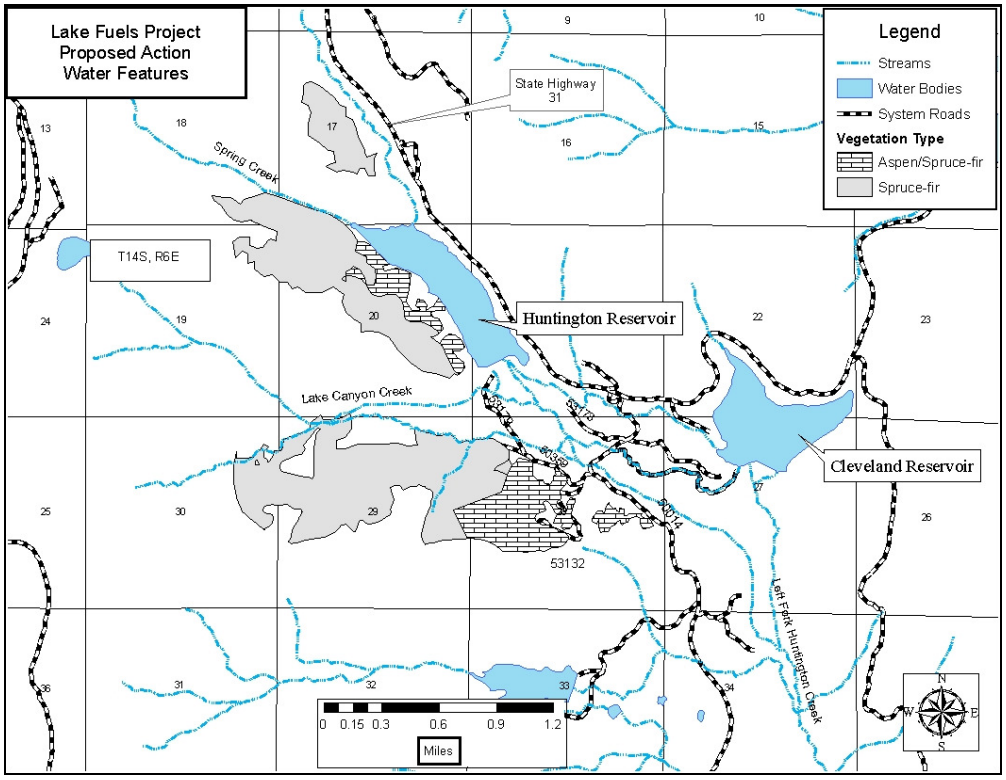
3.5.4 Bonneville and Colorado River Cutthroat Trout

Affected Environment

According to the Utah Division of Wildlife Resources, trout populations within Spring Creek (Map 4) were genetically tested and found to be an archaic from of Bonneville cutthroat trout. Their assumption is that at some point there was connectivity to the fish population on the west side of the mountain or they were moved there some time in the past. There are currently only four streams with BVCT on the Forest and Spring Creek is one of those streams (Jewkes, P., 2008, Aquatics Resource Report, Page 8).

Lake Canyon Creek (Map 4)was surveyed in 1999 by the Utah Division of Wildlife Resources and CRCT, rainbow trout and cutthroat/rainbow trout hybrids were found. Lake Canyon Creek had water temperatures at the time of the survey which were 52 degrees F, an estimated flow of 4.2 cubic feet per second, a mean depth of 0.6 feet, and a mean width of 12.1 feet. A migration barrier was constructed in 2000 on Lake Canyon Creek to prevent any further migration of non-native rainbow trout from entering the stream through a diversion canal, which flows into Cleveland Reservoir (Map 4). The CRCT population in Lake Canyon Creek was identified as a "Conservation Population" in 2001. Lake Canyon Creek is one of only two streams on the Forest that has been identified as a conservation stream for CRCT (Jewkes, P., 2008, Aquatics Resource Report, Page 9).

Map 4 - Location of Water Features.



Direct and Indirect Effects

Alternative 1:

There would be no direct or indirect impacts as a result of the Alternative 1 (No Action) alternative. There would be no harvest activities within the project area or within streamside edge of the SMZ. Log recruitment will not be reduced and all the trees would be retained for woody debris to the stream. No treatments in the area could result in a high intensity, high severity fire which could lead to a large accumulation of ash within the stream which could cause an increased mortality of both species of cutthroat trout. High intensity, high severity fire could increase water temperatures and reduce long-term down woody debris in the cutthroat streams within the project area (Jewkes, P., 2008, Aquatics Resource Report, Page 14).

Alternative 2:

There are two streams within the project boundary. Lake Canyon Creek contains a conservation population of CRCT. Only 53% of the total length of this stream runs adjacent to the harvest units for the proposed project area. The other stream, Spring Creek, contains an archaic population of BVCT, only 22% of the total length of this stream runs adjacent to the harvest units for the proposed project area.

Timber harvest, salvage cutting, site preparation, and release would have no direct effects on Colorado River or Bonneville cutthroat trout because harvest would not occur within stream channels and riparian habitats would be protected from ground disturbing equipment. Habitat would be protected by placing a 100' buffer on all perennial streams and springs and a 50' buffer on all intermittent streams. Harvest would occur within the buffer, however no ground disturbing equipment would be allowed. Buffer zones of this width have been proven effective in filtering sediment from timber harvest activity and

reducing measurable effects to aquatic resources. Harvest activities within riparian or buffer zones that result in reduction of forest canopy can reduce shade and affect stream temperature, cover, primary production and habitat. Bank erosion and lateral channel migration can also contribute sediments if protection vegetation and living root systems are removed. Summer stream temperature increases due to the removal of riparian vegetation has been well documented.

Measurements by Hewlett and Fortson (1983) under winter conditions also indicate that removal of riparian vegetation can reduce stream temperatures by about 10°C. A portion of the streams in the project area flows through a wide floodplain with little riparian cover. Temperatures would not be affected by riparian harvest in these areas. Temperature increases in the summer would be minimal due to the fact that over 90 percent of the spruce in the project area has already been killed by spruce beetle thereby reducing the canopy cover.

Large organic debris is a major component of watersheds and river systems because of its role in hydraulics, sediment routing, and channel morphology of streams flowing through riparian systems (Reardon et al. 2005). Large wood is important to the trout because it routes and stores sediment; provides habitat complexity and acts as a substrate for biological activity. The potential to reduce recruitment of large wood would occur where up to 50 percent of the larger diameter (18”+) trees within a tree length of the streamside edge of the SMZ are removed. Although log recruitment will be reduced through implementation of Alternative 2, enough trees would be retained to augment woody debris to the stream.

Prescribed burns would occur in a portion of the watershed but would have no direct effects on Colorado River or Bonneville cutthroat trout. Indirect effects would vary due to fire intensity, aspect and slope. All burns remove some degree of the forest floor cover. Indirect effects on the riparian habitat include decreased basin stability, and in steep erodible topography, debris flows are possible along with dry ravel and small landslides off hill slopes. Through analysis of the proposed alternative, it was determined that there will be temporary, short-term disturbance to soil resources beyond existing conditions under this alternative. However, based on the project description of treatments, soils will not be detrimentally disturbed. The overall impact of this action will not result in any long-term effects to existing soil resources beyond the current conditions.

Construction of temporary roads, skid trails and log landings would have no direct effects on Colorado River or Bonneville cutthroat trout. Indirect effects would include the removal of vegetative cover and soil disturbance as these areas are established, shaped and drainage structures installed. Proposed road construction, reconstruction, and closures activities have the potential to increase sedimentation, concentrate runoff, possibly alter surface and subsurface flow and potentially affect water quality. The potential for sedimentation would be reduced re-vegetating exposed soils outside the needed roadbed, establishing sedimentation traps in drains leading to streams (Appendix B, Pages 2 and 3). The proposed project includes construction of a road crossing on a tributary to Huntington Reservoir. Culverts or bridges can cause water velocities to be greater than the swimming ability of small fish, thereby impeding migration. Debris accumulation at these crossings can also block fish passage. The design requirements for these facilities would address these potential impacts. A professional hydrologist or fisheries biologist is to assist in the design of the road crossing and would be present at construction to ensure there are no impacts to fisheries migration.

Aquatic resources within the project area are dependent upon high water quality1evels and low levels of siltation. Forest Plan standards and guides and Best Management Practices that have established

specific protective buffer zones for streams would provide protection for Colorado River and Bonneville cutthroat trout habitat during timber harvest, associated silvicultural activities, and prescribed fire. The best practices developed for the project, including a streamside management zone adjacent to Lake Canyon, will maintain water and soil quality and aquatic habitat for cutthroat trout. The construction of temporary roads and skid trails may have a temporary impact on fisheries immediately downstream from crossings by silting in egg masses during the rearing season. However, this effect may be limited by the use of temporary culverts as described in Appendix B - design features, Page 1 (Jewkes, P., 2008, Aquatics Resource Report, Pages 10-11).

Cumulative Effects:

Both authorized and unauthorized recreation activities within and adjacent to the project area have impacted water quality in the past by increasing use and disturbance and would continue to do so. However, projects have been implemented to improve access for recreation, which have resulted in improvements in soil, water and vegetation. Future improvements to the existing trail system would include closing of some user-generated roads, and maintenance/improvement of designated trails. These improvements should reduce sedimentation and impacts to streams from recreation use. A new stream crossing is proposed over Spring Creek in the future for recreational winter use. This crossing would be a winter seasonal snow-pack crossing. A winter seasonal crossing is not likely to adversely impact water quality or Colorado River or Bonneville cutthroat trout habitat and would have no cumulative effects.

Past and present timber harvesting (Spring Canyon 1980s, Rolfson Reservoir 1990-1991, aspen regeneration, salvage on private lands) has decreased vegetation reducing the ability of the area to trap sediment, however, as revegetation occurs these impacts would be reduced. As different units are harvested each year, previous units would begin to recover forest floor vegetation and ground litter from cast leaves and needles. This overlapping process of loss and recovery of ground cover and forest floor vegetation between years would continue post harvest and would allow some stands to begin recovery before others are impacted.

Past transportation actions include development of roads for grazing, recreation, timber operations, access to private lands and improvement of Miller Flat Road. These actions have resulted in improved access and increased use of the area. Road maintenance and improvements work to reduce erosion and sediment production. The cumulative effects of construction of temporary roads, skid trails and log landings from this project should be minimal since the total acreage of disturbance is small for roads and a few additional acres for skid trails and landings. Many of these areas would be closed at project conclusion.

Sheep grazing occurs and would continue to occur on two range allotments within the project area watershed. Grazing can have a negative impact on fisheries habitat by reducing riparian vegetation, which can cause stream bank erosion. Sheep use within these allotments is controlled by grazing permits, to ensure riparian vegetation and stream bank stability are maintained. Livestock use is monitored by the Forest.

The Lake Canyon Creek fish barrier installed in 2001 on Huntington dam resulted in some short-term bank disturbance at the time of implementation. However, installation of the barrier protects Colorado River cutthroat trout by preventing hybridization from non-native rainbows and has resulted in long-term benefits. The watershed revegetation project in the heads of Rolfson, Jordon and Seeley Canyons

reestablished vegetation to meet standards and objectives for the watersheds. Roads were closed and converted to non-motorized trails.

Past oil and gas projects (Questar natural gas pipeline, drilling in the 1950's and 1980's) have not resulted in a decline of cutthroat trout habitat. The Huntington Dam upgrade resulted in changes to the ground slope at the dam site; however the area has been revegetated. Access roads associated with a future gas well and construction of a BOR dam would result in increased access and recreational use. Dam safety repairs to Cleveland, Miller Flat and Rolfson Reservoirs would disturb some riparian vegetation and result in increased fishing pressure. However, revegetation of the riparian areas and restrictions on angling of protected species would reduce risk to fisheries.

The effects from the proposed project relative to all past, present and foreseeable future actions should not negatively impact Colorado River cutthroat trout and Bonneville cutthroat trout within the project area provided all planned design features, mitigation measures, BMPs, and Forest Plan Standards and Guidelines are implemented (Jewkes, P., 2008, Aquatics Resource Report, Pages 12 -13).

3.5.5 Other Aquatic Species

Figure 11 contains a summary of the effects of the Alternatives on other sensitive aquatic species (Jewkes, P., 2008, Aquatics Resource Report, Pages 14 and 15).

Direct and Indirect Effects

Figure 11 – Summary of effects on Aquatic Specites.

	Alternative 1	Alternative 2
Species	**Determination**	**Determination**
Colorado Pikeminnow	Timber harvesting or planting would not be implemented to accomplish project goals. The Alternative 1 (No Action) will have "No Effect" on this species.	There are no Colorado pikeminnow populations or suitable habitat on the forest and the proposed project will not adversely affect the stream flow. Therefore, the Proposed Project will have "No Effect" on this species
Bony tail Chub	Timber harvesting or planting would not be implemented to accomplish project goals. The Alternative 1 (No Action) will have "No Effect" on this species.	There are no bonytail populations or suitable habitat on the forest and the proposed project will not adversely affect the stream flow. Therefore, the Proposed Project will have "No Effect" on this species.
Humpback Chub	Timber harvesting or planting would not be implemented to accomplish project goals. The Alternative 1 (No Action) will have "No Effect" on this species.	There are no humpback chub populations or suitable habitat on the forest and the proposed project will not adversely affect the stream flow. Therefore, the Proposed Project will have "No Effect" on this species.
Razorback Sucker	Timber harvesting or planting would not be implemented to accomplish project goals. The Alternative 1 (No Action) will have "No Effect" on this species.	There are no razorback sucker populations or suitable habitat on the forest and the proposed project will not adversely affect the stream flow. Therefore, the Proposed Project will have "No Effect" on this species.
Spotted Frog	Timber harvesting or planting would not be implemented to accomplish project goals. The Alternative 1 (No Action) will have "No Impact" on this species.	The spotted frog has not been found on the Manti-La Sal National Forest and there is no suitable habitat within the project area. Therefore the Proposed Project will have "No Impact" on this species.

3.6

Hydrology

Affected Environment

The Huntington Creek watershed, including the Left Fork subwatershed, is a municipal watershed. The project and associated best practices are consistent with the Forest Plan, the Clean Water Act, the Safe Drinking Water Act, and the Executive Orders for wetlands and floodplains (Foster K., 2008, Lake Fuels Hydrology Report, Page 1).

Alternative 1:

There will be no direct or indirect effects to the watershed or water quality within the analysis area under the no-action alternative.

Alternative 2:

Direct and Indirect Effects

No watershed, or water quality issues were raised by the individuals that responded during the scoping period. Internal concerns were resolved during the design of the proposed project.
The best practices developed for the project, including a streamside management zone adjacent to Lake Canyon, will maintain water and soil quality and aquatic habitat for cutthroat trout. Soil and water conservation practices (SWCP's) are incorporated in the project design and requirements. With implementation of the design features and SWCP's (Appendix B), direct and indirect effects are expected to be minimal and limited in scope, intensity, and duration. No cumulative effects are expected (Foster K., 2008, Lake Fuels Hydrology Report, Page 1).

3.7 Soils

Affected Environment

The USFS Region IV soil condition evaluation and qualitative soil management monitoring form was used to assess existing conditions. The soil health rating and soil health trend are based on the hydrologic and physical soil condition ratings. Soil health indicators are rated as satisfactory, impaired or unsatisfactory based on observed condition ratings. Assessment evaluations are based on ocular documentation, by data collection for effective ground cover, and by describing the soil profile. Two soil condition evaluations were made for the Lake Fuels project area. These sample locations are found on Figure 1, Soils Map. Effective ground cover was measured using a 100-ft transect every 1 foot at each location in addition to measuring soil compaction along the 100-ft transect every 10 feet. Soil profile description was made for Soil Pit 628-1. Both these sites had a satisfactory soil health rating with an aggrading soil health trend (Davidson R., 2008, Lake Fuels Soils Report, Pages 4 -5).

Direct and Indirect Effects

Alternative 1:

There will be no direct or indirect to soil resources within the analysis area under the no-action alternative (Davidson R., 2008, Lake Fuels Soils Report, Page 9).

Alternative 2:

Following review of the proposed action and potential effects of implementation, it was determined that for the areas sampled, conditions meet the Forest Plan objectives, standards and guidelines. For the project area, soils are stable with overall soil conditions aggrading based on the USFS Region IV soil condition evaluation and qualitative soil management monitoring survey. The average annual erosion

rate for all sample sites is below the soil loss ("T" value) for the soil type. There is no evidence of detrimental soil compaction. Long-term soil quality and productivity are therefore not currently impaired. There will be a 16% overall cumulative increase in temporary, short-term disturbance; however, based on project treatment descriptions, soils will not be detrimentally disturbed. Therefore, it is anticipated that the overall impact of this action will not result in any long-term effects to existing soil resources beyond current conditions (Davidson R., 2008, Lake Fuels Soils Report, Page 9).

Cumulative Effects:

Through analysis of the no-action alternative, it is determined that Alternative 2 would not result in negative impact to soil resources. Therefore, it is determined that there will be no cumulative effects to soil resources within the analysis area under the no-action alternative. (Davidson R., 2008, Lake Fuels Soils Report, Page 9)

3.7 Cultural Resources

Direct and Indirect Effects

Alternative 1:

There will be no effects to cultural resources under this alternative.

Alternative 2:

Cultural resource surveys have been completed for the proposed projects. Design features (Appendix B - Page 6) for the management and protection of cultural resources have been included in the proposed action. No eligible sites were identified during the surveys.

Should eligible sites be identified during implementation they will be avoided during timber harvest and temporary road construction activities; therefore, there would be no effect. The State Historical Preservation Office (SHPO) has been consulted for these activities. (SHPO Letter 2003, Page 1)

3.9 Range

Affected Environment

South Skyline allotment is permitted for 1,199 ewes and lambs from July 7 thru September 30. This allotment has approximately 10 acres/AUM[5] (average on other allotments is 3 acres/AUM), due to past administrative action in combining of five allotments into one. The heads of the canyons removed from grazing for watershed protection (approximately 15 years ago) are to be reevaluated to see if grazing is appropriate. An increase in AUM's based on available forage is a possibility, however the increase in dispersed recreation past, present and future will more than likely absorb the increase.

Spring Lake allotment is permitted for 800 Ewes and lambs from July 16 thru September 30. Past, present and unforeseen dispersed recreation has resulted in a large reduction in permitted livestock numbers on the allotment. Decisions that have been signed and actions taken since the conception of the Lake Timber sale are: the developed dispersed recreation sites in Lake Canyon, ATV learner loops in Lake Canyon, ATV trail from Lake Canyon to Rolfson, ATV trail from Lake Canyon to Skyline, and parking lot and toilet at the head of Lake Canyon. Since the conception of this fuels project, dispersed recreation has had a direct effect on range by are reduction of 422 AUM's from the increase in dispersed

[5] Animal Unit Month (AUM)

recreation and the loss of suitable rangelands over the past five years (Meccariello M., 2008, Lake Fuels Range Report, Page 1).

Direct and Indirect Effects

Alternative 1:

The permitted use would continue to occur and there would be no disruption of the grazing rotation in the aspen stands (Meccariello M., 2008, Lake Fuels Range Report, Page 1).

Alternative 2:

There would be a short term disruption of grazing rotation in aspen stands to meet regeneration requirements (2500-5000 stems/acres and 6 foot in height). Conifer stands, no effects to range based on it was previously not suitable range, short term increase in herbaceous vegetation on the allotment (5-10 years) (Meccariello M., 2008, Lake Fuels Range Report, Page 1).

Cumulative Effects:

No detrimental effects currently ongoing. Past and present increase in dispersed recreation has already resulted in a 422 AUM reduction since the conception of the project (Meccariello M., 2008, Lake Fuels Range Report, Page 1).

3.10 Noxious Weeds

Affected Environment

The Forest has a noxious and invasive weed monitoring program. The majority of the weeds in this area are spread along road corridors (musk thistle). Small patches of musk thistle are also found on the south and south-east facing slopes of aspen stands. Canada thistle is present in low densities along the riparian zone (Meccariello M., 2008, Lake Fuels Range Report, Page 1.

Direct and Indirect Effects

Alternative 1:

There would be direct or indirect effects to noxious or invasive weeds under this alternative.

Alternative 2:

Timber harvest has the potential to spread invasive and noxious weeds. It is not an issue however if mitigation is established. Stipulations in the contract to wash equipment and monitoring for noxious and invasive weeds during logging inspections will mitigate the potential for increased spread (Meccariello M., 2008, Lake Fuels Range Report, Page 1).

Cumulative Effects:

Dispersed recreation has the potential to spread and introduce new noxious and invasive weeds along road and trail corridors. Once established along these corridors they have a potential to spread throughout the landscape. Introduction on new weed species is a concern from recreationists traveling from other counties or states with noxious and invasive weeds on their vehicles and dispersing them on the Manti (Meccariello M., 2008, Lake Fuels Range Report, Page 2).

3.11 Sensitive Plants

The project area has been surveyed multiple times for sensitive plants. No sensitive plant species have been found in the area. There will be **no impact** to Arizona willow due to lack of occurrence in project

area, nor to Carrington's daisy, musinea groundsel, Link Trail columbine, Creutzfeldt flower, canyon sweetvetch, or Maguire campion due to lack of suitable habitat. There will be no further evaluation or discussion for these species (Lake Fuels BABE, 2008, Page 12).

3.11 Forested Vegetation

Affected Environment

Figure 12 identifies the broad forest vegetative cover types and acres by structural classes found within the Lake Fuels Project boundary. This data was derived from field inventories and geographic mapping. The dominant tree species was used to determine the broad vegetation types. Figure 12 displays the predominant Vegetative Structural Stage (VSS) classification in the aspen-mixed conifer and spruce-subalpine fir vegetation types, but since the stands are uneven aged, portions of the stands have other classifications.

Figure 12 – Current Vegetation Types and Average Stand Structure (Acres).

Vegetation Type	Not Applicable	Early	Young	Mid - Aged	Mature	Grand Total
Aspen	-	-	-	553	-	553
Aspen–Mixed Conifer	-	-	-	216	-	216
Non- Forest	3,212	-	-	-	-	3,212
Rock	85	-	-	-	-	85
Spruce-Sub-alpine fir	-	242	573	458	-	1,273
Water	145	-	-	-	-	145
Grand Total	**3,438**	**34**	**1,454**	**553**	**-**	**5,479**

The spruce beetle has altered the stand structures within the project boundary within the last 5 years. The changes to the stand structures were determined by a field survey of dead and spruce beetle infested spruce completed in 2005 and Forest Vegetation Simulation runs based on spruce beetle mortality estimates from monitoring complete by Forest Health Protection and completed surveys. These stands are considered un-even aged and contain a least two structural classes (Cote D., 2008, Lake Fuels Vegetation Report, Pages 3 and 4).

Quaking aspen (*Populus Tremuloides* Michx.) is widely distributed throughout the Manti-La Sal National Forest. Root suckering is the predominant mechanism by which aspen regenerates in the central Rocky Mountains of the western United States. This form of vegetative propagation gives rise to a stand of genetically identical trees, referred to as a "clone". Disturbances have different effects and responses from clone to clone because of inherent genetic differences.

Historically, it is estimated that 160,400 acres of seral (temporary or intermediate stage in forest succession) aspen existed on the Manti-LaSal National Forest. There is now estimated to be only 104,200 acres of seral aspen on the Forest. The lost acres have converted to Ponderosa pine, Engelmann spruce- sub-alpine fir, Douglas fir, or white fir forest types.

Almost all of the aspen/mixed conifer stands (216 acres) in the Lake Project Area are in a mid-aged condition (some of that acres had been considered mature but the spruce mortality has killed 90 percent of the spruce over 10 inches DBH). Conifers both spruce and sub-alpine fir are succeeding the aspen; the spruce mortality is not a sufficient disturbance to trigger a sprouting response. Stand exams in nearby aspen mixed conifer stands where the spruce have been dead for several years have not found any recent

aspen regeneration. Fire exclusion and lack of any alternate regeneration treatment over the past 100 years has caused, in most areas, the decline of these stands and changed the distribution of the structural classes. Figure 13 is a photo of one of the proposed treatment stands, note the overtopping conifers.

Figure 13 – Stand behind Huntington Reservoir, note dead spruce overtopping the aspen.

Aspen forest communities across the forest have declined 34 percent between the timber inventories completed in 1915 and 1965 (Manti-La Sal Forest Plan, page II-12, 1986). A comparison of the acres typed as aspen in the 1993 timber inventory indicates that aspen has declined an additional 15 percent since the 1965 inventory (Cote D., 2008, Lake Fuels Vegetation Report, Pages 4 and 5).

Direct and Indirect Effects

Alternative 1:

This alternative would not alter the current vegetation types or structural class distribution within the watershed in the short term. Aspen-mixed conifer, aspen, and spruce-fir stands would not be treated or regenerated. Vegetation type distributions would remain the same in the short-term.

Under this alternative, conifers will eventually replace many aspen stands or clones. Conifers are longer lived and can, by their shade, prevent aspen from regenerating. This can and has led to the permanent replacement of aspen stands by conifers. The absence of fire or disturbance, coupled with excessive browsing of young aspen trees by livestock and wildlife, has led to rapid replacement of aspen communities by conifer forests. The decline of aspen results in loss of forage and biodiversity (Cote D., 2008, Lake Fuels Vegetation Report, Page 12).

There is a high risk that aspen in the aspen-mixed conifer types will continue to be lost from lack of disturbance. Without disturbance to remove the conifers and stimulate the aspen suckering response in these stands, conifers will gain dominance over the aspen. Many of the seral aspen stands contain too many conifers, which could create heat severe enough to kill root systems and thereby literally killing the aspen clone. In some cases, it will be necessary to physically and mechanically remove conifer trees

from within the clone to prevent too much heat from being generated by either prescribed or wildland fire (Cote D., 2008, Lake Fuels Vegetation Report, Pages 4 and 5).

Alternative 2:

The stand characteristics to meet old growth or mature stands are described in Hamilton, 1993 for cold, dry Engelmann spruce are: a minimum of 15 trees per acre greater than 15 inches DBH; and two distinct diameter classes and canopy layers. Figure 9, in the Sensitive Species section, displays the effects of the Alternatives on the vegetative structure over time. Portions of the stands under Alternative 2 would be meet mature forest or VSS 5 criteria approximately 70 years after treatment. The stands do not currently meet old growth definition due to the spruce beetle mortality.

The clearcut aspen mixed-conifer stands remained in the aspen-mixed conifer vegetation type and were placed in the early structural stage. The changes to structure on the managed acres were based on the modeling of the treatments in FVS.

The 40 acres of treatment listed for even-age and the 105 (spruce-fir) acres of uneven-aged management would be converted to aspen because of the harvest, these acres are expected to regenerate naturally to aspen. The 241 acres of treatment listed as even-aged in the spruce-fir typed stands are not fully stocked as a result of the spruce beetle and will need natural or artificial reforestation.

The aspen stands are expected to regenerate naturally by coppice method. Experience with clearcuts in other portions of the forest has shown that clearcutting will result in full stocking over 95 percent of the time.

Planting will be necessary in the spruce-fir type to ensure an even mixture of spruce and sub-alpine fir. Surveys in spruce beetle killed stands has shown that there are insufficient spruce to provide enough seed source to reforest the stands with 5 years. The proposed treatment stands in the Lake Fuels project can be adequately reforested within 5 years by the use of planting. (Cote D., 2008, Lake Fuels Vegetation Report, Pages 12 thru 21)

Cumulative Effects:

A 6 acre hazard tree removal timber sale was implemented in 2004 to remove dead Engelmann spruce and subalpine fir from the Lake Canyon Recreation sites. Most of the logging occurred during the winter. There are no additional vegetation treatments planned within the cumulative effects boundary at this time. There are no anticipated cumulative effects to the vegetation resource (Cote D., 2008, Lake Fuels Vegetation Report, Page 21).

3.13 Air Quality

The Manti-La Sal National Forest analyzed air Quality for the *South Manti Timber Salvage Final Environmental Impact Statement.* The analysis determined that all alternatives analyzed (alternatives included timber harvest, road construction activities, and associated slash treatment) would be consistent with Forest Plan direction to meet State and Federal air quality objectives. Consistency is based upon compliance with the State Smoke Management Plan and use of the Manti-La Sal Smoke Management Guidelines for Prescribed Fire. Similar effects are expected if Lake Vegetation Management Project alternatives are implemented. Compliance with air quality standards will be consistent with Forest Plan direction to meet State and Federal air quality objectives. (Lake Fuels Air Quality Report, Pages 1-2)

4.0 References

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