South Manti Timber Salvage Final Environmental Impact Statement

United States Forest Service
South Manti
Timber Salvage
Final Environmental Impact Statement
South Manti Timber Salvage Final Environmental Impact Statement

ABSTRACT

This project was initiated in response to epidemic spruce beetle (*Dendroctonus rufipennis*) activity across approximately 24,597 acres of National Forest System lands within the southern portion of the Wasatch Plateau (Townships 19, 20, and 21 South; Range 4 East; SLIM). The South Manti project area is located on the Manti-La Sal National Forest approximately 45 miles southwest of Price, Utah.

Based on comments received during scoping and additional field review, the original proposal (February 17, 1998) was modified and became Alternative 2, which still meets the intent of the original proposal. A Draft Environmental Impact Statement (DEIS) was released for public comment May 7, 1999. Changes have been made to the FEIS based on response to comments and new information.

The Final Environmental Impact Statement (FEIS) discloses the potential impacts of timber salvage harvest and related activities such as road work, road rehabilitation, and reforestation in the project area. Roadless character was identified as a significant issue and was used to develop alternatives to the proposed action. A no action and three action alternatives were considered in detail. These alternatives are consistent with the Agency's interim suspension on road construction and reconstruction.

Alternative 2 includes salvage harvest and associated activities in inventoried roadless areas (RARE II and Forest Plan). Road construction is limited to a roaded portion of an inventoried roadless area. Alternative 3 has salvage harvest in the same areas as Alternative 2, but without constructing roads in inventoried roadless areas or using ground-based log yarding equipment in such areas. Alternative 4 limits salvage harvest and associated activities to areas outside of inventoried roadless areas.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>Abstract-1</td>
</tr>
<tr>
<td>Table of Contents</td>
<td>1</td>
</tr>
<tr>
<td>Appendices</td>
<td>ii</td>
</tr>
<tr>
<td>List of Figures</td>
<td>iii</td>
</tr>
<tr>
<td>Executive Summary</td>
<td>S-1</td>
</tr>
</tbody>
</table>

## Chapter 1

| 1.0 Introduction                           | 1-1  |
| 1.1 Proposed Action                        | 1-5  |
| 1.2 Purpose and Need                       | 1-6  |
| 1.3 incorporation by Reference             | 1-9  |
| 1.4 Scope of the Project                   | 1-9  |
| 1.5 Decisions to be Made                   | 1-10 |
| 1.6 Document Organization                  | 1-10 |

## Chapter 2

| 2.0 Introduction                           | 2-1  |
| 2.1 Alternative Development Process        | 2-1  |
| 2.2 Issue Identification                    | 2-2  |
| 2.3 Alternatives Considered But Not Given Detailed Study | 2-6  |
| 2.4 Alternatives Considered in Detail      | 2-7  |
| 2.5 Comparison of Alternatives             | 2-14 |

## Chapter 3

| 3.0 Introduction                           | 3-1  |
| 3.1 Setting                                | 3-4  |
| 3.2 Air Quality                            | 3-4  |
| 3.3 Land Stability                         | 3-8  |
| 3.4 Soils                                  | 3-9  |
| 3.5 Water Resources                        | 3-11 |
| 3.6 Vegetation Resource                    | 3-17 |
| 3.7 Fuels/Fire                             | 3-28 |
| 3.8 Wildlife Resources                     | 3-31 |
| 3.9 Transportation                         | 3-38 |
| 3.10 Range Allotments And Improvements     | 3-39 |
| 3.11 Visual Landscape                      | 3-40 |
| 3.12 Undeveloped Character                 | 3-42 |
| 3.13 Cultural Resources                    | 3-44 |
| 3.14 Economics                             | 3-45 |
| 3.15 Energy                                | 3-46 |
| 3.16 Roadless Character                    | 3-46 |
TABLE OF CONTENTS (cont.)

Chapter 4

4.0 Introduction .......................... 4-1
4.1 Air Quality .......................... 4-2
4.2 Land Stability ......................... 4-4
4.3 Soils .................................. 4-8
4.4 Water Resources ....................... 4-11
4.5 Vegetation Resource ................. 4-23
4.6 Fuels/Fire .......................... 4-32
4.7 Wildlife Resources ..................... 4-38
4.8 Transportation ....................... 4-52
4.9 Range Allotments And Improvements ......................................................... 4-56
4.10 Visual Landscape ..................... 4-58
4.11 Undeveloped Character .............. 4-61
4.12 Cultural Resources ................. 4-65
4.13 Economics .......................... 4-68
4.14 Energy ................................ 4-73
4.15 Roadless Character .................. 4-74
4.16 Potential Conflicts with Plans and Policies of Other Jurisdictions .............. 4-86
4.17 Probable Environmental Effects that Cannot be Avoided ....................... 4-87
4.18 Relationship Between Short-term Use and Long-term Productivity ............... 4-89
4.19 Irreversible and Irrevocable Commitments of Resources ......................... 4-92
4.20 Forest Plan Consistency ............. 4-92
4.21 Specifically Required Disclosures ......................................................... 4-98

Appendices

Appendix A List of Preparers .................. A-1
Appendix B Public Involvement ............... B-1
Appendix C Forest Plan Direction .......... C-1
Appendix D Project Design Features ........ D-1
Appendix E Summary Unit Information ......... E-1
Appendix F Summary Road Information ......... F-1
Appendix G Past, Present, and Reasonably Foreseeable Actions .................... G-1
Appendix H Stream Crossings ................ H-1
Appendix I National Forest Management Act Consistency .......................... I-1
Appendix J Biological Evaluation / Assessment ............................................. J-1
Glossary .................................. 1
Index ................................... 1
References ................................ 1

LIST OF FIGURES

Chapter 1

1-1 Vicinity Map .................................. 1-3

Chapter 2

2-1 Alternative Summary ..................... 2-14
2-2 Comparison of Alternatives by Purpose and Need ........................................ 2-15
2-3 Comparison of Alternatives by Issue ......................................................... 2-17
2-4 Alternative 1 Map .......................... 2-20
2-5 Alternative 2 Map .......................... 2-21
2-6 Alternative 3 Map .......................... 2-22
2-7 Alternative 4 Map .......................... 2-23

Chapter 3

3-1 Forest Plan Management Units .......... 3-2
3-2 Forest Plan Management Unit Map .......... 3-3
3-3 Air Quality Classes ...................... 3-4
3-4 Geology .................................. 3-4
3-5 Land Stability Classes .................... 3-6
3-6 Land Stability Class Map ................. 3-7
3-7 Soil Erosion Potential ..................... 3-8
3-8 Watersheds Map .......................... 3-10
3-9 State Beneficial Uses ...................... 3-12
3-10 Annual Spruce Beetle-Caused Tree Mortality .............................................. 3-13
3-11 Landscape Spruce Beetle Infestation Map ..................................................... 3-17
3-12 Beetle-Induced Spruce Mortality ............................................................... 3-17
3-13 1960 Forest Cover Type Map .............. 3-22
3-14 Forest Cover Types, Pre and Post Beetle Outbreak ........................................ 3-24
3-15 Forest Structure, Pre and Post Beetle Outbreak ............................................ 3-23
3-16 Stand Characteristics of Treatment Areas ..................................................... 3-25
3-17 Fuel Loading 1999 .......................... 3-30
3-18 Range Allotments ......................... 3-40
3-19 Visual Quality Objectives Map ......... 3-41
3-20 Inventoried Roadless Areas & Unroaded Areas Map ...................................... 3-53
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 4</td>
<td></td>
</tr>
<tr>
<td>4-1 Project Particulate Matter Emission</td>
<td>4-4</td>
</tr>
<tr>
<td>4-2 Activity in Unstable and Mob in Unstable Areas</td>
<td>4-7</td>
</tr>
<tr>
<td>4-3 Erosion Hazard &amp; Tractor Yard</td>
<td>4-10</td>
</tr>
<tr>
<td>4-4 Summary - Erosion Hazard &amp; Tractor Yard</td>
<td>4-11</td>
</tr>
<tr>
<td>4-5 Heat Per Unit Area as an Indicator of Burn Intensity</td>
<td>4-12</td>
</tr>
<tr>
<td>4-6 SEDROUT Summary - Sixmile &amp; Twelvemile Creek Watersheds</td>
<td>4-13</td>
</tr>
<tr>
<td>4-7 SEDROUT Summary - Ferron Creek Watershed</td>
<td>4-14</td>
</tr>
<tr>
<td>4-8 SEDROUT Summary - Muddy Creek Watershed</td>
<td>4-15</td>
</tr>
<tr>
<td>4-9 SEDROUT Subwatersheds Map</td>
<td>4-34</td>
</tr>
<tr>
<td>4-10 Fuel Loading Group &amp; Year</td>
<td>4-35</td>
</tr>
<tr>
<td>4-11 Fire Behavior Outputs Alternative 1</td>
<td>4-35</td>
</tr>
<tr>
<td>4-12 Downed Dead Fuel Loading Helicopter and/or Cable</td>
<td>4-36</td>
</tr>
<tr>
<td>4-13 Fire Behavior Outputs Alternatives 2, 3, &amp; 4 - Helicopter and/or Cable</td>
<td>4-36</td>
</tr>
<tr>
<td>4-14 Downed Dead Fuel Loading - Ground Based</td>
<td>4-37</td>
</tr>
<tr>
<td>4-15 Fire Behavior Outputs Alternatives 2, 3, &amp; 4 - Tractor</td>
<td>4-40</td>
</tr>
<tr>
<td>4-16 Big Game Habitat</td>
<td>4-44</td>
</tr>
<tr>
<td>4-17 Snag Habitat Affected</td>
<td>4-46</td>
</tr>
<tr>
<td>4-18 Project Activity within Suitable Nesting Habitat</td>
<td>4-48</td>
</tr>
<tr>
<td>4-19 Three-Toed Woodpecker Habitat Affected</td>
<td>4-51</td>
</tr>
<tr>
<td>4-20 Hiding Cover/Forage % Ratio Including Cumulative Effects Short Term 3-5 Years</td>
<td>4-57</td>
</tr>
<tr>
<td>4-21 Decrease in Suitable Rangelands</td>
<td>4-57</td>
</tr>
<tr>
<td>4-22 Unroads Area Impact Summary</td>
<td>4-64</td>
</tr>
<tr>
<td>4-23 Unroaded Area Cumulative Impact Summary</td>
<td>4-66</td>
</tr>
<tr>
<td>4-24 Harvest Area Surveyed</td>
<td>4-67</td>
</tr>
<tr>
<td>4-25 Estimated New Prehistoric Sites</td>
<td>4-68</td>
</tr>
<tr>
<td>4-26 Key Characteristics Affecting Economics</td>
<td>4-70</td>
</tr>
<tr>
<td>4-27 Jobs Created and Induced Income</td>
<td>4-71</td>
</tr>
<tr>
<td>4-28 Generated Revenue and Payments in Lieu of Tax</td>
<td>4-71</td>
</tr>
<tr>
<td>4-29 Year 2000 Present Value</td>
<td>4-71</td>
</tr>
<tr>
<td>4-30 Benefit-Cost</td>
<td>4-72</td>
</tr>
<tr>
<td>4-31 Direct and Indirect Effects to Energy</td>
<td>4-74</td>
</tr>
<tr>
<td>4-32 Inventoried Roadless Area Impact Summary</td>
<td>4-77</td>
</tr>
<tr>
<td>4-33 Inventoried Roadless &amp; Unroaded Areas Alternative 1</td>
<td>4-82</td>
</tr>
<tr>
<td>4-34 Inventoried Roadless &amp; Unroaded Areas Alternative 2</td>
<td>4-83</td>
</tr>
<tr>
<td>4-35 Inventoried Roadless &amp; Unroaded Areas Alternative 3</td>
<td>4-84</td>
</tr>
<tr>
<td>4-36 Inventoried Roadless &amp; Unroaded Areas Alternative 4</td>
<td>4-85</td>
</tr>
<tr>
<td>Appendices</td>
<td></td>
</tr>
<tr>
<td>F-1 Proposed Road Closure &amp; Reclamation Alternatives 2, 3, and 4</td>
<td>F-4</td>
</tr>
<tr>
<td>H-1 Stream Crossing Map Alternative 2</td>
<td>H-2</td>
</tr>
<tr>
<td>H-2 Stream Crossing Map Alternative 3</td>
<td>H-3</td>
</tr>
<tr>
<td>H-3 Stream Crossing Map Alternative 4</td>
<td>H-4</td>
</tr>
<tr>
<td>SUMMARY</td>
<td></td>
</tr>
</tbody>
</table>
EXECUTIVE SUMMARY

Introduction
This project was initiated in response to epidemic spruce beetle (Dendroctonus ponderosae) activity across the South Manti landscape. This Final Environmental Impact Statement (FEIS) summarizes potential direct, indirect, and cumulative effects of corresponding site-specific forest management alternatives on portions of the Ferron-Price and Sanpete Ranger Districts of the Manti-La Sal National Forest.

Overview of the Area
The project area includes approximately 24,597 acres of National Forest System lands within the southern portion of the Wasatch Plateau on the Ferron-Price and Sanpete Ranger Districts of the Manti-La Sal National Forest, in Sanpete and Sevier Counties, Utah (Townships 19, 20, and 21 South, Range 4 East, SLM). The project area is approximately 10 miles southwest of the town of Manti, 12 miles east of the town of Maybell, 19 miles west of the town of Ferron, and 45 miles southwest of the town of Price. The project area extends from White Mountain, along the Manti-La Sal and Fiskitake National Forest boundaries, north to the headwaters of Ferron and Sixmile drainages (Figure 5-3, Vicinity Map at end of Executive Summary).

The project area is characterized by a mountainous terrain which includes rock formations and glacial cirques. There are panoramic ridges and valley views (some containing lakes or reservoirs) of subalpine scenery. There is evidence of past and present management in the area such as grazing, timber harvest, roads, trails, and camping areas which have shaped the overall landscape conditions. Dispersed recreation is evident by camping areas, and road and trail use.

Vegetation in the project area is represented predominantly by three cover types: Engelmann spruce-Subalpine fir (47%), grass and brush (36%), and aspen (12%). The Engelmann spruce-Subalpine fir cover type represents over 10,000 acres in the project area. A spruce beetle epidemic has affected most of the spruce within this area. As a result, most spruce trees are dead or dying. Dead trees are those spruce trees in which the flow of nutrients in the cambium/phloem layer, beneath the bark, has ceased. These trees may or may not look dead, depending upon how long they have been dead. Dying trees are those spruce trees with multiple spruce beetle attacks that encircle the tree bole. The spruce trees do not generally appear dead until two years after the spruce beetles have infested the trees. Approximately seventy percent of the spruce trees with a diameter greater than five inches at breast height and ninety percent of the spruce trees with a diameter greater than eleven inches at breast height are dead.

Public Involvement
A "Notice of Intent to Prepare an Environmental Impact Statement" was printed in the Federal Register on February 17, 1998. Comments on the proposal were requested through newspaper notices in Carbon, Emery, and Sanpete Counties, Utah. Additional public notification was completed through the Forest’s Schedule of Proposed Actions and by mailing of individual letters. On October 5, 1998, a public field trip was held to explain the proposed action to interested publics. Notification of a Draft Environmental Impact Statement (DEIS) was printed in the Federal Register on May 7, 1999. Legal notices were published notifying the public of the availability of the DEIS and that comments were being sought (approximately 200 copies were mailed to interested parties). Based upon a request, the comment period to the DEIS was extended until July 21, 1999, to facilitate additional on-the-ground public review of the area. A public field trip was held on July 13, 1999, to explain and answer questions pertaining to the alternatives. 97 comment letters to the DEIS were received.
Purpose and Need

Management of the project area is part of the Manti-La Sal National Forest's attempt to fulfill the Forest Service commitment of "caring for the land and serving people." Nationally, the Forest Service has identified a Natural Resource Agenda to reemphasize its commitment of "caring for the land and serving people." The Agenda focuses on four key emphasis areas: watershed health and restoration; sustainable forest ecosystem management; improved management of the National Forest road system; and improved recreation opportunities and experiences. This project embraces the Agenda's goals.

The purpose and need for this project is to address ecological and economic values affected by spruce beetle activity in the South Manti project area as defined below.

1. Reduce potential for large and intense wildfires across forested areas (with associated environmental affects).
2. Facilitate rapid reestablishment of Engelmann spruce through replanting of spruce in Timber Emphasis Units identified in the Forest Plan.
3. Recover some of the economic value of dead and dying trees.

Issues

Issues are derived from review of the proposed action that was developed in response to the identified purpose and need for the project. Issues are the basis for the project analysis, project design features, alternatives, and disclosure of information. There are fifteen issues associated with this project. One issue relative to the proposed action is considered a significant issue from which to develop alternatives - Issue #15, Impacts to Roadless Character.

The issues associated with this project are summarized below.

Issue #1 - Impacts to Air Quality: Timber harvest and associated activities could have short-term effects on air quality.

Issue #2 - Impacts to Land Stability: Road construction and reconstruction could reduce land stability and induce landslides which could damage resources. Reforestation could improve land stability.

Issue #3 - Impacts to Soil Erosion and Productivity: Timber harvest and associated activities could compact or displace soil. Compacted and displaced soil could be subject to erosion and loss of productivity. Road construction and reconstruction could displace soil and temporarily remove the land from resource production.

Issue #4 - Impacts to Water Resources: Timber harvest, associated activities, and road work could impact the quantity and quality of water resources, including aquatic systems, habitat, and species.

Issue #5 - Impacts to Vegetation Resources: The spruce beetle epidemic has altered the vegetative condition of the landscape. The majority of spruce trees are dead or dying from spruce beetle activity. Timber harvest could remove dead and dying spruce trees. Reforestation could facilitate reestablishment of spruce. Soil disturbed by timber harvest and road work could provide an opportunity for weed seed to germinate. Timber harvest, associated activities, and road work could affect sensitive plants or their habitat.
South Mantii Timber Salvage Draft Environmental Impact Statement

Executive Summary

Several conceptual alternatives were explored in refining the alternatives to be considered in detail. Alternatives considered but not carried into the final analysis are summarized as follows (see Section 2.3 for detailed descriptions):

- Harvesting of spruce trees beyond those presented in the proposed action were not given detailed study.
- Road construction, permanent and temporary, in RARE II inventoried roadless areas was not given detailed study.
- Under current conditions, prescribed fire without prior treatment such as timber harvest to reduce the fuel loading was not given detailed study.
- Aspen stand management was not given detailed study.
- An alternative using cable yarding systems on slopes greater than 40 percent instead of helicopter was not given detailed study.
- Reclassification of suitable timberland was not given detailed study.
- Based upon additional field review and public comment and the interim roads rule, the original proposal of February 17, 1998, has been modified as presented in Alternative 2.
- Based upon further review of draft alternatives 3 and 4, these alternatives were dropped from further review.

No action alternative and three action alternatives were considered in detail. These alternatives represent a reasonable range of alternatives for this project that sharply define the significant issue. The alternatives considered in detail are summarized below and mapped in Figures 5-5 through 5-7 at the end of this Executive Summary. Key components of the alternatives are summarized in Figure 5-1 Alternative Summary. On February 12, 1999, the "Interim Rule" was published and adopted in the Federal Register. The interim rule temporarily suspends construction and reconstruction in unroaded areas. The differences from the original alternatives and the interim rule alternatives are displayed in the executive summary of the DEIS. The alternatives in this FEIS comply with the interim rule.

Alternative 1 - Alternative 1, the no action alternative, proposes no new activities to be initiated in the project area from this planning effort at this time (Figure 5-4 Alternative 1 at the end of this Executive Summary).

Alternative 2 - Based upon additional field review and public comment, Alternative 2 is a modification of the original proposal (February 17, 1998) and incorporates the Agency's interim road rule. Alternative 2 represents the intent of the original proposal. This alternative includes harvest in 3 Rare II inventoried roadless areas and 1 Forest Plan inventoried roadless area (Figure 5-5).

Alternative 2 proposes salvage harvesting of 32.41 MMBF of dead and dying spruce trees across 6,349 acres. Past experience indicates that 50 to 65 percent of the treatment area is likely to be harvested (3,174 to 4,127 acres). Logging systems planned are tractor, helicopter, and cable. It is estimated that this timber would be removed in 6-8 years with multiple sales.

Estimated road work associated with the proposal as follows: construction of 1.1 miles of Forest Development Road (FDR); reconstruction of 11.0 miles of FDR; and 0.5 miles of temporary road (would not be open to public travel and reclaimed after use) to meet current and future resource management needs in the area. 1.9 miles of system roads would be put into level maintenance 1 (closed to public travel) after post sale activities, which includes the 1.1 miles of constructed road in a roaded portion of the Helicopter inventoried roadless area.

4.1 miles of FDR and 19.3 miles of nonsystem roads would be reclaimed that are no longer needed for long term management of National Forest resources.

Planting Engelmann Spruce on 351-716 acres, mechanical scarification for site preparation on 426-554 acres, and naturally reforest 918-1,193 acres. Gopher control for reforestation protection may take place on 606-788 acres.

Treat harvest generated and existing fuels through various methods as follows: whole tree yard tractor yarding units on an estimated 437-568 acres; top and scatter 2,896-3,505 acres of the helicopter yarding units; and jackpt burn 10% of the helicopter yarding units (270-351 acres).

Alternative 3 - Alternative 3 proposes salvage harvest as in Alternative 2, but without constructing roads in inventoried roadless areas (RARE II and Forest Plan) or using ground-based log yarding equipment in such areas (Figure 5-6).

Alternative 3 proposes salvage harvesting of 32.41 MMBF of dead and dying spruce trees across 6,349 acres. Past experience indicates that 50 to 65 percent of the treatment area is likely to be harvested (3,174 to 4,127 acres). Logging systems planned are tractor, helicopter, and cable. It is estimated that this timber would be removed in 6-8 years with multiple sales.

Estimated road work associated with the proposal as follows: reconstruction of 10.8 miles of FDR; and 0.5 miles of temporary road (would not be open to public travel and reclaimed after use) to meet current and future resource management needs in the area. 0.8 miles of system roads would be put into level maintenance 1 (closed to public travel) after post sale activities.

4.1 miles of FDR and 19.3 miles of nonsystem roads would be reclaimed that are no longer needed for long term management of National Forest resources.

Planting Engelmann Spruce on 720-936 acres, mechanical scarification for site preparation on 257-334 acres, and naturally reforest 749-973 acres. Gopher control for reforestation protection may take place on 792-1,030 acres.

Treat harvest generated and existing fuels through various methods as follows: whole tree yard tractor yarding units on an estimated 230-299 acres; top and scatter 2,903-3,773 acres of the helicopter yarding units; and jackpt burn 10% of the helicopter yarding units (290-377 acres).
Alternative 4: Alternative 4 proposes salvage harvest and associated activities without harvesting or developing roads in inventoried roadless areas (Figure 5-7).

- Alternative 4 proposes salvage harvesting of 19-25 MMBF of dead and dying spruce trees across 3,823 acres. Past experience indicates that 50 to 65 percent of the treatment area is likely to be harvested (1,912 to 2,485 acres). Logging systems planned are tractor, helicopter, and cable. It is estimated that this timber would be removed in 5-7 years with multiple sales.

- Estimated road work associated with the proposal as follows: reconstruction of 9.2 miles of FDR; and 0.5 miles of temporary road (would not be open to public travel and reclaimed after use) to meet current and future resource management needs in the area. 0.4 miles of system roads would be put into level maintenance 1 (closed to public travel) after post sale activities.

- 3.8 miles of FDR and 19.3 miles of nonsystem roads would be reclaimed that are no longer needed for long term management of National Forest resources.

- Plant England Spruce on 332-431 acres, mechanical scarification for site preparation on 257-334 acres, and naturally reforest 553-719 acres. Gopher control for reforestation protection may take place on 365-474 acres.

- Treat harvest generated and existing fuels through various methods as follows: whole tree yard tractor yarding units on an estimated 230-299 acres; lop and scatter 1,639 - 2,313 acres of the helicopter yarding units; and jackpot burn 10% of the helicopter yarding units (164 - 213 acres).

---

### Figure 5-1 Alternative Summary 1

<table>
<thead>
<tr>
<th>Description</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>Alternative 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment Area (gross acres)</td>
<td>0</td>
<td>6,349</td>
<td>6,349</td>
<td>3,823</td>
</tr>
<tr>
<td>Treatment Area Harvested² (net acres)</td>
<td>0</td>
<td>3,174 to 4,127</td>
<td>3,174 to 4,127</td>
<td>1,912 to 2,485</td>
</tr>
<tr>
<td>Treatment Area Harvested by Log Yarding Method:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ground-Based (net acres)</td>
<td>0</td>
<td>437 to 568</td>
<td>230 to 299</td>
<td>230 to 299</td>
</tr>
<tr>
<td>Cable-Helicopter (net acres)</td>
<td>0</td>
<td>42 to 54</td>
<td>42 to 54</td>
<td>42 to 54</td>
</tr>
<tr>
<td>Helicopter (net acres)</td>
<td>0</td>
<td>2,856 to 3,505</td>
<td>2,856 to 3,505</td>
<td>1,629 to 2,131</td>
</tr>
<tr>
<td>By-Product Recovery³ by Yarding Method:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timber Recovered by Ground-Based Yarding (MMBF)</td>
<td>0</td>
<td>4.4 to 5.7</td>
<td>2.3 to 3.0</td>
<td>2.3 to 3.0</td>
</tr>
<tr>
<td>Timber Recovered by Cable-Helicopter Yarding (MMBF)</td>
<td>0</td>
<td>0.4 to 0.5</td>
<td>0.4 to 0.5</td>
<td>0.4 to 0.5</td>
</tr>
<tr>
<td>Timber Recovered by Helicopter Yarding (MMBF)</td>
<td>0</td>
<td>27.0 to 35.0</td>
<td>26.0 to 37.7</td>
<td>18.4 to 21.3</td>
</tr>
<tr>
<td>Roads:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FDR² Construction (miles)</td>
<td>0</td>
<td>1.1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>FDR Reconstruction (miles)</td>
<td>0</td>
<td>11.0</td>
<td>10.8</td>
<td>9.2</td>
</tr>
<tr>
<td>Temporary Construction followed by Reclamation (miles)</td>
<td>0</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>FDR Reclamation (miles)</td>
<td>0</td>
<td>4.1</td>
<td>4.1</td>
<td>3.8</td>
</tr>
<tr>
<td>Nonsystem Road and Motorized Trail Reclamation (miles)</td>
<td>0</td>
<td>19.3</td>
<td>19.3</td>
<td>19.3</td>
</tr>
<tr>
<td>Post-project Road and Motorized Trails² (miles)</td>
<td>34</td>
<td>70</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Post-project Road and Motorized Trail Density² (miles/miles²)</td>
<td>2.4</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
</tr>
<tr>
<td>Reforestation:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Artificial Reforestation - Planting (net acres)</td>
<td>0</td>
<td>551 to 716</td>
<td>720 to 936</td>
<td>332 to 431</td>
</tr>
<tr>
<td>Natural Reforestation (net acres)</td>
<td>0</td>
<td>916 to 1,193</td>
<td>749 to 973</td>
<td>553 to 719</td>
</tr>
<tr>
<td>Machine Scarification for Natural or Artificial Ref. (net acres)</td>
<td>0</td>
<td>426 to 554</td>
<td>257 to 334</td>
<td>257 to 334</td>
</tr>
<tr>
<td>Reforestation Protection - Gopher Control (net acres)</td>
<td>0</td>
<td>906 to 798</td>
<td>792 to 1,030</td>
<td>365 to 474</td>
</tr>
</tbody>
</table>

---

1. Key components expected over 5 to 8 years if an alternative is fully implemented.
2. Minor differences may exist between associated components due to rounding of values during calculations.
3. Approximately 50 to 65 percent of the treatment area is likely to be harvested.
4. Based on estimated timber by-product recovery of 10 MBBF per harvest acre.
5. Includes FDR, nonsystem roads and trails, and motorized trails.
Decisions To Be Made
The Responsible Official, Forest Supervisor of the Manti-La Sal National Forest, will make the following decisions associated with this document:

1. Whether to harvest dead and dying trees, and if so, the location, methods of harvest, silvicultural diagnosis, reforestation, and post-sale activities.
2. Whether to change short-term and/or long-term access, and if so, the location, methods of road construction, reconstruction, maintenance, rehabilitation, closure, and access management;
3. What, if any, additional measures are necessary to implement a decision;
4. What, if any, specific project monitoring requirements are needed to assure selected measures are implemented and effective; and,
5. Whether Forest Plan Amendments are needed to implement a decision.

Conclusion of Effects
The disclosure of information is intended to provide a meaningful basis for public review and comment. The effects of each alternative considered in detail can be meaningfully summarized by how well they respond to the identified purpose and need and issues.

Purpose and Need
Figure S-2 Comparison of Alternatives by Purpose and Need, summarizes how well each alternative would address the identified purpose and need.

The changes in treatment acreages associated with the final interim rule has reduced the project's responsibility to the purpose and need: less area would be treated to reduce the potential for large/intense wildfires, less area would have rapid reestablishment of spruce, and less timber by-products would be recovered. Additionally, the final interim rule necessitates more treatment to be accomplished using helicopter logging instead of ground-based or cable. The resulting project would consist of 85 percent to 91 percent helicopter yarding. This change to helicopter yarding has increased the project's costs and reduced its marketability.

<p>| Table 3-2 Comparison of Alternatives by Purpose and Need |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|</p>
<table>
<thead>
<tr>
<th>Purpose and Need</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>Alternative 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced Potential for Large/Intense Wildfires:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Rate of Spread Year 200-Helicopter/Cable (ChHr)</td>
<td>1 - 6</td>
<td>1 - 6</td>
<td>1 - 6</td>
<td>1 - 6</td>
</tr>
<tr>
<td>- Rate of Spread Year 2000-Ground Based (ChHr)</td>
<td>8 - 18</td>
<td>8 - 18</td>
<td>18 - 28</td>
<td>18 - 28</td>
</tr>
<tr>
<td>- Potential for IA-2 Escape Year 2000-Helicopter/Cable</td>
<td>Low-High</td>
<td>Low-High</td>
<td>Low-High</td>
<td>Low-High</td>
</tr>
<tr>
<td>- Potential for IA-2 Escape Year 2000-Ground Based</td>
<td>Low-High</td>
<td>Low-High</td>
<td>Low-High</td>
<td>Low-High</td>
</tr>
<tr>
<td>- Potential for IA-2 Escape Year 2015-Harvested Acres</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Rapid Spruce Reestablishment by Planting in Timber Mgmt. Emphasis Units (TBR):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Years to Stocking(^2) of Spruce without Planting</td>
<td>30 to 90</td>
<td>30 to 90</td>
<td>30 to 90</td>
<td>30 to 90</td>
</tr>
<tr>
<td>- Years to Stocking(^2) of Spruce with Planting</td>
<td>5 to 10</td>
<td>5 to 10</td>
<td>5 to 10</td>
<td>5 to 10</td>
</tr>
<tr>
<td>- Acres Planted(^2) in TBR Areas Treated</td>
<td>0</td>
<td>186</td>
<td>186</td>
<td>186</td>
</tr>
<tr>
<td>- Years to Pre-epidemic Average Stand Production Level(^2) without Planting</td>
<td>100 to 200</td>
<td>100 to 200</td>
<td>100 to 200</td>
<td>100 to 200</td>
</tr>
<tr>
<td>- Years to Pre-epidemic Average Stand Production Level(^2) with Planting</td>
<td>30 to 40</td>
<td>30 to 40</td>
<td>30 to 40</td>
<td>30 to 40</td>
</tr>
<tr>
<td>Economic Recovery of Dead and Dying Trees:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Timber By-Product Recovered (MMBF)</td>
<td>0</td>
<td>32 to 41</td>
<td>32 to 41</td>
<td>32 to 41</td>
</tr>
<tr>
<td>- Expected Revenue from Timber By-Product</td>
<td>$80,000.00</td>
<td>$80,000.00</td>
<td>$80,000.00</td>
<td>$80,000.00</td>
</tr>
<tr>
<td>- Twenty-Five Percent Sale Revenues to Counties (PILT)(^6)</td>
<td>0</td>
<td>$200,000.00</td>
<td>$200,000.00</td>
<td>$200,000.00</td>
</tr>
<tr>
<td>- Years to Commercial Age(^7) without Planting</td>
<td>80 to 140</td>
<td>80 to 140</td>
<td>80 to 140</td>
<td>80 to 140</td>
</tr>
<tr>
<td>- Years to Commercial Age(^7) with Planting</td>
<td>80 to 140</td>
<td>70 to 100</td>
<td>70 to 100</td>
<td>70 to 100</td>
</tr>
</tbody>
</table>

1. Ch/ha/yr (Ch/ha = acres treated/acre).
2. IA - Initial Attack.
3. Adequate stocking exists when at least 70% of the stand suitalbe for tree growth has a minimum of 180 TPA for low productivity to 195 TPA for moderate and high productivity sites.
4. Rate of spread year 200 and 2000 correspond to 2000 and 20000 sprinkler units, respectively.
5. Potential for IA-2 escape year 2000-Harvested Acres
6. ILT - Payment in Lieu of Taxes.
7. To be considered commercial, the average stand diameter would have to be at least 8 to 10 inches at breast height.
The following narratives provide a brief presentation of potential effects from implementing the alternatives considered in detail as indicated by issue comparison elements.

**Air Quality**

All alternatives would comply with State air quality requirements and the Federal conformity rule.

**Land Stability**

Mortality of spruce trees in the project area is causing a decrease in land stability and an increase in the potential for landslides. The removal of dead and dying trees would not, in itself, affect land stability. Road construction, road reconstruction, and staging areas in unstable and moderately unstable areas could induce local landslides. However, such facilities would be designed to minimize landslide risk. Notable differences in effects to land stability are not expected between the action alternatives. Reforestation by planting of spruce would improve land stability with time.

**Soils**

All action alternatives would disturb soil. Ground-based yarding would result in exposed soil over 15 to 20 percent of the harvested area. Cable yarding and helicopter yarding would result in exposed soil over 3 to 8 percent of the harvested area. It is estimated that soil erosion would range from 0.1 to 2 tons per acre per year over the ground-based logged areas and would decrease over time as vegetation becomes established. Soil erosion from cable yarding and helicopter yarding would be considerably less than that of ground-based yarding. Although there are some differences between the action alternatives, notable differences in effects to the soil resources are not expected.

**Road reconstruction, maintenance, and reclamation in the action alternatives should improve soil conditions and reduce erosion concerns.**

**Water Resources**

Changes to sediment loads in the streams would be small and not measurable. Due to large natural variations in sediment loads, the small anticipated changes in sediment would not adversely affect the beneficial uses of water. Temporary increases in sedimentation from ground disturbance associated with logging activities would be short term (1 to 3 years). Temporary increases in sedimentation would be expected from road construction (Alternative 2 only), reclamation, maintenance, and reclamation included in the action alternatives. Over the long-term, road reclamation, maintenance, and reclamation associated with the action alternatives would result in reductions in sediment. The application of best management practices would reduce potential impacts to soil and water resources.

**No harvesting or mechanical entry (skidding, landings, etc.) will be permitted within 100 feet of each side of perennial streams, seeps, lakes, reservoirs, or wetlands. Except at approved crossing locations, no harvest will be allowed within 35 feet of an intermittent stream channel, and no mechanical entry will be allowed within 50 feet.**

**Vegetation Resources**

Epidemic spruce beetle activity has killed the majority of the spruce trees in the area. This has reduced stand development, growth, and production levels in affected areas. Without treatment, it would take 30 to 90 years for adequate natural reforestation of affected spruce stands. With treatment, reforestation would be assured in less time (5 years). Without treatment, it could take 100 to 200 years to return affected spruce stands to pre-epidemic stocking levels. With treatment, return to pre-epidemic stocking and production levels would be expected in less time (60 to 70 years sooner than untreated areas). Additionally, the gene pool would be supplemented by planting spruce trees.

**Range Vegetative trends and production would increase with or without treatment. The rate of improvement would be greater with treatment than without. Weeds would occur with or without treatment. The risk and rate of weed expansion is greater with treatment because of ground disturbance and increased activity in the area. However, weed populations would be treated in accordance with existing decisions and agreements.**

**No endangered plant species exist within the project area. One threatened plant species exists within the project area (Heliotrope milkvetch). There would be no effect to Heliotrope milkvetch from implementation of any of the alternatives.**

**Four sensitive plant species occur within the project area (Carrington daisies, Arizona willow, Musinea groundsel, Maguire campion). There would be "no impact" to Carrington daisies or Arizona willow from implementation of any of the alternatives. Use of the South Camel gravel source for road work and maintenance "may impact" individual Maguire campion and Musinea groundsel and their habitat but will not likely contribute to trend toward for Federal listing or loss of viability to the population or species. This "may impact" determination for Maguire campion or Musinea groundsel is only applicable to use of the gravel at the South Camel gravel source. Other project activities would have a "no effect" determination for these species.**

**Fuels/Fire**

The abundance of dead spruce trees increases wildland fire concerns should a fire start under extreme fire conditions. Treatments would break up the continuity of the fuels and increase the probability of containing fires and reducing its associated effects. Alternative 2 would have the greatest impact to reducing fire susceptibility, fuel loading, and fire behavior, followed by Alternatives 3 and 4 respectively. Alternative 1 would see the probability of a large, intense wildland fire go up, and corresponding suppression efforts would be less effective due to the amount of fuel loadings present when conditions are favorable to fire ignition and rate of spread.

**Wildlife Resources**

Wildlife habitat would be affected by the alternatives. However, no alternative would contribute to a loss of population viability.

**Management Indicator Species**

Elk and Deer: With no action, alternative 1, hiding cover in the affected spruce stands would be reduced as dead spruce trees die and fall to the ground. Also with no action, existing access and associated impacts would continue (94 miles of roads and motorized trails). During implementation of any action alternative, the hiding and security cover for elk and deer would temporarily be reduced proportional to the acreage treated and amount of road work. However, after implementation of the action alternatives, reforestation would provide hiding cover in 15 to 20 years and habitat effectiveness would be increased by the reclamation of approximately 23.4 miles of Forest Development Roads, and nonsystem roads and trails.

**Blue Grouse**: With no action, alternative 1, effects to blue grouse habitat would come from natural succession. Impacts from the action alternatives would primarily come from harvest-related activities and road work that inadvertently removes or damages aspen or fir trees.

**Golden Eagle**: Since the beetle epidemic has already changed the character of the spruce stands to one of a more open habitat, none of the alternatives would notably impact foraging habitat for eagles.
Tree Cavity Dependent Species

All alternatives would continue to provide tree cavity habitat. Within treatment areas, the retention of non-spruce trees and 300 snags per 100 acres would provide for snag maintenance and snag recruitment over time.

Proposed, Threatened, and Endangered Species

Canada Lynx: (Threatened) There would be "no effect" to Canada lynx from Alternative 1. The action alternatives "may affect individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species." adverse habitat impacts from the action alternatives would be as a result of increased human activities in winter habitat. However, there has never been a sighting of lynx in the project area. Beneficial habitat impacts from the action alternatives would occur from reforestation.

Bald Eagle (Threatened): There would be "no effect" to bald eagles from Alternative 1. The action alternatives "may affect individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species." Impacts from the action alternatives include possible disturbance from helicopter activity during eagle migration through the area.

Southwest Willow Flycatcher (Endangered): There would be "no effect" to Southwest willow flycatcher from implementation of any of the alternatives.

Sensitive Species

Peregrine Falcon: There would be "no impact" to peregrine falcon from implementation of any of the alternatives.

Spotted and Townsend's Big-eared Bat: There would be "no impact" to spotted bat and Townsend's big-eared bat from Alternative 1. The action alternatives "may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species." Impacts from the action alternatives include using South Camel gravel source for road work which may affect bat roosting in adjacent limestone cliffs.

Flammulated Owl: There would be "no impact" to flammulated owl from Alternative 1. The action alternatives "may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species." Impacts from the action alternatives include possible avoidance of treated areas by flammulated owls.

Northern Goshawk: There would be "no impact" to Northern goshawk from Alternative 1. The action alternatives "may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species." Impacts from the action alternatives include potential indirect impact to prey species and project activities within nesting habitat. Alternatives 2 and 3 would affect 0.1 acres of suitable nesting habitat. Alternative 4 would affect 560 acres of suitable nesting habitat.

Three-toed Woodpecker: There would be "no impact" to three-toed woodpecker from Alternative 1. The action alternatives "may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species." Impacts from the action alternatives include removal of dead trees which represent a food source for the woodpecker. However, snag retention requirements would allow the woodpecker to use the treated areas.

Transportation

Roads and trails in the area are used for a variety of purposes. Alternative 1 would not impact existing roads and trails. Alternative 2 includes: approximately 1.1 mile of Forest Development Road construction; 11.0 miles of Forest Developed Road reconstruction; 0.5 miles of temporary road construction followed by reclamation; 4.1 miles of Forest Development Road reclamation; and 13.3 miles of non-system, motorized trail road and reclamation.

The road work in Alternatives 3 and 4 is the same as Alternative 2 except that there would be no Forest Development Road construction, and less reconstruction of Forest Development Roads.

Forest visitors can expect minor travel delays due to reconstruction of Forest Development Roads. However, this reconstruction would provide safer and more dependable access. To lessen potential project impacts upon Forest visitors, no hauling would be allowed on weekends, holidays, the day before opening day of deer and elk general rifle seasons, as well as the opening first two days of the seasons.

Alternative 1 has 94 miles of Forest Development Roads, non-system, motorized trails and roads, and system motorized trails. 94 miles of motorized access correlates to a motorized network density of 2.4 miles per square mile within the project area (incorporating Forest Development Roads, non-system motorized trails and roads, and motorized trails). Implementation of the action alternatives would reduce the motorized access to 70 miles, with a corresponding motorized network density of 1.8 miles per square mile.

Range

Forage would temporarily increase with Alternative 1 in the openings created by the dead and dying spruce trees. When these trees fall to the ground, the production and availability of forage would be less.

Permittees could be impacted by the action alternatives. Livestock may temporarily be prohibited from harvest areas to assure adequate reforestation. Such a prohibition could last from 7 to 20 years. This decreased use of suitable range may or may not affect herd size depending upon possible variations in reforestation protection methods, fencing, herding, grazing schedules, or other methods worked out with the permittee.

Visual Landscape

Short-term impacts to range improvements could occur from project activities. However, project-caused damages would be repaired or the improvement would be replaced.

The visual landscape could be affected by timber harvest and road building. In general, increased timber harvest and road building is likely to reduce visual quality of an area. However, the location and characteristics of these activities in context with the existing landscape plays a defining role in determining the overall visual effect. When management-induced changes to the landscape contrast with the existing setting, impacts to the visual resource are the greatest. If management activities blend with the existing landscape setting, they are less visually evident.

Alternative 1 would not change the visual character of the area. All action alternatives would add temporary, unnatural characteristics to the landscape when viewed from the immediate foreground or during and shortly after project implementation. With a more distant perspective or time, the action alternatives should blend with the overall landscape. The overall blending of project activities is attributable to the selective tree removal of the proposed salvage harvesting, limited road construction, road realignment, and reforestation. Road reconstruction and maintenance would blend with the overall setting because it would occur within the immediate area of the existing roadway. All alternatives would meet Visual Quality Objectives within the area.
Undeveloped character of the area could be affected by timber harvest and road building. In general, increased timber harvest and road building is likely to reduce undeveloped character. The potential to impact undeveloped character is also related to the road system used. Since helicopter yarding typically results in less on-the-ground impacts than ground-based yarding, it would be expected to have impact to undeveloped character.

Some impacts, such as the sounds of project activities, would occur only during the immediate time of the activity. Other impacts, such as tree marking paint, skid trails, and logging slash, would be short term (up to 10 years). And yet, other impacts such as roads and tree stumps would be evident much longer (20 to 40 years).

Alternative 1 has 94 miles of Forest Development Roads, nonsystem roads/trails, and system motorized trails. These 94 miles of motorized access correlates to a motorized network density of 2.4 miles per square mile within the project area. Implementation of the action alternatives would reduce the motorized access to 70 miles, with a corresponding motorized network density of 1.8 miles per square mile. The reduced access and rehabilitation of an unnatural feature, roads and trails, would positively affect undeveloped character.

The overall undeveloped character of the area is not expected to notably change because the types of activities, facilities, recreational experiences, and scenery available will remain essentially the same for all alternatives due to developments and activities that already exist.

Alternative 2, 3, and 4 would harvest approximately 1,240-1,613 acres of undeveloped areas, primarily by helicopter, in three unroaded areas identified per the interim rule. All three alternatives comply with the interim rule. All action alternatives would reclaim Forest Development Road #50233 within the unroaded area contiguous with White Mountain inventoried roadless area. This unroaded area would increase in size from 4,300 acres to 4,490 acres.

Cultural Resources

Access and ground disturbance have the potential to affect cultural resources. However, following the existing Memorandum of Understanding will protect known and subsequently discovered cultural resources. In accordance with the National Historic Preservation Act, a "no effect" determination has been made for all alternatives.

Economics

All alternatives have the same inherent cost associated with the preparation of this document. Additionally, all action alternatives would have implementation costs (i.e., sale preparation, sale administration, post harvest requirements, road work).

Areas are identified for harvest based on technical operability, environmental acceptability, and the need to remove dead and dying tree species as a step in ecosystem rehabilitation. The actual amount of harvest, within modelled parameters, depends upon market conditions which vary through time and by the specifics associated with the authorization instrument (e.g., timber sale contract, service contract, etc.). Increased amounts of helicopter yarding reduces the likelihood that all areas identified for treatment would in fact be harvested.

The cost of helicopter yarding is considerably greater than ground-based yarding - almost 7 times as much ($283.37/MBF for helicopter yarding estimated in Alternative 2, and $43/MBF for ground-based yarding). Economic modeling assumptions made were harvest volume per acre was 10,000 board feet per acre and 50% of any unit would receive harvest treatment. While Alternative 2 and 3 treat the same area (3,174 acres), Alternative 2 would helicopter yard 35 percent (2,696 acres), where

Energy

Energy consumption is represented by the use of petroleum products to run project-related equipment. Energy output is represented by the direct fuel value of the harvested timber. All action alternatives would consume fuel. Calculating energy consumption based upon the amount of timber expected to be recovered: Alternatives 2 and 3 would consume 173,240 Millions of British Thermal Units (MMBTU), and Alternative 4 could consume 128,236 MMBTU. However, fuel consumption by helicopter yarding at the high elevations of the project area would be greater than that of ground-based yarding.

Therefore, Alternative 3 (with 92% helicopter yarding) would be expected to consume slightly more energy than Alternative 2 (85% helicopter yarding). Alternatives 2 and 3 could have an energy output of 213,951 MMBTU, and Alternative 4 could have an energy output of 158,371 MMBTU.

Roadless Character

Alternative 1 would have no direct or indirect effects to inventoried roadless areas. Ongoing public use and activities could cumulatively affect their character. Road building can reduce an area's roadless character. None of the action alternatives would construct permanent or temporary roads within RARE II inventoried roadless areas. Alternative 2 is the only alternative that includes road construction (1.1 mile) within an inventoried roadless area (Heliotrope). This road construction is within an existing road corridor and meets the interim road rule. Alternatives 2 and 4 would conduct road reconstruction and maintenance within the Heliotrope inventoried roadless area. Road reclamation can improve an area's roadless character. All action alternatives would reclaim a segment of Forest Development Road #50285 within the Heliotrope inventoried roadless area (1 mile). All action alternatives would also reclaim motorized, nonsystem roads and trails within inventoried roadless areas (3 miles).

Timber harvest can reduce an area's roadless character. Alternatives 2 and 3 would harvest 1,259-1,637 acres within inventoried roadless areas. However, the yarding methods, and corresponding effects, differ between these alternatives. In Alternative 2, yarding within inventoried roadless areas would be by helicopter (79%) and ground-based systems (21%). Impacts from ground-based yarding a usually more evident than aerial yarding because of the skid trails, although stumps would be evident to a visitor walking through the harvest units. In Alternative 3, yarding within inventoried roadless areas would wholly be by helicopter. Alternative 4 would not harvest within inventoried roadless areas.

Alternative 3 would helicopter yard 92 percent (2,903 acres). Alternative 4 would helicopter yard 86 percent of its 1,912 acre treatment area (1,639 acres).

When the timber to be harvested from each alternative is modelled at a selling value of $25,000 per million board feet of timber (MMMBF), the following revenues would be expected: $800,000 for Alternatives 2 and 3, and $475,000 for Alternative 4. Twenty-five percent of these receipts would go to the associated Counties.

Proportional to the amount of timber harvested, all action alternatives would contribute to employment and income opportunities (i.e., timber sale preparation, logging operations, trucking, timber processing, and post-sale requirements). Economic benefits to primary and secondary businesses would also be expected.

Long-term economic benefits would also be expected from the action alternatives. Reforestation efforts would accelerate maturation of the treated stands.
Vicinity Map

Legend:
- Project Area
- Towns
- Roads
- Manti-La Sal National Forest Boundary
- County Boundaries

Scale: 1:100000

Alternative 1

Legend:
- Open system road
- Open system trail
- Closed system road, level 1 maintenance
- System road to be reclaimed by another project
- Non system road
- Inventoried Roadless Area

- 1996 South Manti Timber Salvage Sales
- 1993 Twelvemile Timber Sales
- 1992 Timber Canyon Timber Sales
- Project Boundary
CHAPTER 1
PURPOSE AND NEED
CHAPTER 1 - PURPOSE OF AND NEED FOR ACTION

1.0 INTRODUCTION

This project was initiated in response to widespread spruce mortality caused by epidemic spruce beetle (Dendroctonus rufipennis) activity across the South Manti landscape. This environmental impact statement summarizes potential direct, indirect, and cumulative effects of corresponding site-specific forest management alternatives on portions of the Ferron-Price and Sanpete Ranger Districts of the Manti-La Sal National Forest. The disclosure of information in this document is intended to provide a meaningful basis for public review.

This chapter is divided into the following sections:

- 1.0 Introduction
- 1.1 Proposed Action
- 1.2 Purpose and Need
- 1.3 Incorporation by Reference
- 1.4 Scope of the Project
- 1.5 Decisions to be Made
- 1.6 Document Organization

Proposal

A proposal was designed to address the purpose of and need for action identified in Section 1.2. The proposal included salvage harvest of dead and dying spruce trees, road work, and reforestation in areas of spruce beetle activity in the project area.

A "Notice of Intent to Prepare an Environmental Impact Statement" was printed in the Federal Register on February 17, 1998. Comments on the proposal were requested through newspaper notices in Carbon, Emery, and Sanpete Counties, Utah. Additional public notification was completed through the Forest's Schedule of Proposed Actions and by mailing of individual letters. On October 5, 1998, a public field trip was held to explain the proposed action to interested publics. Notification of a Draft Environmental Impact Statement (DEIS) was printed in the Federal Register on May 7, 1999. Legal notices were published notifying the public of the availability of the DEIS and that comments were being sought (over 200 copies were mailed to interested parties). Based upon a request, the comment period to the DEIS was extended until July 21, 1999, to facilitate additional on-the-ground public review of the area. A public field trip was held on July 13, 1999, to explain and answer questions pertaining to the alternatives. 97 comment letters to the DEIS were received.

Alternatives

Forest management alternatives considered for this project are described in detail in Chapter 2.

Following field verification and review of received comments, the original proposal (February 17, 1998) was modified and is included in this document as Alternative 2. Alternative 2 represents the intent of the original proposal. Alternative 2 proposes salvage harvest of dead and dying spruce trees, road work, and reforestation across the project area, outside and within inventoried roadless areas (RARE II and Forest Plan). Alternative 2 does not include road construction or reconstruction in RARE II inventoried roadless areas; it does include road construction, reconstruction, and road maintenance in a roaded portion of a Forest Plan inventoried roadless area (Heliolrope) as defined in the interim rule.

Two other action alternatives were developed to address the significant issue identified from public comments, while responding to the identified purpose and need for action.
Alternative 3 - Alternative 3 emphasizes achieving the identified purpose and need without constructing or reconstructing roads in RARE II inventoried roadless areas. It does include road reconstruction and road maintenance in a roadded portion of a Forest Plan inventoried roadless area (Heliotrope), and using ground-based and helicopter log yarding in such areas.

Alternative 4 - Alternative 4 emphasizes minimizing impact to the character of inventoried roadless areas (RARE II and Forest Plan) by not harvesting, constructing roads, or reconstructing roads in such areas.

Other alternatives were considered as part of this planning effort, but were not given detailed study for various reasons (refer to Section 2.3 in Chapter 2).

Project Location

The project area is located within the southern portion of the Wasatch Plateau on the Ferron-Price and Sanpete Ranger Districts of the Manti-La Sal National Forest, in Sanpete and Sevier Counties, Utah (Townships 19, 20, and 21 South; Range 4 East; SLM). The project area is approximately 10 miles southeast of the town of Manti, 12 miles east of the town of Mayfield, 19 miles west of the town of Ferron, and 45 miles southwest of the town of Price. The project area extends from White Mountain, along the Manti-La Sal and Fishlake National Forest boundaries, north to the headwaters of Ferron and Sixmile drainages (Figure 1-1 Vicinity Map, on page 1-3).

Area Overview

The project area includes approximately 24,597 acres of National Forest System lands. Five characteristics stand out when visiting the South Manti area:

1. Visual Landscape - The project area is characterized by a mountainous terrain which includes rock formations and glacial cirques. There are panoramic ridges and valley views (some containing lakes or reservoirs) of subalpine scenery.

2. Vegetation - Vegetation in the project area is represented predominantly by three conifer types: Engelmann spruce-Subalpine fir (47%), grass and brush (36%), and aspen (12%).

3. Spruce Beetle - The Engelmann spruce-Subalpine fir cover type represents over 10,000 acres in the project area. A spruce beetle epidemic has affected most of the spruce trees within the project area. As a result, most spruce trees are dead or dying. Dead trees are those spruce trees in which the flow of nutrients in the cambium/phloem layer, beneath the bark, has ceased. These trees may or may not look dead, depending upon how long they have been dead. Dying trees are those spruce trees with multiple spruce beetle attacks that encircle the tree bole. Dying trees are usually dead within a year of such infestation. Approximately seventy percent of the spruce trees with a diameter greater than five inches at breast height and ninety percent of the spruce trees with a diameter greater than eleven inches at breast height are dead.

4. Past and Present Management - There is evidence of past and present management in the area such as grazing, timber harvest, roads, trails, and camping areas which has shaped the overall landscape conditions.

5. Recreation Use - Dispersed recreation is the primary recreational use of the area, as evidenced by camping areas and road and trail use.
Recent forest management actions in the project area include timber harvest approved from three separate analyses: Timber Canyon Timber Sale Environmental Assessment (1992), Twelvemile Timber Sale Environmental Assessment (1993), and South Manti Timber Salvage Sales Environmental Assessment (1996). The environmental impact statement reassesses the need for treatment responsive to spruce beetle activity and potential effects of specific, similar management activities within these previously analyzed areas.

The 1992 Timber Canyon Timber Sale Environmental Assessment and its Decision Notice resulted in the harvest of dead, dying, and at-risk spruce trees from 330 acres, recovering approximately 2.9 million board feet (MMBF) of timber. The 1992 Timber Canyon Timber Sale Environmental Assessment project has been completed.

The 1993 Twelvemile Timber Sale Environmental Assessment and its Decision Notice resulted in the harvest of dead, dying, and at-risk spruce trees from 205 acres, recovering approximately 2.4 million board feet (MMBF) of timber. The 1993 Twelvemile Timber Sale Environmental Assessment project has been completed.

Public participation for the 1996 South Manti Timber Salvage Sales Environmental Assessment project began in the fall of 1992 with a public field trip to the area. Participants viewed the extent of spruce beetle activity and beetle-inflected spruce tree mortality. Participants also discussed opportunities to salvage timber and improve forest health. In the summer of 1993, a project proposal was mailed to 82 people, organizations, and agencies. At that time, an environmental assessment was to be prepared to disclose impacts of the proposal. Late in 1993, the Forest Supervisor directed preparation of an environmental impact statement.

On July 27, 1995, the President signed the Rescission Act (Public Law 104-19) which provided provisions related to emergency salvage of timber on lands administered by the Forest Service. The salvage provisions of Public Law 104-19 were intended to expedite timber salvage within a framework of maintaining forest health and ecosystem management. The provisions included use of environmental assessments to disclose project impacts. The authorities provided by Public Law 104-19 were effective until December 31, 1996.

On September 12, 1995, the Forest Supervisor determined that the provisions of Public Law 104-19 applied to the South Manti Timber Salvage Sales. Consistent with the law, the Forest Supervisor redirected a project analysis to production of an environmental assessment. The resulting South Manti Timber Salvage Sales Environmental Assessment and Decision Notice was completed in 1996. The decision approved harvesting dead, dying, and at-risk live spruce trees from across 8,100 acres to recover an estimated 71 million board feet (MMBF) of timber.

Six timber sales were sold from the 1996 South Manti Timber Salvage Sales decision before the authorities provided by Public Law 104-19 had expired: Camel, Oley, Olga, Baldy, Six, and Duck. These timber sales were expected to recover approximately 20 million board feet (MMBF) of timber across 1,912 acres. The remaining approved timber harvest was not sold under the existing decision because the authority provided by Public Law 104-19 had expired.

Of the six timber sales sold from the 1996 South Manti Timber Salvage Sales decision, Camel (13 acres, 0.1 MMBF), Oley (151 acres, 0.9 MMBF), and Olga (173 acres, 1.0 MMBF) have been harvested. Timber harvest started in 1997 on the Baldy Timber Sale (498 acres, 5.9 MMBF), 1999 on the Six Timber Sale (351 acres, 4.0 MMBF), and 1999 on the Duck Timber Sale (726 acres, 8.1 MMBF).
1.2 PURPOSE AND NEED

The purpose and need for this project is to address ecological and economic values affected by spruce beetle activity in the South Manti project area as further defined in this section of the document.

Management of the project area is part of the Manti-La Sal National Forest’s attempt to fulfill the Forest Service commitment of “caring for the land and serving people.” National forests have led the Natural Resource Agenda to reemphasize its commitment of “caring for the land and serving people.” The Agenda focuses on four key emphasis areas: watershed health and restoration, sustainable forest ecosystem management, improved management of the National Forest road system, and improved recreation opportunities and experiences. This project incorporates the Agenda’s goals.

The Manti-La Sal National Forest Land and Resource Management Plan (Forest Plan) identifies goals for the management of the Forest. Goals are concise statements describing a desired condition to be achieved some time in the future. Progress is made toward achieving the goals, and their corresponding desired conditions, through implementation of site-specific projects. Projects are designed to achieve specific goals and move toward desired conditions. The proposed action was designed to help achieve specific goals of the Forest Plan as identified in the following subsections.

Purpose and Need #1
Reduce the potential for large and intense wildfires across forested areas (associated environmental effects).

Large, intense wildfires (200 acres or greater, 50% or greater tree mortality, greater than 100 tons/acre of PM-10 emissions, and 50% or greater dust consumption or greater than 2 inches of dust removal) can threaten the health of watersheds and sustainable forest ecosystems. Although insects are a part of the natural cycle, when they are active at epidemic levels they can kill extensive areas of trees. Dead trees represent a fuel source in which a wildland fire could burn. An abundance of dead trees can predispose an area to the occurrence of a large, intense wildland fire should a fire start under extreme conditions. A large, intense wildland fire can have undesirable effects ranging from a loss of vegetation and wildlife cover to an overall reduction in site productivity and increased soil erosion and instability. Reducing the amount and continuity of fuel represented by the dead spruce trees would reduce the area’s vulnerability to a large, intense wildland fire.

This purpose and need for the project is responsive to the following Forest Plan goals.

Timber Goal: “Use timber management to meet other management or resource needs.” (Forest Plan, p. III-4).


Protection Goal: “Reduce the accumulated fuels to a tolerable risk level.” (Forest Plan, p. III-5).

Stand-replacement wildland fires occur in spruce-fir forests on a 100-year to 300-year cycle. No substantial wildland fires have occurred within the project area during the last 500 to 600 years. Given epidemic spruce beetle activity across the landscape, and as the dead trees begin to fail, the area will become increasingly predisposed to the occurrence of larger than normal wildland fires during severe drought and fire weather conditions.

Pre-epidemic and current fuel loadings of dead down fuels vary from 10 to 32 tons per acre in the spruce stands. Most spruce trees within the project area are dead or dying due to spruce beetle activity (approximately seventy percent of the spruce trees with a diameter greater than five inches at breast height and ninety percent of spruce trees with a diameter greater than eleven inches at breast height are dead). These dead trees represent an increase in the amount of potential fuel available to burn in a wildland fire. Fuel loadings from 51 to 82 tons per acre are expected in the spruce stands as dead trees fall to the ground by the year 2075. With such extensive tree mortality and eventually higher fuel loadings, there are inherent concerns about the potential for more intense and larger than normal wildland fires.

The proposed action responds to this purpose and need through salvage harvest of dead and dying spruce trees and associated treatments. Salvage harvest of dead and dying timber in conjunction with post-sale treatments will reduce fuel continuity and aid in wildland fire containment when unfavorable weather conditions exist.

Purpose and Need #2
Facilitate rapid reestablishment of Engelmann spruce through replanting of spruce in Timber Management Emphasis Units identified in the Forest Plan.

Spruce tree mortality represents a loss of vegetation, biodiversity, and wildlife cover. It also represents the loss of an important seed source for the future. Timber salves can be used as a tool to restore forest ecosystem health. Following timber harvest, site preparation and reforestation efforts help to ensure a future of healthy trees. Trees contribute to the health of the forest and its sustainability. Healthy forests do far more than grow trees for harvest - they provide clean water, wildlife habitat, recreation opportunities, and more.

This purpose and need for the project is responsive to the following Forest Plan goals.

Vegetation Goal: “. . . varying successional stages will be present to provide for a high level of vegetative diversity and productivity.” (Forest Plan, p. III-2).

Timber Goal: “Maintain a healthy Forest by applying appropriate silvicultural treatments.” (Forest Plan, p. III-3).

Timber Goal: “Use timber management to meet other management or resource needs.” (Forest Plan, p. III-4).

Epidemic outbreaks of spruce beetles and subsequent extensive spruce mortality are not desirable because it dramatically reduces compositional and structural diversity over a relatively short time. With over 90 percent of the mature spruce in affected stands dead, the character of the remaining stands is changed. The character of affected stands is now less varied and more open. The affected stands now consist mostly of subalpine fir and have a smaller average live tree diameter. The spruce trees that have survived the beetle activity are small and poorly distributed across the landscape. They do not represent an ideal seed source. Vegetation in the affected stands will move from an Engelmann spruce-Subalpine fir community toward a community dominated by Subalpine fir, which is the climax species. While beetle epidemics and the trend toward a climax successional stage may be within the historic range of variability, the above-stated Forest Plan Vegetation Goal would not be achieved in a timely manner. With treatment to facilitate reestablishment of spruce, the affected spruce stands will reestablish between 30 and 90 years to regenerate Engelmann spruce to full stocking levels. Without treatment to facilitate reestablishment of spruce, it will also take 100 to 200 years to return to the
affected stands to pre-epidemic stocking and production levels, providing the full range of benefits associated with a healthy forest.

The proposed action responds to this purpose and need through salvage harvest of dead and dying spruce trees, followed by site preparation and reforestation treatments. Reforestation provides a dependable assurance of reestablishment of the spruce component in areas that have experienced extensive mortality. Replanting of spruce in the harvested areas assures adequate stocking within 5 years. Replanting of spruce in the harvested areas also reduces the recovery time for the stand to return to pre-epidemic stocking and production levels by 60 to 70 years. These reforested areas would mature sooner than other areas and would increase structural and compositional diversity conditions more rapidly with a greater resilience to disturbance, providing an array of benefits represented by a healthy forest.

Purpose and Need #3

Recover some of the economic value of the dead and dying trees

While timber harvest can be used as a tool to restore forest ecosystem and watershed health as presented in the preceding purpose and need descriptions, it can also contribute to local economies. Recovery of some of the economic value of dead and dying trees and restoration of healthy forests are beneficial to many rural communities and businesses.

Forest roads are an essential part of the transportation system in many rural parts of the country. Forest roads help meet recreation demands, provide economic opportunities by facilitating the transport of products, and provide access for needed management. While the benefits of roads are many, so too are their ecological impacts. Roads not properly built and maintained can do environmental damage. Timber sales can be used as a tool to better manage the road network across the landscape. Old, unneeded roads may be closed or removed while other roads may be maintained or improved through timber sales. These measures provide for improved services, public safety, and environmental protection. Additionally, twenty-five percent of the revenues generated from National Forests are currently returned to states and distributed to counties for schools and county roads - further benefiting the local communities.

This purpose and need for the project is responsive to the following Forest Plan goals.

Timber Goal: “Provide commercial timber sales of sufficient quantity and quality to maintain local timber industry and accomplish desired vegetation treatment goals.” (Forest Plan, p. III-3).

Timber Goal: “Meet as much of the demand for wood fiber and Forest products as possible, consistent with multiple-use objectives.” (Forest Plan, p. III-3).

Timber Goal: “Use timber management to meet other management or resource needs.” (Forest Plan, p. III-4).

About twenty-two percent (5,335 acres) of the project area emphasis is allocated to provide for wood fiber production and utilization (Management Unit TBR - Timber Management Emphasis). Another seventy-eight percent (19,112 acres) is allocated to allow for wood utilization consistent with meeting other resource value requirements (Management Unit RNG - Range Emphasis). Epidemic spruce beetle activity in lands allocated to providing long-term, continuous supplies of timber products is not desirable because it results in extensive tree mortality in a short period of time. While the short-term economic benefits of harvesting dead trees are obvious, the long-term economic benefits of promptly reestablishing a healthy stand of trees is often overlooked. Without treatment to facilitate reestablishment of spruce, the affected stands will take 80 to 140 years to reach a commercial age.

The proposed action responds to this purpose and need through salvage harvest of dead and dying spruce trees (19-42 MMFB), site preparation and reforestation treatments, and road work. The revenue from selling the dead trees is estimated at $475,000.00 to $800,000.00. A salvage harvest of dead and dying timber and associated road work can provide economic opportunities for businesses and individuals. Demands for lumber and other building products are increasing as more people move into Utah and the Western United States and more homes are built. Continued competition and demand for sawtimber and houselogs is reasonably foreseeable in the next decade. Reforestation efforts would accelerate maturation of the affected spruce stands, thereby better ensuring long-term productivity and potential economic benefits.

1.3 INCORPORATION BY REFERENCE

To decrease the size of this document and the degree of redundancy to the contents of other documents, some material in this document ties to or incorporates by reference other material.

Material specifically cited or otherwise used in preparation of this document is hereby incorporated by reference.

Information in this document ties to the direction contained in the Forest Plan, as amended, and its Record of Decision (1986). Information in the Forest Plan Final Environmental Impact Statement is hereby incorporated by reference. This includes the Utah Northern Goshawk Forest Plan Amendment signed on April 14, 2000.


Information, analyses, and literature incorporated by reference in the 1996 South Manti Timber Salvage Sale Environmental Assessment previous analyses are hereby incorporated by reference as appropriate.

The entirety of the supporting project record is hereby incorporated without further reference.

The project record is available for review at the Forest Supervisor's Office, Manti-La Sal National Forest, 599 West Price River Drive, Price, Utah, 84501.

1.4 SCOPE OF THE PROJECT

The scope of a project refers to the geographic boundaries of the proposal including any connected or cumulative actions. The scope of actions addressed in this document is limited to specific treatment of spruce stands affected by beetle activity, timber harvest, access management, reforestation, and post-sale activities.
This document does not constitute a general management plan for the area. It discloses and evaluates potential effects that could be caused by the site-specific alternatives considered in detail. The project's scope of analysis is confined to the issues associated with the proposed action and includes all lands that may reasonably be affected from implementation of the alternatives. This analysis considers the need for potential amendments to the Forest Plan and associated effects.

1.5 DECISIONS TO BE MADE

The Responsible Official, Forest Supervisor of the Manti-La Sal National Forest, will make the following decisions associated with this document:

1. Whether to harvest dead and dying trees and, if so, the location, methods of harvest, silvicultural diagnosis, reforestation, and post-sale activities;

2. Whether to change short-term and/or long-term access and, if so, the location, methods of road construction, reconstruction, maintenance, rehabilitation, closure, and access management;

3. What, if any, additional measures are necessary to implement a decision;

4. What, if any, specific project monitoring requirements are needed to assure selected measures are implemented and effective; and

5. Whether Forest Plan Amendments are needed to implement a decision.

1.6 DOCUMENT ORGANIZATION

Chapter 1 - Chapter 1 presents an introduction to the project and project area, the purpose and need for action, the proposed action, material incorporated by reference, the scope of the project, and the decisions to be made.

Chapter 2 - Chapter 2 describes the alternative development process and resulting alternatives. Four alternatives considered in detail (including 'no action') and alternatives not given detailed study are described in Chapter 2. Chapter 2 also discusses ways of addressing or resolving issues related to implementation of the action alternatives. The alternatives are displayed so that a comparison can be made of the alternative components, accomplishment of the purpose and need, and potential environmental effects.

Chapter 3 - Chapter 3 discusses the affected environment and provides a frame of reference from which to judge the effects of each alternative.

Chapter 4 - Chapter 4 discloses the effects of implementing each alternative. Direct/indirect and cumulative effects are presented by resource topic. Consistency with the Forest Plan is also presented. Potential conflicts with plans and policies of other jurisdictions, probable environmental effects that cannot be avoided, relationship between short-term use and long-term productivity, irreversible and irretrievable commitments of resources, and specifically required disclosures are presented at the end of Chapter 4.

Appendices - The Appendices contain site-specific or supplementary information that may add depth to the discussions in the main chapters.
CHAPTER 2 - ALTERNATIVES

2.0 INTRODUCTION

This chapter describes in detail four alternative ways to manage the land and resources in the South Manti project area. A team of resource specialists (see Appendix A - List of Preparers) developed these alternatives within the framework of the Forest Plan and ecological stewardship. Alternatives were designed to address or resolve the issues identified from public involvement. A key design requirement of each action alternative was that it had to respond to the purpose and need for the project identified in Chapter 1.

This chapter is divided into the following sections:

- 2.0 Introduction
- 2.1 Alternative Development Process
- 2.2 Issue Identification
- 2.3 Alternatives Considered But Not Given Detailed Study
- 2.4 Alternatives Considered in Detail
- 2.5 Comparison of Alternatives

A description of the project area potentially affected by the alternatives is found in Chapter 3. The potential consequences of implementing each alternative are found in Chapter 4. A comparative summary of the alternatives and their effects is presented in Section 2.5 at the end of this chapter.

2.1 ALTERNATIVE DEVELOPMENT PROCESS

Alternative development is strongly driven by public comments.

Public comments were sought on the February 1998 proposal. Comments were sought by various means including notice in the Federal Register, newspapers, the Forest’s Solicitude of Proposed Actions, by individual letters, and a field trip. A detailed summary of public involvement efforts and results is contained in Appendix B - Public Involvement of the Draft Environmental Impact Statement (DEIS).

Twenty-two letters were received in response to the Forest’s public involvement efforts. The letters were from individuals, organizations, private businesses, and natural resource management agencies. The contents of each letter were analyzed by a team of resource specialists (see Appendix B - Public Involvement of DEIS). The team of resource specialists reviewed the comments and identified issues that could help with analysis, project design, and development of alternative actions.

Notification of a Draft Environmental Impact Statement (DEIS) was printed in the Federal Register on May 7, 1999. Legal notices were published notifying the public of the availability of the DEIS and that comments were being sought (over 200 copies were mailed to interested parties). Based upon a request, the comment period to the DEIS was extended until July 21, 1999, to facilitate additional on-the-ground public review of the area. A public field trip was held on July 13, 1999, to explain and answer questions pertaining to the alternatives. 97 comment letters to the DEIS were received. The content of each letter was analyzed and responded to by a team of resource specialist (see Appendix B - Public Involvement in the Final Environmental Impact Statement - FEIS). Following field verification and review of received comments, the original proposal (February 17, 1998) was modified and is included in this document as Alternative 2. Changes have been made since the DEIS to reflect response to comments and refinement of site specific data.
2.2 ISSUE IDENTIFICATION

Issues are derived from review of the proposed action that was developed in response to the identified purpose and need. From the public comments received, fourteen 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.

One issue, relative to the proposed action, was found to be a significant issue in that it was a basis from which to develop alternatives - issue #15, Impacts to Roadless Character.

The following fifteen issues were identified. Each issue is explained by a brief statement of the concern. Key comparison elements are identified for each issue. These elements are useful in evaluating how alternatives respond to the issue and the potential effects of each alternative. The discussion of effects in Chapter 4 addresses the identified key comparison elements and other pertinent information. Additional and supporting information is maintained in the project record at the Manti-La Sal National Forest Supervisor's Office.

1. Impacts to Air Quality: Timber harvest and associated activities could have short-term effects on air quality.

   Key Comparison Elements:
   • Relationship to State air quality standards (compliance).

2. Impacts to Land Stability: The North Hom Formation in the area, loose rock material overlying the formation, and soils derived from the formation are naturally unstable. Road construction and reconstruction could reduce land stability and induce landslides. Landslides could damage resources. Reforestation could improve land stability.

   Key Comparison Elements:
   • Road construction in unstable and moderately unstable areas (miles).
   • Road reconstruction in unstable and moderately unstable areas (miles).
   • Harvest/reforestation in unstable and moderately unstable areas (acres).

3. Impacts to Soil Erosion and Productivity: Timber harvest and associated activities could compact or displace soil. Compacted and displaced soil could be subject to erosion and loss of productivity. Different log yarding methods have different soil-related effects. Road construction and reconstruction could displace soil and temporarily remove the land from resource production.

   Key Comparison Elements:
   • Bare soil by log yarding method (net acres).
   • Erosion potential of ground-based yarding areas (net acres of low and moderate erosion hazard).
   • Percent of spruce-fir stands treated which may reduce burn intensity of wildland fire.

4. Impacts to Water Resources (Water Quantity and Quality; Riparian/Wetlands; Aquatic Habitat; Aquatic Species): Timber harvest, associated activities, and road work could impact the quality of water resources. Water quality could be affected in terms of sedimentation, stream temperature, and water chemistry.

   Aquatic habitat and species are dependent on water quantity, water quality, and healthy riparian and wetland systems. Timber harvest, associated activities and

road work, and changes in water quality could affect riparian and wetland systems, and aquatic habitat.

   Key Comparison Elements:
   • Water Quality
     • Acres treated and susceptible to compaction and erosion (net acres)
     • Sediment yield per watershed from surface erosion (acre feet of sediment, "modeled")
     • Short-term effects from road construction and reconstruction across perennial streams (number crossings)
     • Long-term sediment yield from road reclamation (degree of change)

   Riparian and Wetland Systems
   • Road construction and reconstruction across perennial streams (number).

   Aquatic Habitat
   • Stream habitat impacts from sediment yields (degree of impact).

5. Impacts to Vegetation Resources (Forest Health, Diversity, and Productivity; Noxious Weeds; Sensitive Plant Species): The spruce beetle epidemic has altered the vegetative condition of the landscape. The majority of spruce trees are dead or dying from spruce beetle activity. Timber harvest could remove dead and drying spruce trees. Reforestation could facilitate reestablishment of spruce.

   Timber harvest and road work disturbs soil. Disturbed soil provides an ideal opportunity for weed seed to germinate. Vehicles, people, and animals could transport noxious weed seed that could become established.

   No threatened or endangered plant species or their habitat would be affected. Timber harvest, associated activities, and road work could affect sensitive plants or their habitat.

   Key Comparison Elements:
   • Forest Health, Species Composition, and Productivity
     • Spruce stands reforested by planting and natural (acres).
     • Spruce stands reforested by planting (acres).
     • Spruce recovery rate in beetle-infested spruce stands (years to full stocking, years to commercial age, years to pre-epidemic conditions).

   Noxious Weeds
   • Soil disturbance (acres).
   • Sensitive Plant Species
     • Carrington Daisies (impact determination).
     • Arizona Willow (impact determination).
     • Mussina Groundsel (impact determination).
     • Maguire Camption (impact determination).

6. Impacts to Fuel Loading and Fire Behavior: The majority of spruce trees are dead or dying from spruce beetle activity. When these dead trees eventually fall to the ground, they will increase the amount of dead, down fuel in stands across the landscape. The potential risk of a larger than normal wildland fire, and the associated wildland fire behavior in these spruce stands could increase. Timber harvest could remove dead and dying spruce trees, thereby reducing the amount of dead, down fuel available to a wildland fire in these stands.

   Key Comparison Elements:
   • Fuel reduction (acres harvested).
   • Rates of spread (chains/hour).
7. **Impacts to Wildlife Resources (Forest Management Indicator Species; Tree Cavity Dependent Species; Threatened, Endangered, and Sensitive Animal Species)** - Timber harvesting and road work could alter the habitat, behavior, and risk of mortality of management indicator species, tree cavity dependent species, threatened species, endangered species, and sensitive species.

Management indicator species are species identified in the Forest Plan to represent a variety of species and habitats. Effects to management indicator species, reflect anticipated effects to representative species (e.g., raptores, squirrels, chimps, hares, rabbits, bears, porcupines, badgers) and their habitats. The following terrestrial management indicator species use the project area:
- Elk, mule deer, blue grouse, and golden eagles.

The following proposed, threatened, and endangered species may be influenced by the project: Canada lynx, bald eagle, and Southwest willow flycatcher. The following Forest Service sensitive species may be influenced by the project: Peregrine falcon, spotted bat and Townsend's big-eared bat, flammulated owl, Northern goshawk, and three-toed woodpecker.

**Key Comparison Elements**

**Management Indicator Species**
- Elk and Deer: Hiding and foraging habitat (acres).
- Elk and Deer: Vulnerability and use of available habitat (road density).
- Blue Grouse: Wintering habitat, Douglas-fir stands affected (acres).
- Golden Eagles: Prey base (availability)

**Tree Cavity Dependent Species**
- Snag habitat affected (acres).

**Proposed, Threatened, and Endangered Species**
- Canada Lynx - Threatened (effect determination).
- Bald Eagle - Threatened (effect determination).
- Southwest Willow Flycatcher - Endangered (effect determination).

**Sensitive Species**
- Peregrine Falcon (impact determination).
- Spotted bat and Townsend's big-eared bat (impact determination).
- Flammulated Owl (impact determination).
- Northern Goshawk (impact determination).
- Three-toed Woodpecker (impact determination).

8. **Impacts to Transportation System, Access, Visitor Safety, and Travel Delays**

Road work affects the transportation system and access opportunities. Road work and hauling timber on publicly used roads could impact Forest users in terms of safety and travel times. Project-related traffic could conflict with recreational traffic.

**Key Comparison Elements**

**Transportation System and Access**
- Forest Development Road construction and reconstruction (miles).
- Reclamation of Forest Development Roads, and non-system roads/trails (miles).
- Post-project Forest Development Road to road and motorized trail access (miles).
- Post-project Forest Development Road and motorized trail density (miles per square mile).

**User Safety and Travel Delays**
- Traffic mix conflicts (summer and winter logging traffic vehicles/day).
- Delays in travel from logging traffic and associated road work (extent).

9. **Impacts to Range Allotments and Improvements** - Timber harvest, associated activities, and road work could affect the operation of range allotments and existing range improvements, such as springs and fences.

**Key Comparison Elements**
- Suitable rangeland restricted for timber regeneration (acres).
- Livestock restrictions (duration of restriction).

10. **Impacts to Visual Landscape** - The spruce trees, averaging about 70 percent of the mixed-conifer forest visual landscape, have been infested by spruce beetles. These beetles have killed the majority of the spruce trees. As the spruce trees die, the foliage appearance changes from green to red to yellowish-green. As the yellowish-green needles drop from the tree, only the grey background of dead branches remain. Timber harvest would remove some of these dead trees. Timber harvest and road work could further alter the visual landscape and affect visitors' experiences as seen from roadways, dispersed and developed recreation areas, campgrounds, lakes, and reservoirs.

**Key Comparison Elements**
- Post-activity visual quality condition (relationship to visual quality objective).

11. **Impacts to Undeveloped Character** - Timber harvest, associated activities, and road work could impact the undeveloped character of the landscape.

**Key Comparison Elements**
- Scenic condition (landscape alteration, relationship to visual quality objective).
- Recreation experience (change to recreation opportunity spectrum).
- Direct impacts to contiguous unroaded areas (net harvest acres)

12. **Impacts to Cultural Resources** - Timber harvest and associated activities could affect cultural resources.

**Key Comparison Elements**
- Potential to affect paleontological/cultural resources (treatment acres).
- Expected prehistoric sites within unsurveyed harvest units (number).
- Effect to prehistoric sites (effect determination).
- Effect to historic sites (effect determination).
- Known sites eligible for National Register of Historic Places (number).

13. **Impacts to Economics** - Timber harvesting and associated activities may affect the economies of local communities and contribute to the National treasury.

**Key Comparison Elements**
- Projected employment (number of jobs, created income).
- Payment in lieu of taxes to Counties (dollars).
- Economic efficiency (present net value, benefit/cost ratio).

14. **Impacts to Energy** - Timber harvest and associated activities consume fuel.

**Key Comparison Elements**
- Fuel consumption and output (Millions of British thermal units).
15. **Impacts to Roadless Character** - Timber harvest, associated activities, and road work could impact inventoried roadless areas (RARE II and Forest Plan) and their roadless characteristics.

**Key Comparison Elements:**
- Direct impacts to inventoried roadless areas (net harvest acres, road construction).

**Significant Issue**

Most issues are resolved through incorporation of laws, regulations, policy, or specific design features. Issue #15 represents a concern resulting from the proposed action that is not so readily resolved. Correspondingly, it is referred to as a significant issue that is used to develop alternatives for potential resolution of the concern. This significant issue was used by the team of resource specialists to develop alternatives to the proposed action.

### 2.3 ALTERNATIVES CONSIDERED BUT NOT GIVEN DETAILED STUDY

Several alternatives to the proposed action were identified, considered, and eliminated from detailed study for various reasons. These alternatives are summarized below along with an explanation of why they were not given further detailed study.

- Harvesting areas of spruce trees beyond those presented in the proposed action were not given detailed study because field review raised logging feasibility and economics concerns, as well as additional resource concerns.
- Road construction, permanent and temporary, in RARE II inventoried roadless areas was not given detailed study because of current social values and the ability to meet the project’s purpose and need without additional road.
Alternative 2 Development

Following field verification and review of received comments, the original proposal (February 17, 1998) was modified and is included in this document as Alternative 2. Changes have been made since the DEIS to reflect response to comments and refinement of site specific data. Alternative 2 meets the intent of the original proposal and includes the following:

Relationship to Significant Issue

Alternative 2 is not responsive to Issue #15 (Impacts to Roadless Character), as it allows road construction, reconstruction, and maintenance into inventoried roadless areas, and it also allows tractor and mechanical site preparation for fuel reduction and planting in these same inventoried roadless areas.

Commercial Treatment Activities

Figure 2-5, Alternative 2 Map, on page 2-23, displays the key components of this alternative. Figure 2-1, on page 2-14, summarizes key features of this alternative. Additional alternative information is in Appendix E: Unit Information, and Appendix F - Road Information.

Commercial Treatment Acreage: Alternative 2 would salvage harvest dead and dying spruce trees across approximately 6,349 treatment acres. Past experience indicates that 50 to 65 percent of the treatment area is likely to be harvested (3,174 to 4,127 acres). The actual harvest acreage is less than the treatment area because of stand and site conditions (e.g., areas of non-spruce tree species, natural openings, meadows, rock outcrops), resource protection (riparian areas, steep slopes, unstable ground), and economic feasibility.

Location of Commercial Treatment:

RARE II Inventoried Roadless Areas

Harvest would occur in three RARE II inventoried roadless areas as follows: Black Mountain, Teton, and White Mountain. This is reflected by treatment in areas B4, D4/5, G1, and G2.

Forest Plan Inventoried Roadless Areas

Harvest would occur in the Heliotrope Forest Plan inventoried roadless area. This is reflected by treatment in areas E1, E2, E3, and E4.

Type of Commercial Treatment: All tree removal would be by a selective salvage harvest of dead and dying spruce trees. Felled timber would be yarded from within the unit to landing areas by various yarding methods: ground-based (437-568 acres), cable/helicopter option (42-54 acres), and helicopter (2,896-3,505 acres).

Conventional ground-based yarding systems such as tractor or rubber-tired skidders would be used on accessible slopes less than 40 percent. On slopes greater than 40 percent where access is not a problem, yarding would be optional by either cable or helicopter. On the remaining area where slopes are greater than 40 percent and/or access is not readily available, helicopter yarding would be used.

Ground-based yarding would apply to units: A11, B4, D3, E1, E2, E3, F1, F3, G1, G4, and G6.

Optional cable/helicopter yarding would apply to units: A3, C7, and parts of G6.

Helicopter yarding would apply to units: A1, A6, A7/B, A9, C11/2, C3, C4, C6, C8, D1, D2, D3, D4/5, E1, E2, E3, E4, F1, F3, G1, G2, G3, G4, and G5.

By-Product Recovery: With an estimated by-product recovery of 10 thousand board feet (MBF) per acre, approximately 32 to 41 million board feet (MMBF) of timber could be recovered. Actual recovered volume may vary depending upon stand and market conditions at the time of implementation.

Timing: This alternative could take approximately 6-8 calendar years to implement the removal of included timber through multiple timber sales. The normal operating season would be July 1st to October 1st.

Associated fuel reduction and initial reforestation activities (scarification and planting) would be completed within 1 to 2 years after harvest operations.

Transportation System

Road use would be required for project activities such as harvest implementation, post-harvest activities, reforestation, monitoring, fuel management, and fuelwood management.

The following road work has been identified as part of this alternative: Forest Development Road construction (1.1 mile); Forest Development Road reconstruction (11.0 miles); Forest Development Roads to be reclaimed (4.1 miles); nonsystem trails and roads to be reclaimed (19.3 miles). Road and trail reclamation would occur as funds become available.

RARE II Inventoried Roadless Areas

No permanent or temporary road work would occur in RARE II inventoried roadless areas.

Forest Plan Inventoried Roadless Areas

Activity proposed in a roaded portion of the Heliotrope Forest Plan inventoried roadless area: road construction (Forest Development Road (1.1 mile); road reconstruction (Forest Development Roads #52070 (0.1 miles) and #520285 (0.2 miles); pre-haul maintenance #52070 (0.2 miles). Note, part of road #52070 is not in the roadless area, but would receive reconstruction and pre-haul maintenance.

After full implementation of the project, and nonsystem trails and roads have been reclaimed, Forest Development Road, nonsystem trails and roads, and motorized trail density would decrease from 2.4 miles of road/trails per square mile to 1.8 miles of road/trails per square mile. Approximately 70 miles of roads and trails would remain open to motorized use. No existing system motorized trails would be closed.

Aggregate for road work and maintenance would be obtained from one of two sites (South Camel, Baseball Flat) or from off-Forest sources.

Post-Harvest Activities

Treat harvest generated and existing fuels through various methods as follows: whole tree yard tractor yarding units on an estimated 437-568 acres; top and scatter 2,896-3,505 acres of the helicopter yarding units; and jackpot burn 10% of the helicopter yarding units (270-351 acres).
Planting Engelmann Spruce on 551-716 acres, mechanical scarification for site preparation on 426-554 acres, and naturally reforest 918-1,198 acres. Gopher control for reforestation protection may take place on 606-788 acres. Permitted livestock would be managed to protect reforestation from unacceptable damage.

Current management in the area would continue, including removal of fuelwood using system roads.

**Alternative 3 - Relationship to Purpose and Need**

Alternative 3 addresses the identified purpose and need by reducing the fuel loading across 6,349 acres, facilitating rapid reestablishment of spruce trees through planting harvested areas within Timber Management Emphasis Units identified in the Forest Plan, and recovering some economic value of the dead and dying trees (32 to 41 MMBF).

**Alternative 3 Development**

Changes have been made since the DEIS to reflect response to comments and refinement of site specific data.

**Relationship to Significant Issues**

Alternative 3 is moderately responsive to Issue #15 (Impacts to Roadless Character) by: 1) not allowing road construction or temporary roads in inventoried roadless areas; 2) allowing only helicopter yarding in inventoried roadless areas, and; 3) not allowing mechanical fuels reduction or mechanical scarification for site preparation in inventoried roadless areas.

**Commercial Treatment Activities**

Figure 2-6, Alternative 3 Map on page 2-25, displays the key components of this alternative. Figure 2-1, on page 2-14, summarizes key features of this alternative. Additional alternative information is in Appendix E: Unit Information, and Appendix F: Road Information.

**Location of Commercial Treatment:**

RARE II Inventoried Roadless Areas
Harvest would occur in three RARE II inventoried roadless areas as follows: Black Mountain, Twelve Mile, and White Mountain. This is reflected by treatment in areas B4, C4/5, G1, and G2.

Forest Plan Inventoried Roadless Areas
Harvest would occur in the Heliotrope Forest Plan inventoried roadless area. This is reflected by treatment in areas E1, E2, E3, and E4. Road reconstruction and pre-haul maintenance would take place in the Heliotrope inventoried roadless area.

**Commercial Treatment Acreage:** Alternative 3 would salvage harvest dead and dying spruce trees across the same 6,349 acres as Alternative 2. Past experience indicates that 50 to 65 percent of the treatment area is likely to be harvested (3,174 to 4,127 acres). The actual harvest acreage is less than the treatment area for the same reasons as Alternative 2.

**Location of Commercial Treatment:** The location of treatment areas are the same as for Alternative 2, both outside of and within inventoried roadless areas.
Alternative 4 - Relationship to Purpose and Need

Alternative 4 addresses the identified purpose and need by reducing the fuel loading across 3,823 acres, facilitating rapid reestablishment of spruce trees through planting harvested areas within Timber Management Emphasis Units identified in the Forest Plan, and recovering some economic value of the dead and dying trees (19 to 25 MBF).

Alternative 4 Development

Changes have been made since the DEIS to reflect response to comments and refinement of site specific data.

Relationship to Significant Issue

Alternative 4 is responsive to Issue #15 (Impacts to Roadless Character) by not allowing timber harvest and road construction in inventoried roadless areas - RARE II and Forest Plan. Timber harvest and associated activities (e.g. road construction/reconstruction, mechanical site preparation) within inventoried roadless areas are not a part of this alternative.

Commercial Treatment Activities

Figure 2-7, Alternative 4 Map on page 2-27 displays the key components of this alternative. Figure 2-1, on page 2-14, summarizes key features of this alternative. Additional alternative information is in Appendix E - Unit Information, and Appendix F - Road Information.

Commercial Treatment Acreage: Alternative 4 would salvage harvest dead and dying spruce trees across approximately 3,823 treatment acres. Past experience indicates that 50 to 65 percent of the treatment area is likely to be harvested (1,912 to 2,485). The actual harvest acreage is less than the treatment area for the same reasons as Alternative 2.

Location of Commercial Treatment: The location of treatment areas are the same as for Alternative 2, except that no harvest would occur within inventoried roadless areas.

Type of Commercial Treatment: Like Alternative 2, all tree removal would be by a selective salvage harvest of dead and dying spruce trees. Felled timber would be yarded from within the unit to landing areas by various yarding methods: ground-based (230-399 acres), cable/helicopter option (42-54 acres), and helicopter (1,839-2,131 acres).

Ground-based yarding would apply to units: A11, D3, E2, F1, F3, G4, and G6.

Optional cable/helicopter yarding would apply to units: A3, C7, and parts of G6.

Helicopter yarding would apply to units: A1, A6, A7/8, A9, C1/2, C3, C4, C6, C8, C9, D1, D2, D3, D4/5, E1, E2, F1, F3, G3, G4, and G5.

By-Product Recovery: With an estimated by-product recovery of 10 thousand board feet (MBF) per acre, approximately 19 to 25 million board feet (MBF) of timber could be recovered. Actual recovered volume may vary depending upon stand and market conditions at the time of implementation.

Timings: This alternative could take approximately 5-7 calendar years to implement the removal of included timber through multiple timber sales. The normal operating season would be July 1st to October 15th. Associated fuel reduction and initial reforestation activities (scarification and planting) would be completed within 1 to 2 years after harvest operations.

Transportation System

Alternative 4: Reconstruction activity would take place on 9.2 miles of Forest Development roads. No road reconstruction or maintenance associated with timber harvest would occur within inventoried roadless areas. No reconstruction would occur on Forest Development Road #50150 above Emerald Lake.

After full implementation of the project, and non-system trails and roads have been reclaimed, Forest Development Road, non-system trails and roads, and motorized trail density would decrease from 2.4 miles of road/trails per square mile to 1.8 miles of road/trails per square mile. Approximately 70 miles of roads and trails would remain open to motorized use. No existing system motorized trails would be closed.

Aggregate for road work and maintenance would be obtained from one of two sites (South Camel, Baseball Flat) or from off-Forest sources.

Post-Harvest Activities

Treat harvest generated and existing fuels through various methods as follows: whole tree yard tractor yarding units on an estimated 230-299 acres; top and scatter 1,839-2,131 acres of the helicopter yarding units; and jackpot burn 10% of the helicopter yarding units (164-213 acres).

Planting Engelmann Spruce on 332-431 acres, mechanical scarification for site preparation on 252-334 acres, and naturally reforested 553-719 acres. Gopher control for reforestation protection may take place on 385-474 acres. Permitted livestock would be managed to protect reforestation from unacceptable damage.
Figure 2-1 Alternative Summary.

<table>
<thead>
<tr>
<th>Description</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>Alternative 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment Area (gross acres)</td>
<td>0</td>
<td>6,349</td>
<td>6,349</td>
<td>3,823</td>
</tr>
<tr>
<td>Treatment Area Harvested (net acres)</td>
<td>0</td>
<td>3,174 to 4,127</td>
<td>3,174 to 4,127</td>
<td>1,912 to 2,485</td>
</tr>
<tr>
<td>Treatment Area Harvested by Log Yarding Method:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ground-based (net acres)</td>
<td>0</td>
<td>437 to 568</td>
<td>230 to 299</td>
<td>230 to 299</td>
</tr>
<tr>
<td>Cable/ho1icopter (net acres)</td>
<td>0</td>
<td>42 to 54</td>
<td>42 to 54</td>
<td>42 to 54</td>
</tr>
<tr>
<td>Helicopter (net acres)</td>
<td>2,696 to 3,505</td>
<td>2,903 to 3,773</td>
<td>1,629 to 2,311</td>
<td></td>
</tr>
<tr>
<td>By-Product Recovery (by Yarding Method):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timber Recovered by Ground-based Yarding (MMBF)</td>
<td>0</td>
<td>4.4 to 5.7</td>
<td>2.3 to 3.0</td>
<td>2.3 to 3.0</td>
</tr>
<tr>
<td>Timber Recovered by Cable/Helicopter Yarding (MMBF)</td>
<td>0</td>
<td>0.4 to 0.5</td>
<td>0.4 to 0.5</td>
<td>0.4 to 0.5</td>
</tr>
<tr>
<td>Timber Recovered by Helicopter (MMBF)</td>
<td>27.0 to 35.0</td>
<td>29.0 to 37.7</td>
<td>18.4 to 21.3</td>
<td></td>
</tr>
<tr>
<td>Roads: FDR 4 Construction (miles)</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>FDR Reconstruction (miles)</td>
<td>0</td>
<td>11.0</td>
<td>10.8</td>
<td>9.2</td>
</tr>
<tr>
<td>Temporary Construction followed by Reclamation (miles)</td>
<td>0</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>FDR Reclamation (miles)</td>
<td>0</td>
<td>4.1</td>
<td>4.1</td>
<td>3.8</td>
</tr>
<tr>
<td>Non-system Road and Motorized Trail Reclamation (miles)</td>
<td>0</td>
<td>19.3</td>
<td>19.3</td>
<td>19.3</td>
</tr>
<tr>
<td>Post-project Road and Motorized Trails 5 (miles)</td>
<td>94</td>
<td>70</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Post-project Road and Motorized Trail Density 6 (miles/miles²)</td>
<td>2.4</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
</tr>
<tr>
<td>Retorestation:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Artificial Retorestation - Planting (net acres)</td>
<td>0</td>
<td>551 to 716</td>
<td>720 to 906</td>
<td>332 to 431</td>
</tr>
<tr>
<td>Natural Retorestation (net acres)</td>
<td>0</td>
<td>818 to 1,193</td>
<td>749 to 973</td>
<td>553 to 719</td>
</tr>
<tr>
<td>Retracement for Natural or Artificial Ref. (net acres)</td>
<td>0</td>
<td>426 to 554</td>
<td>257 to 334</td>
<td>75 to 234</td>
</tr>
<tr>
<td>Retracement Protection - Gopher Control (net acres)</td>
<td>0</td>
<td>806 to 1,788</td>
<td>792 to 1,030</td>
<td>365 to 474</td>
</tr>
</tbody>
</table>

1. Key components expected over 5 to 8 years if an alternative is fully implemented.
2. Approximately 50 to 65 percent of the treatment area is likely to be harvested.
3. Based on estimated timber-by-product recovery of 10 MMBF per harvest acre.
4. FDR is the abbreviation for "Forest Development Road", also referred to as a system road. Maintenance level 1 after post sale activities.
5. Includes FDR, non-system trails and roads, and motorized trails.

2.5 COMPARISON OF ALTERNATIVES

Comparison by Propose and Need

The following Figure 2-2 Comparison of Alternatives by Purpose and Need summaries the relationship of each alternative to the identified purpose and need. The values presented in Figure 2-2, does not represent all the facets of the alternatives considered. For a comprehensive understanding of the alternatives, refer to Chapter 4.

Figure 2-2 Comparison of Alternatives by Purpose and Need

<table>
<thead>
<tr>
<th>Purpose and Need</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>Alternative 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 Reduced Potential for Large/Intense Wildfires</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Fuel Reduction - Acres Harvested</td>
<td>0</td>
<td>3,174 to 4,127</td>
<td>3,174 to 4,127</td>
<td>1,912 to 2,485</td>
</tr>
<tr>
<td>- Rate of Spread Year 2000-Helicopter/Cable (ChV) ²</td>
<td>5.6 / 1.6</td>
<td>5.6 / 1.6</td>
<td>5.6 / 1.6</td>
<td>5.6 / 1.6</td>
</tr>
<tr>
<td>- Rate of Spread Year 2000-Ground Based (ChV)²</td>
<td>1.1 / 1.1</td>
<td>2.0 / 2.0</td>
<td>2.0 / 2.0</td>
<td>2.0 / 2.0</td>
</tr>
<tr>
<td>- Rate of Spread Year 2015-Harvested Acres (ChV)²</td>
<td>Low-High</td>
<td>Low-High</td>
<td>Low-High</td>
<td>Low-High</td>
</tr>
<tr>
<td>- Potential for IA² Escape Year 2000-Helicopter/Cable</td>
<td>Low-High</td>
<td>Low-High</td>
<td>Low-High</td>
<td>Low-High</td>
</tr>
<tr>
<td>- Potential for IA² Escape Year 2000-Ground Based</td>
<td>Low-High</td>
<td>Low-High</td>
<td>Low-High</td>
<td>Low-High</td>
</tr>
<tr>
<td>- Potential for IA² Escape Year 2015-Harvested Acres</td>
<td>Low-High</td>
<td>Low-High</td>
<td>Low-High</td>
<td>Low-High</td>
</tr>
<tr>
<td>#2 Rapid Sprout Reseeds Establishment by Planting in Timber Mgmt, Emphasis Units (TBR)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Years to Stocking ² of Sprouts without Planting</td>
<td>30 to 90</td>
<td>30 to 90</td>
<td>30 to 90</td>
<td>30 to 90</td>
</tr>
<tr>
<td>- Years to Stocking ² of Sprouts with Planting</td>
<td>30 to 90</td>
<td>30 to 90</td>
<td>30 to 90</td>
<td>30 to 90</td>
</tr>
<tr>
<td>- Acres Plant ² in TBR Areas Treated</td>
<td>100 to 200</td>
<td>100 to 200</td>
<td>100 to 200</td>
<td>100 to 200</td>
</tr>
<tr>
<td>- Years to Pre-epidemic Average Stand Production Levels ² without Planting</td>
<td>N/A</td>
<td>30 to 40</td>
<td>30 to 40</td>
<td>30 to 40</td>
</tr>
<tr>
<td>- Years to Pre-epidemic Average Stand Production Levels ² with Planting</td>
<td>N/A</td>
<td>30 to 40</td>
<td>30 to 40</td>
<td>30 to 40</td>
</tr>
<tr>
<td>#3 Economic Recovery of Dead and Dying Trees</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Timber By-Product Recovered (MMBF)</td>
<td>0</td>
<td>32 to 41</td>
<td>32 to 41</td>
<td>19 to 25</td>
</tr>
<tr>
<td>- Expected Revenue from Timber By-Product</td>
<td>$800,000</td>
<td>$800,000</td>
<td>$475,000</td>
<td></td>
</tr>
<tr>
<td>- Twenty-five Percent Sale Revenues to Counties (PILT)²</td>
<td>$200,000</td>
<td>$200,000</td>
<td>$119,000</td>
<td></td>
</tr>
<tr>
<td>- Years to Commercial Age ² without Planting</td>
<td>80 to 140</td>
<td>80 to 140</td>
<td>80 to 140</td>
<td>80 to 140</td>
</tr>
<tr>
<td>- Years to Commercial Age ² with Planting</td>
<td>80 to 140</td>
<td>80 to 140</td>
<td>80 to 140</td>
<td>80 to 140</td>
</tr>
</tbody>
</table>

1. Chains/Hours (Chain = 66 feet).
2. IA - Initial Attack.
3. Assumes stocking exists when at least 70% of the...suitable for tree growth has a minimum of 150 TPA.
4. Planting needs were identified through inventory data and modelling.
5. Further information is located in the project file, Chapter 7 of the 1998 EA.
6. PILT - Payment In Lieu of Taxes.
7. To be considered commercial, the average stand diameter would have to be at least 8 to 10 inches at breast height.
Comparison by Issues

The following Figure 2-3 Comparison of Alternatives by Issue summarizes values associated with the issue key comparison elements for the alternatives considered in detail. For a full understanding of what the issue comparison element values mean, refer to Chapter 4.

The values presented in Figure 2-3 Comparison of Alternatives by Issue are in reference to effects resulting from or associated with the alternatives considered in detail. The values presented in Figure 2-3 do not present externally-generated potential cumulative effects, such as those that might occur from a wildland fire across the landscape.

<table>
<thead>
<tr>
<th>ISSUE #1 - AIR QUALITY</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>Alternative 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relationship to State requirements (compliance)</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>ISSUE #2 - LAND STABILITY</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road construction in unstable and moderately unstable areas (miles)</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Road reconstruction in unstable and moderately unstable areas (miles)</td>
<td>0</td>
<td>10</td>
<td>10</td>
<td>9.0</td>
</tr>
<tr>
<td>Harvest/reforestation in unstable and moderately unstable areas (acres)</td>
<td>0</td>
<td>1,469-1,909</td>
<td>1,469-1,909</td>
<td>885-1,150</td>
</tr>
<tr>
<td>ISSUE #3 - SOIL EROSION AND PRODUCTIVITY</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bare soil from helicopter yarding (acres helicopter landings)</td>
<td>0</td>
<td>29</td>
<td>27</td>
<td>22</td>
</tr>
<tr>
<td>Bare soil from ground-based yarding (net acres)</td>
<td>0</td>
<td>114</td>
<td>80</td>
<td>60</td>
</tr>
<tr>
<td>Ground-based yarding in areas of low erosion potential (net acres)</td>
<td>0</td>
<td>173</td>
<td>116</td>
<td>116</td>
</tr>
<tr>
<td>Ground-based yarding in areas of moderate erosion potential (net acres)</td>
<td>0</td>
<td>395</td>
<td>184</td>
<td>184</td>
</tr>
<tr>
<td>Percent of Sppce-Plus stands treated, (past and proposed) which may reduce</td>
<td>21%</td>
<td>49.5%</td>
<td>49.5%</td>
<td>38-43%</td>
</tr>
<tr>
<td>Burn intensity from wildland fire</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISSUE #4 - WATER RESOURCES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Quality:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acres treated and susceptible to compaction &amp; erosion (acres)</td>
<td>0</td>
<td>437</td>
<td>568</td>
<td>230-299</td>
</tr>
<tr>
<td>Sediment yield per Watershed from surface erosion (acres feet, &quot;modeled&quot;)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Twelvemile Creek Watershed</td>
<td>3.87</td>
<td>3.86</td>
<td>3.86</td>
<td>3.86</td>
</tr>
<tr>
<td>Upper Ferron Creek Watershed</td>
<td>4.29</td>
<td>4.31</td>
<td>4.31</td>
<td>4.31</td>
</tr>
<tr>
<td>Lower Indian Creek Watershed</td>
<td>10.98</td>
<td>11.04</td>
<td>11.01</td>
<td>10.99</td>
</tr>
<tr>
<td>South Fork of Muddy Creek Watershed</td>
<td>3.73</td>
<td>3.69</td>
<td>3.69</td>
<td>3.69</td>
</tr>
<tr>
<td>Muddy Creek Watershed</td>
<td>9.69</td>
<td>9.68</td>
<td>9.68</td>
<td>9.68</td>
</tr>
<tr>
<td>Short term effects from road stream crossings constructed/reconstructed (ft)</td>
<td>0</td>
<td>10</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Long term sediment yield from road realignment/reconstruction (degree of change)</td>
<td>none</td>
<td>decrease</td>
<td>decrease</td>
<td>decrease</td>
</tr>
<tr>
<td>Riparian and Wetland Systems:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road construction/reconstruction across perennial streams (number)</td>
<td>0</td>
<td>10</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Aquatic Habitat:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stream habitat impacts from sediment yields (degree of impact)</td>
<td>least</td>
<td>greatest</td>
<td>2nd greatest</td>
<td>3rd greatest</td>
</tr>
<tr>
<td>ISSUE #5 - VEGETATION RESOURCES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forest Health, Species Composition, and Productivity:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spruce stands reforested by planting/natural (acres)</td>
<td>0</td>
<td>1,469-1,909</td>
<td>1,469-1,909</td>
<td>885-1,150</td>
</tr>
<tr>
<td>Spruce stands harvested and reforested by planting (acres)</td>
<td>0</td>
<td>551-716</td>
<td>720-936</td>
<td>332-431</td>
</tr>
<tr>
<td>Spruce recovery rate without planting (years to full stocking)</td>
<td>30 to 90</td>
<td>30 to 90</td>
<td>30 to 90</td>
<td>30 to 90</td>
</tr>
<tr>
<td>Spruce recovery rate with planting (years to full stocking)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Spruce recovery without planting (years to pre-epidemic condition)</td>
<td>100 to 200</td>
<td>150 to 200</td>
<td>100 to 200</td>
<td>100 to 200</td>
</tr>
<tr>
<td>Spruce recovery rate with planting (years to pre-epidemic condition)</td>
<td>N/A</td>
<td>30 to 40</td>
<td>30 to 40</td>
<td>30 to 40</td>
</tr>
<tr>
<td>Spruce recovery rate without planting (years to commercial age)</td>
<td>80 to 140</td>
<td>80 to 140</td>
<td>80 to 140</td>
<td>80 to 140</td>
</tr>
<tr>
<td>Spruce recovery rate with planting (years to commercial age)</td>
<td>N/A</td>
<td>70 to 100</td>
<td>70 to 100</td>
<td>70 to 120</td>
</tr>
<tr>
<td>Noxious Weeds:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil disturbance (acres)</td>
<td>0</td>
<td>143</td>
<td>87</td>
<td>82</td>
</tr>
</tbody>
</table>

1. Adequate stocking exists when at least 70% of the stand suitable for tree growth has a minimum of 150 TPA for low productivity to 195.
2. To be considered commercial, average stand diameter would have to be at least 8 to 10 inches in diameter at breast height.
Figure 2-3 Comparison of Alternatives by Issue (cont.)

<table>
<thead>
<tr>
<th>ISSUE</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>Alternative 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISSUE #5 - VEGETATION RESOURCES (continued)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitive Plant Species:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carrington Daisies (impact determination)</td>
<td>no impact</td>
<td>no impact</td>
<td>no impact</td>
<td>no impact</td>
</tr>
<tr>
<td>Arizona Willow (impact determination)</td>
<td>no impact</td>
<td>no impact</td>
<td>no impact</td>
<td>no impact</td>
</tr>
<tr>
<td>Muskeg Groundsel (impact determination)</td>
<td>may impact A</td>
<td>may impact B</td>
<td>may impact C</td>
<td>may impact D</td>
</tr>
<tr>
<td>Maguire Campan (impact determination)</td>
<td>may impact A</td>
<td>may impact A</td>
<td>may impact A</td>
<td>may impact A</td>
</tr>
<tr>
<td>ISSUES #6 - FUEL LOADING AND POTENTIAL FOR ESCAPE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rate of Spread Year 2000 - Helicopter (ft/hr)</td>
<td>1.6</td>
<td>5.6</td>
<td>5.6</td>
<td>5.6</td>
</tr>
<tr>
<td>Rate of Spread Year 2000 - Ground-Based (ft/hr)</td>
<td>1.6</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Rate of Spread Year 2075 - Harvested Acres (ft/hr)</td>
<td>8</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Potential for A Escape Year 2000 - Helicopter (ft/hr)</td>
<td>Low-High</td>
<td>Mod-High</td>
<td>Mod-High</td>
<td>Mod-High</td>
</tr>
<tr>
<td>Potential for A Escape Year 2000 - Ground-Based (ft/hr)</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>ISSUES #7 - WILDFIRE RESOURCES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management Indicator Species:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elk and deer habitat (acres)</td>
<td>12,652</td>
<td>8,852</td>
<td>8,852</td>
<td>10,852</td>
</tr>
<tr>
<td>foresting habitat (acres)</td>
<td>13,179</td>
<td>11,217</td>
<td>12,171</td>
<td>15,959</td>
</tr>
<tr>
<td>vulnerability (road density: miles/square mile)</td>
<td>2.4</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
</tr>
<tr>
<td>Blue Grouse (winning habitat of Douglas-fir trees affected (acres))</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Golden Eagle (prey base availability)</td>
<td>no change</td>
<td>no change</td>
<td>no change</td>
<td>no change</td>
</tr>
<tr>
<td>Tree Cavity Dependent Species:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snag habitat affected (acres)</td>
<td>3,174 to 4,127</td>
<td>3,174 to 4,127</td>
<td>912 to 2,485</td>
<td></td>
</tr>
<tr>
<td>Threatened and Endangered Species:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Species Endangered (threatened effect determination)</td>
<td>no effect</td>
<td>may affect A</td>
<td>may affect A</td>
<td>may affect A</td>
</tr>
<tr>
<td>Bath Eagle - Threatened (effect determination)</td>
<td>no effect</td>
<td>may affect B</td>
<td>may affect B</td>
<td>may affect B</td>
</tr>
<tr>
<td>Southwest Willow Flycatcher - Endangered (effect determination)</td>
<td>no effect</td>
<td>no effect</td>
<td>no effect</td>
<td>no effect</td>
</tr>
<tr>
<td>Sensitive Species:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parmae Fallow (potential impact)</td>
<td>no impact</td>
<td>no impact</td>
<td>no impact</td>
<td>no impact</td>
</tr>
<tr>
<td>Goosack (impact determination)</td>
<td>no impact</td>
<td>no impact</td>
<td>no impact</td>
<td>no impact</td>
</tr>
<tr>
<td>Fumigated Owl (impact determination)</td>
<td>no impact</td>
<td>no impact</td>
<td>no impact</td>
<td>no impact</td>
</tr>
<tr>
<td>Swainson's Hawk (impact determination)</td>
<td>no impact</td>
<td>no impact</td>
<td>no impact</td>
<td>no impact</td>
</tr>
<tr>
<td>Spotted and Townsend's Big-eared (impact determination)</td>
<td>no impact</td>
<td>no impact</td>
<td>no impact</td>
<td>no impact</td>
</tr>
</tbody>
</table>

3. May impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species. Impact determination based on planned project use of existing South Canyon timber source or ongoing Forest of stockpile at North Canyon pit.
5. Initial Attack.
6. May potentially affect individuals or habitat, but is not likely to adversely affect the species or its habitat. Effect determination based on increased human activities, changes to winter habitat, and reforestation.
7. May affect individuals or habitat, but is not likely to adversely affect the species or its habitat. Effect determination based on possible disturbance to hibernating animals.
8. May affect individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species. Impact determination based on potential indirect effect to prey and activities within nesting habitat.
9. May impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species. Impact determination based on possible avoidance of the area by species which represent critical wildlife and/or sources for food production.
10. May impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species. Impact determination based on species which represent critical wildlife and/or sources for food production.
11. May affect individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species. Impact determination based on potential indirect effect to prey and activities within nesting habitat.
12. May impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species. Impact determination based on potential indirect effect to prey and activities within nesting habitat.
13. Conversion to level 1 maintenance after project use refers to same FDR as proposed for construction.
Alternative 1

LEGEND:

- Open system road
- Open system trail
- Closed system road, level 1 maintenance
- System road to be reclaimed by another project
- Non-system road
- Inventoried Roadless Area
- 1996 South Manti Timber Salvage Sales
- 1993 Twelvemile Timber Sales
- 1992 Timber Canyon Timber Sales
- Project Boundary

SCALE
1:100000

1 0 1 Miles

Alternative 2

LEGEND:

- Gravel Pit: S South Camel, B Baseball Flat
- Helicopter Landing Areas
- Road Reconstruction
- Road Construction
- Open system road
- System road to be reclaimed: 50025, 52333, 52346, 50024, 51278
- System road to be closed after use by the project, level 1
- Inventoried Roadless Areas
- Cable/Helicopter Yarding
- Helicopter Yarding
- Tractor Yarding
- Project Boundary

SCALE
1:100000

1 0 1 Miles
CHAPTER 3 - AFFECTED ENVIRONMENT

3.0 INTRODUCTION

This chapter describes the existing environmental conditions of the project area that may or may not be affected by the implementation of the alternatives considered in detail described in Chapter 2. Relevant direction, from the Manti-La Sal National Forest Land and Resources Management Plan, as amended (Forest Plan), and applicable laws/regulations are also discussed in this chapter. For each resource issue, the geographic scope of potential effects is presented followed by a brief description of the existing conditions. Unless otherwise specified, the geographic scope is the project area.

This chapter is divided into the following sections:

- 3.0 Introduction
- 3.1 Setting
- 3.2 Air Quality
- 3.3 Land Stability
- 3.4 Soils
- 3.5 Water Resources
- 3.6 Vegetation Resource
- 3.7 Fuels/Fire
- 3.8 Wildlife Resources
- 3.9 Transportation
- 3.10 Range Allotments And Improvements
- 3.11 Visual Landscape
- 3.12 Undeveloped Character
- 3.13 Cultural Resources
- 3.14 Economics
- 3.15 Energy
- 3.16 Roadless Character

The information presented in this chapter provides a comprehensive frame of reference for the potential effects disclosed in Chapter 4.

Reports and material in the project record, maintained at the Manti-La Sal National Forest Supervisor’s Office, was used to develop the following description of the affected environment. The project record contains more information than presented in this chapter.

Forest Plan Management Direction

This project tiers to the direction of the Forest Plan and Record of Decision and incorporates by reference the analysis disclosed in its environmental impact statement.

Forestwide Goals and Direction

Forestwide direction is presented in the Appendix C: Forest Plan Direction. This direction applies to all areas across the Forest.

Management Unit Goals and Direction

The Forest is divided into fifteen different management units. Six different management units exist within the project area. Figure 3-1 Forest Plan Management Units, describes the different management units within the project area. Figure 3-2 Forest Plan Management Unit Map, shows where the management units are located within the project area.
The direction for each management unit supplements and may amend Forestwide direction. The direction applicable to the management units in the project area is presented in Appendix C - Forest Plan Direction.

**Figure 3-1 Forest Plan Management Units**

<table>
<thead>
<tr>
<th>Forest Plan Management Unit</th>
<th>Area</th>
<th>% Project Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range Forage Production Management Unit (RNG)</td>
<td>18,524</td>
<td>77%</td>
</tr>
<tr>
<td>Wood Fiber Production and Utilization (TBR)</td>
<td>5,148</td>
<td>21%</td>
</tr>
<tr>
<td>Riparian Management Unit (RPM)</td>
<td>375</td>
<td>2%</td>
</tr>
<tr>
<td>Undeveloped Motorized Recreation Sites (UDM)</td>
<td>6 sites included within other mgmt. units</td>
<td></td>
</tr>
<tr>
<td>Developed Recreation Sites (DRS)</td>
<td>97</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Watershed Protection and Improvement (WPIE)</td>
<td>52</td>
<td>&lt;1%</td>
</tr>
</tbody>
</table>

**LEGEND:**

- **CRS:** Developed Recreation Sites
- **RNG:** Range Forage Production
- **TBR:** Wood-Fiber Production/Utilization
- **WPIE:** Watershed Protection/Improvement
- **RPM:** Riparian Management Unit
- **UDM:** Undeveloped Motorized Recreation Sites
The project area is located in Central Utah in the southern portion of the Wasatch Plateau. The Wasatch Plateau is a north-south high plateau bounded by Castle Valley to the east and Sanpete Valley to the west. The project area is approximately 45 miles southwest of Price, Utah, on public lands administered by the Forest-Price and Sanpete Ranger Districts of the Marfil-La Sal National Forest, in Sanpete and Sevier Counties. See Figure 1-1 Vicinity Map, for a geographic presentation of the project's location.

Elevations in the project area range between 8,000 to 11,000 feet above sea level. The topography of the project area varies from rolling plateaus to steep, west-east drainages and associated canyons. Land features include: dense and open, scattered spruce/fir stands of trees; meadows, brush fields, and open rangeland; limestone, siltstone, and sandstone rock types; glacial cirques, moraines, and till; and streams, reservoirs, and lakes. The basic character of the area has been historically influenced by wildlife, prehistoric humans, domestic grazing, timber harvesting, water impoundment projects, and recreational uses.

Average annual precipitation is 28 to 35 inches. Precipitation (mainly rainfall) from May through September is 8 to 12 inches. Temperatures in the area range from 13 to 90 degrees Fahrenheit. The freeze-free season ranges from 0 to 40 days, and is usually 0 to 20 days. A neutral to unstable atmosphere predominates with winds usually from the southwest during the day, and local light down-canyon winds at night. Storm systems generally come from the northwest or west, preceded by winds from the southwest to southeast. High intensity thunderstorms are common from mid-July through September.

The Forest is in the Upper Colorado River Basin.

The Clean Air Act of 1970 and the 1977 and 1990 amendments are the primary legislative tools for improving and maintaining air quality in the United States. The Act established varying levels of air quality protection for Class I, II, or III areas. Figure 3-3 Air Quality Classes lists the potentially affected areas within a 62-mile (100-kilometer) radius of the project area and their class designation. The act required the amendment promulgated a general conformity rule (40 CFR 51 and 93) directing Federal agencies to ensure that Federal actions do not interfere with achieving the goals and objectives in State Implementation Plans for non-attainment areas. Federal activities producing smoke or resulting in incremental increases in vehicle use (tailpipe emissions) and/or dust from road use or highway sanding may come under the conformity provisions. Utah County is a moderate non-attainment area with particulate matter (dust, dirt, soot, smoke, and liquid droplets). The air quality standard for particulate matter focuses on materials with diameters smaller that 10 micrometers (µm). The Forest area (p. 88, 43) also requires that all projects meet State and Federal air quality objectives.

<table>
<thead>
<tr>
<th>POTENTIALLY AFFECTED AREAS</th>
<th>LOCATION TO PROJECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Reef National Park (northern portion)</td>
<td>30 miles south of project area</td>
</tr>
<tr>
<td>Sanpete County</td>
<td>encompasses project area</td>
</tr>
<tr>
<td>Sevier County</td>
<td>encompasses project area</td>
</tr>
<tr>
<td>High density non-attainment</td>
<td>4.5 miles north of project area</td>
</tr>
</tbody>
</table>

Class I Areas: All international and national parks greater than 6,000 acres, and national wilderness areas greater than 5,000 acres which existed as of August 7, 1977. This class provides the most protection to pristine lands by severely limiting the amount of additional man-caused air pollution that can be added to these areas.

Class II Areas: All other areas of the county, unless upgraded to Class I. A greater amount of additional human-caused air pollution may be added to these areas. All Forest Service lands which are not designated as Class I are Class II.

Class III Areas: Areas having the least amount of regulatory protection from additional air pollution. To date, no Class III areas have been designated anywhere in the country.

Non-attainment Areas: Those areas which do not meet national air quality standards.

States have the primary responsibility for air quality management, which they carry out through implementation plans and other management plans. Although currently in draft, the State Smoke Management Plan will be implemented in 2000 by the Forest Service as a participating agency. Its provisions and permitting processes require the State Program Coordinator to consider project size and projected emissions, proximity to non-attainment areas, and weather conditions when issuing a burn permit and scheduling ignitions, including final go-no go decisions (Zachoschnich, 2000). The control strategies in the State Implementation Plan for Utah County focus on industry, solid fuel and wood burning devices, inspection and maintenance of diesel trucks, and control of road salting and sanding (Utah DEQ, Division of Air Quality, 1990).

High winds are common and dispersion in mountainous terrain is typically very good. However, calm periods do occur which allow smoke or engine emissions to settle nearby and even to drift down-slope towards the valleys. The prevailing wind direction is from the west towards the east, which means that the communities of Ferron and Emery would be downwind. When the winds are from the east, the communities of Mayfield and Sterling would be downwind. All of these communities are more than 10 miles from the project area.

Visibility depends on the amount of materials suspended in the air (particulates). The project area has some of the best air quality, regarding particulates and least light extinction, in the United States (USDA Forest Service, 1992a). Visibility within the project area ranges from 40 miles to 120 miles throughout most of the year, surpassing the average visibility in rural areas of the Southwestern United States of 85 miles to 80 miles. Exceptions are usually caused by dust during windstorms.

The National Ambient Air Quality Standard for coarse particulate dispersion less than or equal to a size of 10 micrometers in aerodynamic diameter (PM10) for a maximum 24-hour period is 150 µg/m3 (micrometers per cubic meter). The National Ambient Air Quality Standard for fine particulate dispersion less than or equal to a size of 2.5 micrometers in aerodynamic diameter (PM2.5) for a maximum 24-hour period is 65 µg/m3. Measurements of particulates have not been made in the project area. However, measurements of surrounding cities were taken in 1974. The maximum 24-hour average PM10 particulates measured for Price and Castle Dale were 181 µg/m3 and 86 µg/m3, respectively. PM2.5 particulates often reflect 90 percent of PM10. Applying this assumption, the maximum 24-hour average PM2.5 particulates measured for Price and Castle Dale in 1974 could have been 163 µg/m3 and 77 µg/m3, respectively. Particulate levels have likely exceeded National standards in local areas within the project area as a result of dust displaced by high winds.

Particulates, S0X (airborne compounds of sulfur oxides), N0X (airborne compounds of nitrogen oxides), HC (airborne hydrocarbon chloride), and CO (carbon monoxide gas) can affect health. Carbon and Emery Counties have high levels of emissions in some of these categories, while Sanpete and Sevier Counties have relatively low emissions. Particulates are predominantly caused by dust from roads (greater than 90 percent average for all four counties). Monitoring of sulfur dioxide, oxidant, and nitrogen oxides in
the area has shown levels to be well below National Ambient Air Quality Standards. No monitoring has been done in the project area for carbon monoxide or hydrocarbons, but the rural nature of the region and the generally good dispersion characteristics suggest acceptable levels of these compounds.

3.3 LAND STABILITY

The geologic structure of the area is well understood. East of the divide, the rock units dip generally about 4 to 8 degrees to the west. West of the divide, the rock units dip sharply westward, as much as 20 degrees, forming a steep single-banked fold known as the Wasatch Monocline. North-south trending faults are common within the monocline.

Rocks exposed in the area range from the mid-Cretaceous period (90 million years ago) to the Paleocene period (70 million years ago). From oldest to youngest, the geology consists of the North Horn Formation, Flagstaff Limestone, and surface deposits consisting of glacial till, colluvium, alluvium, and landslide debris. These features are described in Figure 3-4 Geology.

Figure 3-4 Geology

<table>
<thead>
<tr>
<th>GEOLGY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Horn Formation</td>
<td>The North Horn Formation consists of imbedded shale, sandstone, conglomerate, and limestone. Shale members contain a high percentage of clay with a low resistance to erosion and a low shear strength when wet which causes unstable slopes.</td>
</tr>
<tr>
<td>Flagstaff Limestone</td>
<td>The Flagstaff Limestone is relatively competent, dike-forming, and caps the major high ridges and peaks. It consists of limestone with minor amounts of shale and sandstone. Rock falls and rock slumps are common on steep cliffs faced undercut by erosion and landslides in the underlying less resistant North Horn Formation. Failure planes are on the order of 500 feet thick.</td>
</tr>
<tr>
<td>Surface Material</td>
<td>Surface material (glacial till, colluvium, alluvium, and landslide debris) derived from the Flagstaff Limestone and North Horn Formation shape the slopes at depths to 170 feet. Landslide deposits as thick as 300 feet have been measured at the Mant Canyon North Slope. Soil creep is evident along steep slopes, especially north-facing slopes that tend to have thicker soil deposits.</td>
</tr>
</tbody>
</table>

The project area contains numerous landslides including: rock slides, rock falls, rock slumps, debris flows, earthflows, and complex landslides that contain more than one type of movement. These features have been common since the last glacial period.

Isolated high-frequency, low-magnitude landslides have occurred within the project area and in other areas of similar geology. Such events typically occur during average or below average precipitation years or cycles. They are typically caused by rockslides and rockfalls. Landslides are considered to be high-frequency because they are not restricted to low-frequency, high precipitation cycles. Examples of such landslides in the project area or similar geology include: the 1989 Slide Lake landslide within the project area; the 1971 Boulder Canyon landslide near the project area; and the 1975 Cottonwood and Mant North landslides away from the project area.

A portion of these landslides have been triggered by human activities, such as road building and water pipeline development, where there has been a disruption of natural drainage and/or inefficient drainage. It is likely that historically, human caused changes in vegetation, topography, and water flow which contributed to conditions that ultimately resulted in isolated landslides. However, in the project area, there are no obvious spatial correlations between recent land management disturbances (e.g. campgrounds, roads, fences, reservoirs) and the occurrence of high-frequency, low-magnitude landslides. Earthquakes are also thought to be triggering mechanisms for landslide activity on the Mant Division of the Forest.

Most landslides mapped within the project area appear to be predominately the result of geologic conditions and natural triggering mechanisms (e.g. earthquakes, extreme precipitation cycles, erosion). Late snowstorms, rapid snowmelt, and high runoff volumes in 1983 and 1984 caused flooding, severe erosion, and saturation of surface materials. Approximately 427 new landslides were mapped on the Wasatch Plateau from these conditions. A greater number of landslides correspondingly occurred on the west side of Skyline Drive (Forest Development Road #50150) within the North Horn Formation. These were low-frequency, high-magnitude landslide events. The recurrence interval for the two-year precipitation received through June of 1983 is about 125 years along the west side of the Wasatch Plateau.

A land stability map was produced for the project area using Godfrey's 1978 and 1985 work as a base, with refinement included for more recent and detailed information. Pale and recent landslides were mapped from aerial photography. Land stability zones were delineated based on landslide occurrences, geologic information, and topographic information. Four stability zones were delineated as a result of this effort (Figure 3-5 Land Stability Classes and Figure 3-6 Land Stability Class Map).

Figure 3-5 Land Stability Classes

<table>
<thead>
<tr>
<th>STABILITY CLASS</th>
<th>Acres</th>
<th>% Area</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unstable</td>
<td>8,825</td>
<td>37</td>
<td>Areas actively sliding or moving, exhibiting a high occurrence of landslide deposits (recent and ancient), and areas of similar geologic and topographic characteristics. These areas have a high potential for new landslides to occur and existing landslides to become active, either with or without human activity. The defining characteristics include: (1) North Horn Formation outcrops and overlying surface deposits with slopes greater than 35 percent; (2) Flagstaff Limestone outcrops and overlying surface deposits with slopes ranging from 35-60 percent that are near to and could be undercut by erosion of the North Horn Formation; and (3) Flagstaff Limestone cliffs with slopes exceeding 90 percent.</td>
</tr>
<tr>
<td>Moderately Unstable</td>
<td>6,799</td>
<td>27</td>
<td>Areas containing fewer landslides (recent and ancient) than the unstable area, and areas with similar geologic and topographic characteristics. These areas have potential for new or reactivated landslides with human activity and during average and above precipitation years or cycles. These areas often contain the toe or runout zones of landslides that occurred on steeper slopes above. The defining characteristics are North Horn Formation outcrops and overlying surface deposits with slopes ranging from 30-35 percent.</td>
</tr>
<tr>
<td>Moderately Stable</td>
<td>7,350</td>
<td>30</td>
<td>Areas containing few landslides and exposed formations with slopes generally below the thresholds associated with unstable landslides. This area should contain the runout zones of landslides that originated in the more unstable zones on steeper slopes. Small slumps and small slumping may occur due to saturated conditions, erosion, and intensive human activity. Defining characteristics include: (1) North Horn Formation outcrops with slopes less than 20 percent; (2) Flagstaff Limestone outcrops on slopes that range from 35-60 percent where not undercut by erosion and landslides in the North Horn Formation; and (3) Flagstaff Limestone outcrops on slopes ranging from 10-20 percent.</td>
</tr>
<tr>
<td>Stable</td>
<td>1,613</td>
<td>6</td>
<td>Flat lying areas in stable formations (Flagstaff Limestone). No stability problems are anticipated in these areas. Defining characteristics include: (1) Flagstaff Limestone outcrops on slopes less than 10 percent; and (2) alluvial deposits on slopes less than 10 percent.</td>
</tr>
</tbody>
</table>
3.4 SOILS

The soils in the project area were mapped using aerial photography transferred to paper maps. The geographic scope for analysis of the soil resource (compaction, erosion, and productivity) is the project area itself.

Soil Map

Unit Descriptions

The soil descriptions used in this analysis are from the Draft Soil Resource Inventory of the Mental Division (USDA Forest Service, unpublished).

Nearly all of the soils in the project area are derived from the Flagstaff Limestone Formation and shale and limestone of the North Horn Formation. These are usually residual materials over bedrock on the plateau tops, colluvial materials on the mountain slopes, and glacial till and landslide materials in the basins. In general, the soils have dark colored topsoil layers of about 6 to 18 inches in thickness. Soil textures are typically clay loam or clay, with varying amounts of rock fragments. The soils derived from limestone materials are generally cobbly or stony, while those from shaley material have lower amounts of rock fragment. Soil reaction is typically pH 6.0 to 7.8. Subsoils typically have a light color from the influence of limestone. A denser, subsoil material is often encountered in the soils developed on glacial till.

Most soils have a moderate to moderately-high susceptibility to compaction. Compaction susceptibility is generally greatest on sites with slopes less than 40 percent. Most soils have a moderate soil erodibility rating, however the potential for erosion to occur is largely dependent upon the steepness of the slopes and the amount of surface cover.

Most of the area has a moderate erosion hazard rating. Figure 3.7 Soil Erosion Potential, describes the soil map units within the project area and presents their erodibility and erosion hazard ratings.

Soil Productivity

The long-term productivity and sustainability of forests and rangelands depends on maintaining the quality of soil properties and conditions that affect the productivity and hydrologic function for soils. Guidelines have been set, beyond which it is reasonably certain that there will be long-term losses in productivity or hydrologic function (USDA Forest Service, 1993a). Under current conditions, none of the areas proposed for treatment exceed the soil quality guidelines. Current erosion rates are well within soil loss tolerance thresholds. Ground cover and above ground organic matter are at or above optimum levels for the various soil types.
### Soil Erosion Potential

<table>
<thead>
<tr>
<th>SOIL MAP UNIT</th>
<th>Acres</th>
<th>% Area</th>
<th>Slope%</th>
<th>Soil Erodibility</th>
<th>Erosion Hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>575</td>
<td>2</td>
<td>0 to 30</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>2</td>
<td>465</td>
<td>2</td>
<td>10 to 40</td>
<td>M to H</td>
<td>M</td>
</tr>
<tr>
<td>3</td>
<td>254</td>
<td>1</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>4</td>
<td>1775</td>
<td>7</td>
<td>5 to 30</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>5</td>
<td>795</td>
<td>3</td>
<td>30 to 80</td>
<td>M</td>
<td>H</td>
</tr>
<tr>
<td>6</td>
<td>28</td>
<td>&lt;1</td>
<td>5 to 45</td>
<td>L to M</td>
<td>L to M</td>
</tr>
<tr>
<td>7</td>
<td>194</td>
<td>1</td>
<td>30 to 60</td>
<td>M to H</td>
<td>H</td>
</tr>
<tr>
<td>8</td>
<td>3066</td>
<td>14</td>
<td>30 to 80</td>
<td>L to M</td>
<td>M</td>
</tr>
<tr>
<td>9</td>
<td>1028</td>
<td>4</td>
<td>5 to 25</td>
<td>M</td>
<td>L to M</td>
</tr>
<tr>
<td>10</td>
<td>2872</td>
<td>12</td>
<td>5 to 40</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>11</td>
<td>5281</td>
<td>21</td>
<td>5 to 35</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>12</td>
<td>4862</td>
<td>20</td>
<td>5 to 40</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>13</td>
<td>761</td>
<td>3</td>
<td>30 to 40</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>14</td>
<td>2251</td>
<td>9</td>
<td>130 to 75</td>
<td>M to H</td>
<td>M</td>
</tr>
</tbody>
</table>

1. **Soil Erodibility**: The soil erodibility rating (E) is a relative measure of the susceptibility of soil particles to detachment and transport by rainfall and runoff. It relates to the soil's retained experimental range from 0.02 to 0.89. A rating of "low" equals less than 0.36; "moderate" equals 0.36 to 0.46; and "high" equals greater than 0.46. "L" = low, "M" = moderate, "H" = high. 
2. **Erosion Hazard**: Erosion hazard is a relative measure of erosion potential of bare ground. The rating does not include cover from vegetation, organic matter, or rock fragments in the soil. Actual soil erosion rates would be substantially lower when vegetative cover is present. A rating of "low" equals less than 6 tons/year (0.02 lb/ft²) sediment; "moderate" equals 6 to 10 tons/year (0.02 to 0.03 lb/ft²) sediment; and "high" equals greater than 10 tons/year (0.03 lb/ft²) sediment. "L" = low, "M" = moderate, "H" = high.

### 3.5 WATER RESOURCES

The project area is within the Colorado River and Sevier River basins. The Colorado River basin includes Muddy and Ferron watersheds. Muddy Creek is tributary to the Dirty Devil River, which flows into the Colorado River at Lake Powell. Ferron Creek is tributary to the San Rafael River which joins the Colorado River above Lake Powell. The Sevier River Basin includes Skamxle and Twentymile watersheds, both of which flow to the San Pitch River which flows into the Sevier River. The Sevier River is a closed basin located entirely within the State of Utah.

For analysis purposes, the project area has been divided into four watersheds: Muddy Creek, Twentymile, Skamxle, and Ferron Creek (Figure 3-8).

Seventeen lakes, reservoirs, and ponds, representing about twenty-two percent of the lakes within the Forest boundary, are in the project area: Skamxle Ponds, Deep Lake, WPA Ponds, Island Lake, Duck Fork Reservoir, Rush Ponds, Ferron Reservoir, Willow Lake, Julius Flat, Blue Lake, Henson Reservoir, Slide Lake, Emerald Lake, Spansers Reservoir, Oleys Lakes, Emery Reservoir, and Three Lakes. These waters are important to irrigation, recreation, and fisheries.

### WATER QUALITY

Water quality standards for the streams of Utah are legislated by the State. These standards are tied to the beneficial uses that are made of the water. The beneficial uses for the streams in and downstream of the project area are presented in Figure 3-9 State Beneficial Uses. In addition to the assigned use classes, all surface water located within the outer boundaries of National Forests, whether on public or private lands, is designated as High Quality Waters. Category 1. Water quality is to be maintained with little or no degradation. New point source discharges are prohibited; existing sources will be controlled to the extent feasible through implementation of best management practices. Projects such as, but not limited to, construction of dams or roads will be considered where pollution will result only during the actual construction activity, and where best management practices will be employed to minimize pollution effects (Utah DEQ, Division of Water Quality, 1997).
The Clean Water Act requires that the State of Utah compile a 303(d) list which includes water bodies within the State that do not attain the current water quality standards. The 303(d) list for the project area includes the following stream reaches.

San Pitch River and tributaries from the confluence with the Sevier River to the tailwater of Gunnison Reservoir, including Wellsville Creek but excluding Soldier Creek. This reach is listed for total dissolved solids. It is a low priority for preparation of a total maximum daily load allocation, and preparation of a TMDL will be scheduled for some time after 2002 (Utah DEQ, Division of Water Quality, 2000).

The State of Utah requires that the Best Management Practices (BMPs) be used on National Forest System lands. The Forest Service is the designated water quality management agency for National Forest System lands and is responsible for implementing BMPs on such lands. BMPs are usually derived from Forest Service Handbook 2509.22 Soil and Water Conservation Practices (USDA Forest Service, 1998) and are listed in Appendix D.

The Forest Plan also requires that water quality be maintained or improved and that BMPs are used in all resource activities. The waters on the National Forest are to meet State Water Quality Standards.

The State has established a total suspended solids standard for recreation uses (90 mg/l) and an allowable turbidity increase of 10 nephelometric turbidity units (NTUs) for aquatic life. The State has no numeric standards for total sediment or bedload. The narrative standards prohibit the discharge of substances "in concentration or combinations of substances which produce undesirable physiological responses in desirable resident fish or other desirable aquatic life..." (Utah DEQ, Division of Water Quality, 1997). The background level of total suspended solids, which can be related to turbidity, have been measured ranging from 0 to 26,000 parts per million.

Detached soil and rock particles are termed sediment while being transported in the water and then deposited. Total sediment production includes input from mass movements, channel erosion, and surface erosion.
Riparian areas include riparian ecosystems, aquatic ecosystems, and wetlands. Riparian areas are associated with lakes and reservoirs; potholes, boggy mires, meadows; springs; and ephemeral, intermittent, or perennial streams where free and unbound water is available (USDA-Forest Service, 1992).

Riparian ecosystems and wetlands have distinctive vegetation communities that require free or unbound water and soil characteristics which reflect periodic saturation. Floodplains are areas that are inundated by floods, the area of concern is that which would be flooded by 100-year to 500-year recurrence events. Riparian management (RPN) units are defined in the Forest Plan as extending 200 feet horizontally on either side of the high water line of all perennial water. RPN units are associated with perennial streams, lakes, and reservoirs. Approximately 40 acres (less than 1 percent) of RPN units are associated with 17 lakes, reservoirs, and ponds.

Perennial and intermittent stream channels within the project area, specifically those with a residence of spruce mortality, contain all amounts of large woody debris. Field estimates of large woody debris (greater than 12 inches diameter) range from 250 to 400 pieces per stream mile (Davies Field Review, 1998). Mortality of spruce within 100 feet of riparian zones is high. As these dead trees fall into stream channels over the next 10 to 75 years, large woody debris is expected to double reaching 500 to 800 pieces per stream mile.

Wetlands are managed under the guidance of Executive Order 11990 (1977) and Forest Service Manual 2527 (USDA-Forest Service, 1994c). Wetlands regulations are enforced by the Army Corps of Engineers and the Environmental Protection Agency. Generally, when a human-caused alteration to streams or wetlands is proposed, a 404 Permit is needed to assure wetlands and aquatic resources are protected. A nationwide permit is in place concerning wetlands less than 0.1 acre in size. 404 permits are a general exemption for avian activities that apply if certain conditions are met. The Forest Plan (p. III-71) requires 404 Permits to be acquired as needed.

Wetlands contain wetland vegetation, hydric soils, and are wet at least 15 days each year during the growing season. From an aerial photograph review, wetlands were identified using vegetation as the sole criteria. Most wetlands are small, generally less than 10 acres, and often much smaller. The wetlands are not continuous across the landscape, but may be linear in places for as much as a half a mile. In some instances, wetlands are associated with constructed reservoirs. Wetlands also occur in association with beaver dams and along stream channels.

Floodplains are regulated by Executive Order 11988 (1977) and Forest Service Manual 2527 (USDA-Forest Service, 1994c). Forest Service Manual 2527 states that the 100-year and 500-year floodplains will be avoided so far as practical. No facility will be developed within the 100-year flood plain unless it is a functionally dependend use, such as a culvert or a bridge.

AQUATIC HABITAT AND SPECIES

The following perennial streams within the project area support fish populations: South Fork of Muddy Creek (including Black Fork, Mill Fork, Fish Creek, Slide Fork Reservoir, and two unnamed tributaries), North Fork of Muddy Creek (including unnamed tributaries), Muddy Creek (mainstem), South Fork Twelfthmile Creek (and unnamed tributaries), Twelfthmile Creek (mainstem), South Fork of Sixmile Creek (including the tributaries that enter the South Fork of Sixmile Creek upstream from Sixmile Ponds), Ferron Creek, Mill Stream, Little Horse Creek, Singleton Creek, Indian Creek, Lake Fork, Georges Fork, and Duck Fork Creek.

Species that could be directly or indirectly affected within the project area are: Yellowstone cutthroat trout (Oncorhynchus clarki), rainbow trout (Salmo gairdneri), red shiners (Notropis lutarius), fathead minnows (Pimephales promelas), speckled dace (Rhinichthys osculus), redside shiners (Richardsonius balteatus), flannel-mouth suckers (Catalostomus limbatus), roundtail chubs (Gila robusta) and mountain suckers (Catalostomus platyrynchus) (Ber, 1999).

There are several high-value recreational stream fisheries within the project area. Duck Fork Creek (above the reservoir), Lake Fork, and Indian Creek support naturally-reproducing Yellowstone cutthroat populations. Angler information from the Muddy and Twelfthmile drainages indicates that both streams support small naturally-reproducing populations of Yellowstone cutthroat trout.

Two non-game species, flannel-mouth suckers and roundtail chubs, are known to inhabit mainstream reaches below the project area and are currently classified as "Species of Concern" by the State of Utah (UDWR, 1999).

Several reservoirs and lakes could be directly or indirectly affected by activities within the project area: Slide Lake, Three Lakes, Blue Lake, Julia Flat Reservoir, Island Lake, Emerald Lake, Emery Reservoir, Spinners Reservoir, Shingletown Reservoir, Deep Lake, WPA Ponds, Oleys Lake, Rush Pond, Willow Lake, Ferron Reservoir, Duck Fork Reservoir, and Sixmile Ponds.

Twelve of these reservoirs and lakes are intensively managed as "put-and-take" fisheries by the Utah Division of Wildlife Resources (i.e. stocked fisheries with very high angler catch rates). Blue Lake and Emery Reservoir are stocked with brook trout. Willow Lake is stocked with tiger trout (Salvelinus fontinalis x Salmo trutta), a sterile hybrid between brook trout (Salvelinus fontinalis) and brown trout (Salmo trutta) (Ber, 1997). Blue Lake was stocked with grayling (trout) in 1997 (Ber, 1997). Julius Flat, Island Lake, Emerald Lake, Spinners Reservoir, Deep Lake, and Ferron Reservoir are all stocked with rainbow trout. Ferron and Duck Fork Reservoirs are stocked heavily with cutthroat trout and are heavily used by anglers. Duck Fork Reservoir is currently managed as quality fishery by the Utah Division of Wildlife Resources (i.e. there are restrictions on slot size limit, required use of artificial lures only). Field inspections of pot-hole habitats in the 1995 field season (Dufour, 1995) found Great Basin Spadefoot toad (Scaphiopus hemphilli) larvae and egg clusters in pot-hole habitats in the Upper Muddy drainage (approximately 10,000 feet in elevation above 8,000 level). No other information is known about amphibian distribution, although suitable habitats exist throughout the project area.

Habitat suitable for supporting the spotted frog (Rana pretiosa) (currently classified as a Sensitive species by Region 4 - USFS) is not present within the project area (Perkins, Utah Division of Wildlife Resources Herpetologist; Kalez, Utah Division of Wildlife Resources, 1995 personal communication). Utah Division of Wildlife Resources surveys indicate that spotted frogs prefer lower elevation, floodplain-type environments. At this time spotted frogs have not been identified in the project area.

The stream channels of Muddy Creek and Twelfthmile Creek appear to be recovering from landfills, flooding (1983 & 1984), and historic livestock grazing impacts (Burns, 1995). Stream inventories conducted by Forest Biologists in 1981 noted re-establishment of cottonwoods and willows in riparian areas, unstable banks in places, and silt deposition in pools. In the Muddy Creek and Ferron Creek watersheds, extensive...
soil movement and channel adjustment was observed by the Forest Fisheries Biologist in response to high runoff, especially in the Upper Muddy drainage in 1993 (Dufour, 1995). High fall flows caused substantial channel down-cutting and some lateral adjustment in the lower portion of the same drainage near the Forest boundary (Dufour, 1995).

Bassin-wide inventories of aquatic habitat conditions in the Upper Ferron drainage were conducted in 1995. Three streams were inventoried: Little Horse Creek, Duck Fork Creek, and Lake Fork Creek. Data from these field surveys show that habitats for these species are at risk. Some areas of these channels continue to show evidence of 1983 and 1984 flood events (i.e. signs of channel adjustment and bank-cutting were evident). A study of the role of large woody material in these three streams demonstrated that wood directly creates pool habitat. In Duck Fork Creek, woody debris created 43 percent of the pool habitat. In Little Horse Creek, woody debris created 51 percent of the pool habitat. In Lake Fork Creek, woody debris created 38 percent of the pool habitat. Wood is therefore a significant contributor to the pool habitat component that provides fish with foraging, resting, and over-wintering habitats in otherwise high-current environments.

Abundant wetlands have been observed throughout the project area. Wetlands are critical to aquatic communities that in turn act as water reservoirs and provide base flows during low-water periods. Potholes, small ponds, and marshy areas provide surface and groundwater sources that can run-off. These wet areas support invertebrate and amphibian populations.

Aquatic macroinvertebrates are management indicator species, identified in the Forest Plan, to assess impacts of management activities on aquatic communities and water quality. Monitoring stations located at the Forest boundary on Ferron, Muddy, and Twelvemile Creeks. Water quality in Twelvemile Creek appears to have improved steadily since the landslide and flooding events of 1983 and 1984. Data results for Ferron Creek and Muddy Creek are so variable that there is no apparent trend.

There are no known threatened, endangered, or Forest Service Region 4 sensitive fish species within the project area. However, small populations of native Colorado River cutthroat trout (Oncorhynchus clarki leucostigma) may still inhabit isolated headwaters streams throughout the project area, although none have been currently documented. A population of Colorado River cutthroat trout is proposed for introduction into Little Horse Creek sometime in 2001, or later, by the Utah Division of Wildlife Resources (Berg, 1999).

Bonnieville Cutthroat trout (Oncorhynchus clarki utah) are not known to be present in the project area. Both Twelvemile Creek and Sixmile Creek are within the historical range of this species but they have high sediment loads and channel damage from floods and landslides, most predominately in the lower reaches. The upper headwaters contain better habitat compared to the lower reaches and appear to have the only suitable habitat for this species. Introduction of Yellowstone Cutthroat trout and habitat degradation (mostly from natural landslides and floods) are likely causes of elimination of Bonnieville Cutthroat trout in these watersheds.

Far downstream from the project area, there are four Colorado River fish species which are currently listed as endangered: Colorado pikeminnow (Ptychocheilus lucius), bonytail chub (Gila robusta), humpback chub (Gila cypha), and razorback sucker (Xyrauchen texanus).

3.6 VEGETATION RESOURCE

FOREST HEALTH, SPECIES COMPOSITION, AND PRODUCTIVITY

The 1998 South Manti Timber Salvage Final Environmental Impact Statement disclosed the potential effects of actively implementing sanitation treatments in areas that were not infested by spruce beetle (USDA Forest Service, 1996c). Disclosed effects also included information describing the possibility of beetle populations increasing in these areas. This scenario has since occurred, as time frames necessary to install sanitation have lapsed due to administrative and political constraints.

Therefore, the following information from the 1998 South Manti Timber Salvage Final Environmental Assessment, combined with other pertinent information, summarizes the existing condition of forest health and composition of the area.

Forest Health

Since 1989, extensive EngeImann spruce mortality has occurred on the Ferron/Price and Sanpete Ranger Districts as the result of epidemic populations of spruce beetle (Dendroctonus ponderosae) (Figure 3-10 Annual Spruce Beetle Caused Tree Mortality). The spruce beetle infestation and subsequent spruce tree mortality levels have exceeded endemic levels.

In 1993, the project area was identified to include the Engelmann spruce-subalpine fir forest type on the Ferron/Price and Sanpete Ranger Districts that was infested or in imminent danger of infestation from a spreading spruce beetle epidemic. Uninfested and lightly infested spruce-subalpine fir stands in the area, in imminent danger of infestation, were also included in the project area. Areas in imminent danger of infestation were located near Lake Fork and Blue Meadows. Approximately 10,211 acres of Engelmann spruce-subalpine were identified as potential sites for silvicultural treatments related to the spruce beetle epidemic, which was killing most of the spruce trees equal to and greater than eight inches in diameter at breast height.

Figure 3-10 Annual Spruce Beetle Caused Tree Mortality

(Site FHP Annual Conditions Report, FHP, 1981-1998)
Before making a decision on the 1996 South Manti Timber Salvage Sale Environmental Assessment, the extent of the infestation was reviewed. Initially, the spruce beetle population developed from two centers of activity near Black Mountain and Island Lake adjacent to Skyline Drive (Forest Development Road #50150). The infestation extended from the joint boundary of the Fishlake and Manti-La Sal National Forests at the southern end of the project area, north to Twelvemile Creek. Previously uninfested areas that were originally identified as being in "imminent danger" of infestation had reached epidemic population levels.

Current spruce tree mortality extends from the southern Forest boundary north along the Wasatch Plateau to Potters Canyon (Figure 3-11 Landscape Spruce Beetle Infestation Map) as a result of the infestation. In 1998, John Anhold (Forest Service Entomologist) estimated approximately 30,000 acres of spruce-fir forest had been affected by the spruce beetle infestation on the Wasatch Plateau (Anhold, 1998).

U.S. Forest Service, Forest Health Protection personnel surveyed portions of the infested area in 1993. Survey results indicated that 52 percent of the spruce in infested stands was dead. Results also indicated a corresponding reduction in the average spruce live tree diameter at breast height from 19.9 to 15.3 inches (Munson, 1994).

Additional surveys completed by Forest Service Forest Health Protection personnel in 1996 and 1998 further indicate a substantial amount of beetle-induced spruce mortality (USDA Forest Service, FFPM 1996 and 1998). The spruce beetle prefers large diameter trees (> 16 inches), but will attack trees as small as six to eight inches when populations are at epidemic levels. In 1998, sampled stands showed approximately 73 percent of the spruce trees equal to or greater than 5 inches in diameter at breast height had died as a result of the epidemic. It also showed approximately 91 percent of the spruce trees greater than 11 inches in diameter at breast height had died as a result of the epidemic. Forest monitoring of the proposed treatment areas in 1999 showed similar spruce mortality levels (S. Cote, 1999).

Spruce beetle caused mortality has altered previously existing stand characteristics. This change has been depicted by the Forest Vegetation Simulator Model (FVSM) and illustrations of the pre-outbreak condition and existing condition are available in the project record.

Approximately 535 acres of dead spruce trees have been salvaged under the 1992 Timber Canyon and 1993 Twelvemile Timber Sales. A total of 1,912 acres have been or are being treated under the 1996 South Manti Timber Salvage Sales. Figure 3-11 Landscape Spruce Beetle Infestation Map, shows the spruce beetle affected acres. The spruce beetle affected acres represent all of the spruce stands within the project area.

This spruce beetle epidemic is likely within the historic range of variability. Most of the spruce-fir stand on the Wasatch Plateau are roughly the same age. Since stand replacing fires are limited by the lack of stand continuity, the assumption is that the spruce beetle is the catalyst for stand replacement. Following a spruce beetle epidemic, the affected stands are dominated by fir (Schmidt and Frye, USDA 1977). As the fir trees reach 125 to 175 years of age, they begin to die and drop out of the overstory. Younger spruce and fir in the understory use these openings to increase in size and allow the establishment of new seedlings. As the spruce increase in size and age, pockets of older spruce reach a stage where they are susceptible to attack by spruce beetle. Periodically, outbreaks will occur following wind or other disturbance events that create a favorable environment (downed trees) for developing populations of spruce beetle. Outbreak intensity is dictated by the number and size of spruce that are down, the presence of the insect, the continuity of the preferred tree size (15 inches or larger average diameter), and stand densities (greater than 150 square feet of basal area).

Early in stand succession, these events would affect smaller sites containing susceptible spruce. Initially, these small areas are composed of large, old spruce scattered throughout the generally younger and smaller diameter spruce-fir component. The lack of susceptible larger diameter spruce would cause the developing population of spruce beetles to subside due to a lack of source of food. Other natural factors including parasites and predators, will contribute to suppressing these isolated populations of spruce beetle. As this natural succession process continues, spruce becomes more prevalent in the mixed stands due to naturally occurring factors (e.g. an increase in fir mortality with a subsequent increase in light) that encourages spruce development.

Over time these spruce-fir sites will be dominated by spruce of relatively even structure and size. As the spruce component matures and density increases, susceptibility of these sites to large scale spruce beetle outbreaks will increase. Eventually, a disturbance event will occur that results in downed larger diameter spruce that will provide suitable habitat for spruce beetle populations to increase. This type of disturbance event occurred in the South Manti project area when a landslide and subsequent windthrow developed creating ideal conditions for spruce beetle population development. Stand conditions surrounding the disturbance consisted of a large, continuous landscape of susceptible spruce. Thus, the natural process of species dominance from fir to spruce and back to fir has completed a full cycle of transition. This cycle of development is fairly representative of spruce-fir ecosystems found throughout most of the Rocky Mountain area.
A wide variety of plant communities and plant species occur within the project area: conifer, aspen, riparian, high mountain grass and forb lands, and high mountain brush lands. Conifer timber types occur mostly on the north and east aspects, slopes, and upper basins. Aspen types are found on the upper bench lands, mixed with the conifer on lower north and west slopes and without conifers on the higher south and west slopes, and in the mid-elevation basins. Riparian types are generally found along the small streams, wet meadows, around small natural lakes and springs. High mountain grass and forb lands are found on the plateau tops, upper bench lands, and exposed slopes and ridge tops. High mountain brush lands occur on the high plateau tops, exposed south slopes, and ridges.

The dominant habitat types of the timber stands being considered for treatment are classified as ABLA/RIMO (Abies lasiocarpa/Ribes montanum - Subalpine fir/Mountain goosberry) and ABLA/BERE (Abies lasiocarpa/Beauregard maple - Subalpine fir/Oregon grape). Prior to the epidemic, stands varied from uniform tree spacing to clumpy, open conditions. The stands were generally uneven-aged and mature with Engelmann spruce (Picea engelmannii) and subalpine fir (Abies lasiocarpa) dominant in the overstory. Quaking aspen (Populus tremuloides) and timber pine (Pinus flexilis) also occur in some...
stands. The understory generally consists of subalpine fir and Engelmann spruce. The less tolerant aspen and limber pine are being replaced by the more shade tolerant spruce and fir species. Undergrowth shrub species include mountain gooseberry, mountain snowberry, and red elderberry. Herbaceous species include sweetroot, heartleaf arnica, European yarrow, and rose sedge.

Based on a 1980 timber survey, the project area includes five primary forest cover types:

1. Engelmann spruce-subalpine fir 11,490 acres;
2. Douglas-fir 155 acres;
3. Aspen 2,857 acres;
4. Grass and brush lands 8,762 acres;

An additional 527 acres were not classified at the time of survey. These primary forest cover types are presented in Figure 3-13 1980 Forest Cover Type Map.

Approximately 10,817 acres of the spruce-subalpine fir cover type area were characterized by 8; it consists of sparsely vegetated areas greater than eight inches in diameter at breast height. These sites are characterized by dominant spruce overstory trees that are equal to and greater than 8 inches in diameter at breast height.

The spruce beetle epidemic has created a vegetation condition that is less varied, with more openings than those that previously existed before the outbreak. In areas of essentially pure, large-diameter spruce trees, mortality has reached 100%. High mortality levels associated with the outbreak have resulted in the loss of the larger (greater than 11 inches in diameter) live spruce trees from the stands. The effects of this mortality include:

- reduced numbers (abundance) of live spruce trees;
- reduced gene pool of spruce seed source;
- reduced average stand diameter, height, and age class diversity (structural diversity);
- conversion of species composition from a dominant or moderate spruce mix towards subalpine fir;
- reduced seed source in some areas, slowing natural regeneration of affected sites to a forested condition.

The gene pool has been reduced as some stands or areas of almost pure, large-diameter spruce have experienced heavy (> 90%) spruce mortality within the local ecosystem structure. This results in loss of the mature and more competitive (prior to the current epidemic) spruce trees from the genetic pool. Remaining large-diameter spruce are more fragmented and isolated in structure, which could limit interaction of gene pools and increase inbreeding (Erickson, 1980). Erickson (1980) also suggests that "large reductions in the parent tree population could lead to a genetic bottleneck, whereby stand regeneration occurs with a small or restricted set of genotypes". This would appear to be the case in the South Mantl Project area, since few Engelmann spruce of cone-bearing age exist to restore the spruce population naturally (additional documentation relative to genetic diversity and changes from disturbance can be found in section 4.5).

From a timber production perspective, many of the remaining spruce trees exhibit undesirable characteristics that could result in lower quality wood and production capability (i.e. slower or reduced height and diameter growth, forking, poor ability to naturally prune limbs, susceptibility to disease and insects, crooking or stem spiral, etc.).

Although the ratio of spruce to fir has changed, the number of tree species is still the same. The percentage of live spruce trees has decreased within the beetle affected areas. Subalpine fir, and to a minor extent quaking aspen and limber pine, have replaced the more commercially valuable spruce as the dominant or larger residual live trees in many areas. Individual stand conditions vary, and some locations have lost between 70 to more than 90 percent of spruce greater than 8 inches in diameter at breast height (Figure 3-14 Forest Cover Types, Pre- and Post Beetle Outbreak).

Data from the 1996 South Mantl Timber Salvage Sales Environmental Assessment indicates that before the beetle infestation, spruce trees comprised about half of the overall stand structure (USDA Forest Service, 1996c).

Figure 3-14 Forest Cover Types, Pre- and Post Beetle Outbreak 1

<table>
<thead>
<tr>
<th>FOREST COVER TYPE</th>
<th>PRE-BEEFLE OUTBREAK</th>
<th>POST-BEEFLE OUTBREAK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spruce-fir</td>
<td>89% 19,396 acres</td>
<td>7% 1566 acres</td>
</tr>
<tr>
<td>Subalpine fir</td>
<td>0% 0 acres</td>
<td>93% 9,707 acres</td>
</tr>
<tr>
<td>Spruce</td>
<td>1% 87 acres</td>
<td>&lt;1% 20 acres</td>
</tr>
</tbody>
</table>

1. These figures include acres evaluated in the 1996 South Mantl Timber Salvage Sales Environmental Assessment and estimates of condition on the 272 acres of additional treatment proposed in this analysis.
2. Based on inventory prior to the spruce beetle epidemic.

Figure 3-15 Forest Structure, Pre and Post Beetle Outbreak 1

<table>
<thead>
<tr>
<th>FOREST STRUCTURE</th>
<th>PRE-BEEFLE OUTBREAK</th>
<th>POST-BEEFLE OUTBREAK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open</td>
<td>17% 988 acres</td>
<td>61% 6,424 acres</td>
</tr>
<tr>
<td>Single-Storey</td>
<td>3% 164 acres</td>
<td>9% 518 acres</td>
</tr>
<tr>
<td>Multi-Storey</td>
<td>80% 9,331 acres</td>
<td>&lt;34% 3,542 acres</td>
</tr>
</tbody>
</table>

1. These figures include acres evaluated in the 1996 South Mantl Timber Salvage Sales Environmental Assessment and estimates of condition on the 272 acres of additional treatment proposed in this analysis.
2. Based on inventory prior to the spruce beetle epidemic.

A Vegetative Structural Stage (VSS) analysis was completed for the project area using the FVS modeling for the 1996 South Mantl Timber Salvage Sales Environmental Assessment. The analysis was completed to identify changes in stand structure, species, and canopy closure, and the potential effect on VSS class. The analysis showed that the VSS class for stands proposed for treatment in 1996 was being reduced in average size and canopy closure due to spruce mortality. Only two stands were projected to maintain a size structure and tree density that might retain sufficient mature forest trees (18 inch and larger dbh) to retain a mature forest character or have some potential to quality as old forest (old growth). Average structural stage has been reduced from a mature forest to a seedling/sapling or young forest structure (see VSS analysis in the project file). Actual mortality has exceeded modeling projections. No mature forest or old forest stands exist within the project area. Only areas with average numbers of subalpine fir meeting size and other characteristics defined in Characteristics of Old-Growth Forests in the Intermountain Region (USDA Forest Service, 1993) would meet this criterion for spruce-fir stands.
Engelmann spruce has shifted toward a minor role in the structure of the ecosystem in relation to subalpine fir. Limber pine and aspen, which are more intolerant to shade and competition from other trees, will benefit from reduced competition and increased light due to death of overtopping spruce trees. Some natural expansion of limber pine will occur through natural seeding in open disturbed areas with suitable seed trees. Aspen will expand where competing spruces have died within and on the fringes of existing aspen clones, allowing suckering (sprouting) of the existing root system.

Fire hazards are considered a concern in these forest types during periods of drought and high wind conditions (Bradley, Noste, and Fischer, 1992). An Intermountain Region analysis of properly functioning condition suggests that the spruce-fir forest community should include mixed severity fire regimes on a 50 to 80 year cycle and lethal fire regimes on a 100 to 300 year cycle. Fire should contribute to a mosaic of vegetation (size, species, and structure) that encourages patchy fires and prevents the development of large continuous blocks of homogenous ages and species (USDA Forest Service, 1998b). According to that assessment, ecosystems are considered to be in a properly functioning condition if they are dynamic and resilient to disturbances to structure, composition, and processes of their biological and physical components. Although there is evidence of past fire throughout the project area, no fire history studies have been completed in the area.

The Forest Plan defines suitable timber stands using the following criteria:
1) Able to produce 20 cubic feet or more per acre per year;
2) Capable of being restocked within 5 years;
3) Can be harvested within direction of the Forest Plan (USDA Forest Service, 1996).

Sites meeting these criteria are determined to be suitable for commercial harvest for timber or wood fiber production. All of the forested areas considered for potential silvicultural treatments are suitable for timber harvest, based on average stand productivity figures (1996 South Manti Timber Salvage Sales Environmental Assessment, p. 3-21 and Timber Productivity and Suitability Analysis, project file). Some areas within these stands, approximately 2,311 acres, have been estimated as nonrestockable or unsuitable based on soil suitability and ground conditions that preclude regeneration within five year restocking requirements. Unsuitability does not preclude salvage harvest of dead and dying trees.

Stands within the project area were mature prior to infestation by the spruce beetles. The average stand age was approximately 140 years, with individual trees up to 250 years in age. For the proposed treatment areas, average trees per acre and merchantable volumes per acre of live and dead trees greater than 5 inches in diameter at breast height are displayed in Figure 3-16 Stand Characteristics of Treatment Areas Proposed for Treatment.

<table>
<thead>
<tr>
<th>Treatment Type</th>
<th>Avg. Trees per Acre</th>
<th>Avg. Volume per Acre (MBF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dead Spruce</td>
<td>58</td>
<td>6.4</td>
</tr>
<tr>
<td>Live Spruce</td>
<td>20</td>
<td>4.6</td>
</tr>
<tr>
<td>Total Spruce</td>
<td>78</td>
<td>6.0</td>
</tr>
<tr>
<td>Other Species</td>
<td>32</td>
<td>2.0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>184</td>
<td>17.6</td>
</tr>
</tbody>
</table>

1. Adapted from 1995/1996 treatment area data, trees greater than 5" diameter at breast height.
2. MBF = thousand board feet.
The current spruce mortality rate exceeds 73 percent of the spruce trees within the area (more than 653,000 trees), with approximately 110 MMBF of dead spruce (Figure 3-12 Beetle Induced Spruce Mortality).

Stand development or stand production is directly affected by how well stocked a stand is, or how well the potential growing space in a stand is occupied. Long and Smith (1984) developed a descriptive model that can be used to evaluate stand conditions and stand development within the project area.

Prior to the spruce beetle outbreak, stand conditions were comparable to Long's and Smith's descriptions for Stages C and D of the stand development model. Full site occupancy occurs in Stage C, and density related mortality begins to occur as a stand enters Stage D. Prior to the outbreak, growth rates and tree health of stands in the project area were declining, and density related mortality was occurring in some areas of the stands. This assessment is based on visual signs of older tree mortality, tree decay, root decline, and tree density found in some sites. Site occupancy can normally be regained at this stage. Opening are created by the mortality rate level. The sites are then quickly occupied by the expanding crowns and root systems of residual trees.

Stand inventory data indicates that as individual stands were infested and extensive mortality began to occur, they moved into a condition comparable to Stage E of the stand development model. This stage is characterized by high mortality and decreasing growth. As mortality occurs, large gaps are created, and the site or stand cannot be fully occupied until regeneration occurs (natural or artificial). Stand production is substantially below the site's potential to produce. The ability of the stands to recover to pre-infestation conditions has been severely limited by the loss of the larger diameter spruce trees. Currently, few dominant or codominant spruce 15 inches in diameter at breast height or larger are left in many areas to provide a viable seed source for natural regeneration of spruce (Alexander, 1987). Although spruce and subalpine fir can begin producing cones at heights of 4 to 5 feet in height, sapling, pole, and small sawtimber size trees are generally poor seed producers.

Increases in herbaceous material in affected stands following the epidemic also limit natural regeneration and seedling growth (Schmid and Hinds, 1974). Increased levels of light, nutrients, and moisture available to understory shrub, forb, and grass vegetation will substantially increase growth of these herbaceous species, reducing and inhibiting tree seedling establishment and subsequent seedling distribution within these stands. Scarification or other site preparation measures may be necessary to reduce competition to allow seedling establishment after forb, shrub, and grass species have begun to dominate openings.

In the project area, epidemic spruce beetle activity has significantly reduced stand development, growth, and production levels from pre-epidemic conditions. The loss of large-diameter spruce will continue in infested areas as long as susceptible hosts and viable spruce beetle populations exist. The spruce beetle-induced mortality has resulted in the natural and artificial replacement of the sawtimber size spruce component with shrubs, forbs, grasses, or trees. Replacement occurs as spruce trees die and the openings they leave are filled through foliage and root expansion, natural seeding, sprouting, or planting of trees. The created gaps cannot be fully occupied until reforestation occurs through natural regeneration or planting. Spruce mortality has caused extensive reduction in the area fully occupied by growing trees.
The mature, large-diameter live trees that remain as the epidemic passes include subalpine fir, localized clones of aspen, and minor amounts of limber pine, Douglas-fir, and Engelmann spruce.

Salvage and rehabilitation treatments have been initiated within 2,447 acres of the project area, as previously described. Treatment includes planting of Engelmann spruce seedlings on 1,055 acres. This includes the 536 acres in the Timber Canyon and Twelvemile timber sales and 505 acres within the 1996 South Manti Salvage Sales.

Approximately 3,021 acres of the 6,349 acres proposed for treatment by this planning effort are considered to be poorly stocked and in need of reforestation treatments at this time. During stocking surveys of the existing salvaged spruce sites, moderate to high populations of pocket gophers were noted in some areas (see project record).

A noxious weed is defined as a plant that is extremely prolific, invasive, competitive, harmful, destructive, and difficult to control. It is also a plant that has been designated by legislative action for control. Based on the annual Forest noxious weed report, about 19,600 acres of the Forest are infested with noxious weeds.

Musk thistle (Carduus nutans), White tup (Cardaria draba), and Canada thistle (Cirsium arvense) are the three noxious weeds known to occur within the project area. Known musk thistle locations include sites near Spidners Reservoir, Ferron Reservoir, the head of Sollyme Canyon, Millfork Canyon, and Twelvemile Canyon. White top sites can be found west of Julius Flat Reservoir, Twelvemile Canyon, and the head of Sollyme Canyon. Canada thistle infestations are usually associated with wetland/riparian areas. It is likely other areas within the project area are infested. All of these weedy plants have the potential to grow in a wide variety of habitats and can reseed rapidly into disturbed sites.

About 500 to 600 plant species occur within the project area. Of these, only one, Heliotrope milk-vetch is listed as a threatened plant species, *Astragalus montis*. Information regarding this species and potential effects is contained in Appendix J - Biological Assessment. There are no endangered plant species within the project area.

Four plant species within the project area are listed as Forest Service Region 4 sensitive: Carrington daisy (*Euryops carthamoides*), Arizona willow (*Salix arizonica*), Maguire campion (*Silene petersonii*), and Musinea groundsel (*Senecio musinei*).

Carrington daisy have been found in small isolated populations mostly on Flagstaff Limestone Formation outcrops at the head of Cove Creek, on top of East Mountain, at the south rim of Heliotrope Mountain, and on top of Ferron Mountain. This plant is associated with a low forb vegetation type.

Arizona willow can be found within a perennial wet meadow at the head of the Muddy Creek drainage. The plant typically grows to two to three feet tall.

Scattered populations of Maguire campion have been found mostly on Flagstaff Limestone Formation outcrops on high elevation ridges and snowdrift sites from Wagon Road Ridge south to the top of White Mountain. There is also a small population of Maguire campion on Mount Baldy and Black Mountain. This plant is part of the subalpine low forb plant community.

Musinea groundsel can be found on open tops on Flagstaff Limestone Formation barriers, such as Heliotrope Mountain, and possibly on Mount Baldy and White Mountain.

REGULATORY FRAMEWORK

Under the Endangered Species Act, it is Forest Service policy to analyze potential impacts to threatened and endangered species (refer to Appendix J - Biological Evaluation). Although not required under the Endangered Species Act, it is also Forest Service policy to analyze potential impacts to species proposed by the Fish and Wildlife Service for listing as threatened or endangered and sensitive species (USDA Forest Service, 1995b). Sensitive species are those identified by the Forest Service Regional Forester as, "those species for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density" or "significant current or predicted down-bold trends in habitat capability that would reduce a species' existing distribution," (USDA Forest Service, 1995b).

3.7 FUELS/FIRE

The Manti Division of the Manti-La Sal National Forest encompasses about 800,000 acres of which approximately 65,000 acres consists of private lands inside the Forest Boundary. Fire occurrence on the Manti Division averages about 20 fires per year. Of those 20 fires, 3 (15 percent) are person-caused and 17 (85 percent) are ignited by lightning.

There has been an average of one ignition per year over the past 28 years within the project area. Typically, due to direct suppression and/or wet conditions, these fires rarely reach more than one acre in size (the largest fire in the past 28 years in the project area is 1 acre). There is no indication that ground fires have burned through this area for several decades (Fire History Data, Project File).

Historically, severe fire activity in spruce-fir stands resulted in stand replacement. Evidence of this is exhibited by the lack of climax condition stands. During low fire severity periods (wet conditions), fire did not carry well through the existing fuels and the spruce-fir stands were generally not directly impacted by fire. No substantial fires have occurred in this area in the last 75 to 100 years. There is some indication of small fires that appear to have burned themselves out (less than 0.25 acre in size).

Grazing in the area has reduced the fine fuels. The reduced amount of fine fuels may have kept ground fires from spreading. However, the fine ground fuels at these high elevations often do not cure sufficiently to carry a ground fire during the summer months. The first hard frost in the late fall usually begins the curing process. Perennial grasses and forbs cure out before the fall in extreme drought years, which occur approximately 10 to 15 percent of the time.

The Forest Service Suppression Tactics Reference Guide describes Spruce-fir forest as a "fuel type that occupies a relatively large area at higher elevations within the Southern Rocky Mountains. Team action fires occur here about 5 percent of the total time and are difficult and expensive to suppress. These high elevation communities are comprised of Engelmann spruce and subalpine fir...Elevation of these communities is 9,000 - 12,500 feet. ." It also describes the Flattops Wilderness area that suffered a spruce beetle epidemic that resulted in high spruce mortality. The area is one with large quantities of large snags and heavy fuels loading. "Fires in this area are extremely difficult to control...and pose extreme safety hazards to fire fighters who are on the line." These relationships would be comparable to the S. Manti project area.

There are four basic factors important to forest susceptibility to wildland fire and the results of fire impacts: fire susceptibility of the different species, stand structure, fuel moisture and existing fuel loading.
Fire Susceptibility

Bradley (1992) provides a thorough discussion of how fire affects tree species found within the project area. In general, the relative resistance of a tree species to fire, from highest resistant to lowest resistant, is limber pine, Engelmann spruce, subalpine fir, and aspen. For example, if a stand consists of aspen and subalpine fir, there will be a high mortality rate to these trees even with a low to moderate fire intensity. Subalpine fir is less resistant than spruce. The subalpine fir stands affected from spruce beetle activity could be slightly more susceptible to damage and mortality from wildland fire than the previous spruce-fir stands. Subalpine fir is slightly more fire resistant than aspen. Although aspen is susceptible to fire damage, it typically sprouts back and recovers quickly after a fire.

Stand Structure

The dominant forest cover or community type has shifted from a spruce-fir mixed forest to a forest dominated by subalpine fir. The forest structure has shifted from multi-storied to more open conditions. Prior to the spruce beetle epidemic, the dominant structure of infested stands was uneven-aged and multi-storied with several age and height classes. Approximately 80 percent of the forest structure was multi-storied (9,331 acres). Infested stands have generally shifted towards a more open structure as a result of beetle-induced mortality. Modelling predicts that the beetle caused spruce mortality could leave approximately 40 percent of the stands as multi-storied (3,542 acres). Exceptions would occur in stands and areas where subalpine fir is a major component of the stand structure (Figure 3-11).

The three primary Fire Groups represented within the project area include: the Dry Lower Subalpine Habitat Types (Group 10); the Moist to Wet Subalpine Habitat Type (Group 11); and the Colder, Upper Subalpine Habitat Types (Group 12).

Comparing the successional trend pathways for Fire Groups 10, 11, and 12 to the existing vegetative conditions in the project area, the spruce/subalpine fir overstory (70 percent or more) is past mid-successional levels for these fire groups. Forests with a strong component of aspen in the overstory (50 percent or more), coupled with invading sub-alpine fir, is indicative of stands quickly approaching the mid-successional level. The forested acres with heavy spruce tree mortality will be converted back to the early mid-successional stages for these Fire Groups.

The development of more multi-layered canopies creates a high vertical continuity of fuels. This vertical continuity of fuels creates a potentially high risk of spread from crown fires. This high crown fire risk is a key element for the potential for stand replacement wildland fires. Stands within the project area that are dominated by mature spruce and subalpine fir 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. 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.

Fuel Moisture

The moisture of the dead, down fuels in the spruce/fir type is typically higher than that of either the mixed conifer or pine type. This higher dead, down fuel moisture is the primary reason for the very long stand replacing fire frequencies in the project area.

The canopy closure of a mature healthy forest stand tends to maintain a more constant dead, down fuel moisture and temperature both seasonally and diurnally. This is due to the shading of the dead, down fuels from solar radiation.

In areas of heavy spruce mortality, there will be larger and additional openings created and will result in a greater amount of solar radiation reaching the surface fuels. The amount of evaporation from these fuels will gradually become greater as the needles fall from the dead trees. The additional solar radiation will dry the dead, down woody fuels more than in a normal healthy stand.

An opposite effect can be expected on the soil moisture and ground fuels. Soil moisture will increase due to the increase in total transpiration. The increase in soil moisture in these openings will more moisture available for perennial grasses, forbs, and shrubs than there was prior to the beetle epidemic and spruce mortality.

Existing Fuel Loading

Current fuel loading within the project area varies from approximately 10 to 32 tons per acre of down fuel, with an average of approximately 22 tons per acre. The average size of the existing ground fuels is generally greater than 3 inches in diameter. Sample plots were measured in the field during the summer of 1999 using the Planair Intersect method. Photos were taken depicting the representative downed fuel loading. Photos were also taken in the treatment areas. The two photo groups were compared and all the treatment areas were placed in a representative Fuel Loading Group based on similar current fuel loading and stand structure (Figure 3-17 Fuel Loading) (project record).

Fuel Loading Group 1: A1, A3, A6, C3, C8, C9, D2, E1, E4, G1, G2, G3, G4, G6
Fuel Loading Group 2: A7, A8, A9, C1, C10 C4, C7, D1, D3, D4/S4/5 E2, E3, F1, G5
Fuel Loading Group 3: B4, F3

Figure 3-17 Fuel Loading-1999

<table>
<thead>
<tr>
<th>Fuel Loading Groups</th>
<th>Fuel Load, 1-Hr, &lt;3 in. dead, tons/ac</th>
<th>Fuel Load, 10-Hr, &lt;3 in. dead, tons/ac</th>
<th>Fuel Load, 100-Hr, &lt;3 in. dead, tons/ac</th>
<th>Fuel Load, &lt;3 in. dead, tons/ac</th>
<th>Fuel Load, Total dead, tons/ac</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Hr.</td>
<td>0.47</td>
<td>0.95</td>
<td>1.79</td>
<td>3.17</td>
<td>7.0</td>
</tr>
<tr>
<td>3.57</td>
<td>3.28</td>
<td>2.88</td>
<td>4.53</td>
<td>8.26</td>
<td>14.53</td>
</tr>
<tr>
<td>4.44</td>
<td>1.99</td>
<td>1.83</td>
<td>3.37</td>
<td>6.82</td>
<td>12.82</td>
</tr>
</tbody>
</table>

Fuels less than 3 inches in diameter are important for fire behavior estimations. Fuels greater than 3 inches are important for resistance to control estimations.

As previously discussed, the stand structure is changing due to the high mortality of the spruce component. Studies of dead standing spruce on the White River National Forest have shown that within 20 years after dying, 72 percent of the beetle killed trees of all sizes were still standing and 28 percent were down (Journal of Forestry, 1950). Studies of dead standing spruce on the Dixie National Forest have shown that within 25 years after dying, 84 percent of the beetle killed trees of all sizes were still standing and 16 percent were down (Journal of Forestry, 1950).

Within the project area 2,447 acres of harvest operations have occurred to date. These areas have had a significantly reduced potential fuel loading due to the harvest methods employed, mostly whole tree tract yarding. This method removes both the less than 3 inch material as well as the greater than 3 inch material. These areas have been manipulated into a low Fuel Model 8 for fire behavior.
The potential for large fires in spruce fir stands due to beetle infestations can increase over time but it is not as serious a problem as it can be in other timber types like lodgepole or P. ponderosa pine. J. M. Schmid and T. E. Hinds in their paper Development of Spruce-Fir Stands Following Spruce Beetle Outbreaks (December 1994) state the following: "... widespread fire seems to be a rare event in the spruce-fir type. ... Although the beetle-killed snags are a potential lightning rod and the massive number of dead trees has created a large fuel buildup, ... the accompanying rainfall apparently dampens the surrounding vegetation enough to prevent development of widespread fire. ... Consequently, it has been concluded that fire events are rare in these areas, and they would need low humidities associated with higher temperatures and wind for a large, intense wildland fire to occur.

3.8 WILDLIFE RESOURCES

The Forest Service Manual (USDA Forest Service, 1995b) and the Forest Plan (p. II-22) state that wildlife habitat should be maintained to provide for viable populations of existing and approved introduced wildlife species.

MANAGEMENT INDICATOR SPECIES

Deer and Elk

The herd

The Forest Plan identifies the following terrestrial and avian management indicator species: mule deer, elk, blue grouse, and golden eagles.

Deer seasonally use the project area. The deer found in the project area are part of a greater Manti herd. Deer populations are below herd objectives, but are steadily increasing (Jones, 1998).

An elk herd of about 2,500 animals is also found within the project area and is part of a larger Wasatch Plateau elk herd of more than 11,000 animals (Jones, 1998). This is part of the largest elk herd in the State of Utah. Approximately 20 percent of the total elk harvested in the State comes from the Wasatch Plateau. In the project area, elk generally use late spring, summer, and fall habitat within the upper reaches of Ferron Canyon, Twelve Mile Creek, Timber Canyon, and the Muddy Creek drainage.

Economically, the South Manti herds provide great hunting and viewing opportunities for many recreationists throughout the State. According to the Utah Big Game Annual Rapport (1995), it is estimated that more than 1,100 people hunt elk within the project area for a total of more than 3,500 hunter days. A similar number of people hunt deer in the project area for about half the number of hunter days as for elk. The number of hunter days is generally weather dependent for deer and elk hunting.

Habitat

Within the project area, late spring, summer, and fall habitat primarily provide hiding/security cover and forage for deer and elk summer range (Jones, 1998). Hiding cover is defined as vegetated areas where brush/trees are tall or dense enough to hide 90 percent of an animal (in this case, deer or elk) at 200 feet. Forage is defined as natural openings, burns, or harvested areas which provide an adequate level of browse and non-woody plants for food.

Hiding/security cover is the primary habitat provided by the stands of trees within the project area. The stands of conifer/aspen provide both forage and cover, while stands of conifer provide mostly cover. However, the function of the conifer trees has decreased due to the loss of the overstory canopy because of spruce beetle-induced mortality. Recent wildlife surveys (1998) have found deer and elk occupying these habitats. Survey observations recognized that slash, downed logs, and other woody material (at forest edges, especially within the conifer/aspen areas) are important to deer, elk, and their young for providing additional cover/hiding/security areas. Even prior to the spruce beetle infestation, the amount of cover in the project area was limiting during the general elk hunt. During this hunt, elk have been known to move to lower elevations off the Forest to avoid hunters (Jones, 1998).

There is no winter range in the project area. Portions of conifer/aspen and aspen stands that are near water are especially important during the early spring and early fall, as drying and calving habitat. Most of these areas are found at mid-elevations which occur generally outside the treatment areas. In the calving and fawning areas, cows and does give birth and the young spend their first few critical weeks of life.

Cover/Forage Ratios

For big-game, the Forest Plan states 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 foraging." Currently, the project area contains 48 percent cover (hiding and thermal) and 52 percent forage. This meets Forest Plan direction. However, the spruce beetle infestation is rapidly changing the stand structure within cover habitat areas due to the loss of crown cover by spruce tree mortality. Schmid and Frye (1977) state that deer and elk can benefit from the loss of canopy cover because forage production increases. However, such a benefit is important only in areas, and at times, when forage is limiting. Forage is not limited in the project area. Therefore, for the project area, the adverse effect of reduced cover (increased vulnerability) is not counter balanced from an increase in forage.

Habitat Effectiveness/Road Density

During the summer, big-game prefer habitats where they are least disturbed. Vehicles are a major disturbance to big-game. Studies have shown that big-game will avoid areas up to one half mile wide on each side of a road. This distance depends on topography, existing vegetation, and vehicle use level of the road. Avoidance of this habitat decreases the effectiveness of the habitat in providing big-game needs. A variety of habitat effectiveness models have been developed to predict this avoidance of areas by big-game (Lyon, 1979).

Within the project area there are 94 miles of Forest Development Roads, nonsystem roads and trails, and motorized system trails. This road access coincides with a road network density of about 2.4 miles per square mile. High road densities increase elk vulnerability during the hunting seasons. Increased vulnerability leads to fewer and younger bucks and bulls, and lower male to female ratios in the herd. In a 1987 survey of Utah hunters, the majority of hunters indicated that they would prefer reducing hunting pressure if it created a scenario by where the subsequent harvest had a higher proportion of mature deer (Austin and Jordan, 1989).

Blue grouse can be found year round in much of the area. Stands of trees that are adjacent to open sagebrush/grass/forb vegetative types are particularly important for blue grouse during the mating season. Aspen habitats are most important to blue grouse as brooding areas during the later summer and fall. During the breeding season, dense understory within aspen stands is essential. Insects are abundant, and cover and security is available for nestling (Bunnett, 1978). During the winter, mature stands of fir (especially Douglas-fir) provide food and protection from the elements. Because of the preference for Douglas-fir, which is found mostly at mid-elevations, populations of blue grouse are more dense at lower elevations than they are in the project area.
Golden Eagles

During the late spring, summer, and fall, golden eagles can be seen in the area. Some foraging opportunities are available within the area for golden eagles. No eagle eyries have been found in or near the project area. It is suspected that eagles observed in the area come from nesting sites along the cliffs at lower elevations to the west and east. Eagles are opportunists, feeding on a variety of prey. Main sources of prey found within the area are rodents or other small mammals such as hares and rabbits. This prey can be found in open and forested habitats. In the general area of southeastern Utah, golden eagle populations appear to be increasing (Utah Division of Wildlife Resources, 1990).

TREE CAVITY DEPENDANT SPECIES

Specific surveys have been conducted for Three-toed woodpeckers within the project area. Accidental observations have documented the presence of other cavity nesters within the area. Cavity nesters most commonly found in the project area include: Northern flickers, yellow-bellied sapsuckers, Northern three-toed woodpeckers, tree swallows, hairy woodpeckers, downy woodpeckers, and mountain blue birds (District files). It is assumed that these species occur in the area on a regular basis, even if at low numbers. Toone (1992) conducted a general survey for three-toed woodpecker within the Muddy Creek drainage. Survey results identified numerous three-toed woodpeckers as well as hairy, downy woodpeckers, and yellow-bellied sapsuckers (See the following section on sensitive species for more information about the Northern three-toed woodpecker).

The cavity nesters in the area use mostly large snags in forested areas of mixed conifer, conifer/aspen, and aspen to nest and forage. Suitable habitat for cavity nesters is widely present across the project area, including aspen areas which some nesters prefer. The spruce beetle infestation has created over 11,000 acres of prime nesting and foraging habitat across the area. Recent salvage harvest of beetle killed spruce has slightly reduced the available snag habitat. Management strategies for tree cavity dependant species have been aimed at maintaining or retaining suitable habitat in areas associated with recent harvesting.

PROPOSED, THREATENED, AND ENDANGERED ANIMAL SPECIES

There are six vertebrate Forest Service Region 4 sensitive species known or suspected to occur on the Manti Division: peregrine falcon (Falco peregrinus), spotted bat (Sturnira maculatum), Townsend's Big-eared bat (Corynorhinus townsendii), southwestern willow flycatcher (Empidonax velox), Northern goshawk (Accipiter gentilis), and Northern three-toed woodpecker (Picoides tridactylus)

Peregrine falcon

Peregrines occupy a wide range of habitats. They are typically found in open country near rivers, marshes, and coasts. Cliffs are preferred nesting sites, although reintroduced birds now regularly nest on man-made structures such as towers and high-rise buildings. Peregrines are known to travel more than 18 miles from the nest site to hunt food. However, a 10 mile radius around the nest is an average hunting area, with 80 percent of the foraging occurring within a mile of the nest. Peregrine falcons prey on a wide variety of birds including shorebirds, waterfowl, grouse, and pigeons (Rasciaf, 1980).

Peregrine falcons have recovered to a level of approximately 160 eyries in the state of Utah. Well above the 21 active eyries set as a goal for Utah by the Utah Peregrine Falcon Recovery Plan. Migrating or transient, peregrines have been seen on the Wissat Plateau. In 1996, surveys conducted by U.S. Forest Service, Utah Division of Wildlife Resources, and PacifiCorp Company discovered peregrines exhibiting nesting behavior in Cottonwood Canyon (approximately 4 miles east of Joe's Valley Reservoir). The pair was observed copulating and defending a territory however, egg laying and incubation did not occur at this site. Additional surveys (1996) conducted by Forest Service personnel found a pair of peregrines occupying a territory on the east rim of South Horn mountain (approximately 6 miles southeast of Joe's Valley Reservoir). This pair was found using the cliff systems directly below the existing electronic site. In 1996 the Utah Division of Wildlife Resources discovered an active peregrine nest near the Star Point Mine (approximately 10 miles southeast of Price, Utah). The nest was occupied with eggs but a is not known if the nest produced young. Other nest observations are found in the area on a regular basis. In 1977 D. Fenton found a pair of peregrines nesting near the South Rim of the black sand basalt head wall. Peregrine falcons nesting in the South Manti timber sale area. Nesting habitat is very limited. Any birds observed in the analysis area would be incidental.

Spotted Bat

Spotted bats occur in scattered areas throughout Utah. They have been found in a variety of habitat types including open ponderosa pine, desert scrub, pinyon-juniper, open pasture and hay fields. They roost alone in rock crevices high up on steep cliff faces. Cracks and crevices ranging in width from 0.8 inches to 2.2 inches in limestone or sandstone cliffs are critical roosting sites. There is some evidence that individuals show fidelity to roost sites. Spotted bats are territorial and avoid each other while foraging. They are thought to migrate south for winter hibernation. Spotted bats are rare and may be limited by suitable roosting sites. They are found relatively remote, undisturbed areas, suggesting that they may be sensitive to human disturbance. Little is known about the spotted bat's food habits. They are thought to feed primarily on moths. Their echolocation call is very effective for fast flight feeding on moths. They forage alone, after dark, and avoid each other by listening to the echolocation calls of others (Leonard and Fenton 1983, Woodworth et al., 1981; Watkins, 1977).

In the summer of 1997, surveys detected spotted bats within the following areas outside of the project area: Mill Fork Canyon, Crandall Canyon, Biddlecome Hollow, Tie Fork, Huntington Canyon, and Bear Creek Canyon. Although these areas are outside the project area, they are within the Wissat Plateau where most suitable habitat exists. To date, the only known sightings of spotted bats located in the South Manti area have been at Emerald Lake. It is believed the bats located at this site roost in the limestone cliffs found throughout the area.

Except for some available limestone cliffs found throughout the area, the treatment areas do not contain much suitable roosting habitat. Only about 2 to 5 acres of rock/cliff habitat may support roost sites within the Camel Rock quarries, which have been used as a source of road gravel (Camel Rock Quarry Biological Evaluation, 1997).

Spotted bat foraging habitat is associated mainly with riparian areas. Such sites can be found within the project area. Foraging is probably the primary use the spotted bat will exhibit within the area.
Townsend's Big-Eared Bat (Western Big-Eared Bat)

Townsend's big-eared bat uses a variety of scrub and disturbed habitat throughout Western North America. These bats use ponderosa pine forest, shrubsteppe ground cover, and coniferous forests, and mixed coniferous forest throughout much of the greater Yellowstone area. They may also use tools such as nests, mine entrances, and buildings for roosting and hibernation. They are often found in large numbers on structures, open woodlands, along forest edges, and over water. Townsend's big-eared bat occurs throughout Western North America including Utah. During the winter they roost singly or in small clusters. They remain at these sites from October to February. Migration for these bats usually means a change in location in the same cave or to another nearby cave.

The Townsend's big-eared bat is very sensitive to human disturbance. It will readily abandon roosts when disturbed. Activities that will or may disturb caves or mines should be evaluated to determine potential impacts to this species (Kunz and Martin, 1982; Utah Division of Wildlife Resources, 1990).

Bat surveys in the last two years on the Forest have not located any Townsend’s big-eared bats (Johnson et al., 1997). This bat has been documented using inactive coal mines as hibernacula on the District and they have been found roosting in buildings in the town of Ferron. Limited surveys within the project area resulted in no findings of the Townsend's big-eared bat. However, it is possible that they utilize the area at least seasonally for foraging and roosting.

Flammmulated Owl

Flammmulated owls are found throughout the western United States including Utah. They can be found in the mixed pine forests, from pine mixed with oak and pinyon at lower elevations to pine mixed spruce and fir at higher elevations. Flammmulated owls have also been found in aspen and second growth ponderosa pine. However, they prefer mature ponderosa pine/Douglas-fir forests with open canopies. Large diameter dead trees with cavities are important nest site characteristics. They avoid foraging in young dense stands where hunting is difficult. Flammmulated owls are dependent upon mature conifer stands for nesting. They are also known to avoid open, recently logged areas. Flammmulated owls are almost exclusively insectivorous, preying on small to medium sized moths, beetles, caterpillars, and crickets (Reynolds and Linkhart, 1987; Johnsgard, 1998; Bull et al., 1990).

Flammmulated owls have been found in the Quinlan drainage and the head of the Muddy Drainage on Ferron/Price Ranger District. All but one of these locations have been associated with ponderosa pine. The location in the head of the Muddy Drainage is within the project area. This sighting was a vocalization believed to be from a flammmulated owl, that was heard while conducting owl surveys. This "sighting" was not confirmed visually.

Nesting habitat can be found in some areas where spruce stands contain Douglas-fir. These areas are usually located along ridge-tops and upper slopes. The best habitat found in the project area for nesting owls is in the only stand of Douglas-fir near Julis Flat Reservoir (in the southern portion of the project area). Spruce beetle-induced tree mortality, which causes a change in stand canopy, may have reduced habitat by creating a closed understory condition that is not favored for foraging.

Northern Goshawk

Goshawk forage and nest in dense forest settings. Goshawks have been found in a variety of forest ecosystems including lodgepole pine, ponderosa pine, Douglas-fir, and mixed forest throughout much of the Interior Plateau. They may use small mammals and birds (rabbits, squirrels, chipmunks, grouse, woodpeckers, jays, robins, grosbeaks, etc.). Goshawk nest sites are usually located in mature forests near water, and on branches of relatively little snags. Nests are often used year after year. Goshawks are very protective of their young in the nest and loudly defend them to intruders. They are very sensitive to human disturbance and have abandoned nests and young due to human activities that take place too close to their nest (Kennedy and Stahlecker, 1993; Hennessey, 1978).

Goshawks are a summer resident of the Wasatch Plateau, with the number of nesting birds varying from year to year. Nest sites on the Plateau are typically associated with seral aspen forest types. Seventeen percent of the project area contains suitable Goshawk habitat. Surveys have found two nest territories with multiple nests within the project area. Other nest sites have been located on the project area but it is not known for sure which raptor species have utilized them. It is possible that additional territories have been established in the area as well.

Range and timber management are the primary resources emphasized by the Forest Plan within the project area. These management actions can decrease goshawk habitat by removing cover and food for prey species and removing large trees for nesting purposes. Also, these actions can indirectly interfere with fire regimes and natural forest succession. In order to address the current management direction in regards to the goshawk, the Forest Service will employ the recommendations in the Conservation Strategy and Agreement for the Management of Northern Goshawk Habitat in Northern Utah (USDA Forest Service, 1999) as a tool to conserve, restore, and protect native processes and disturbed habitats.

Northern Three-toed Woodpecker

Three-toed woodpeckers range across North America. They are found in northern coniferous and mixed forest types up to 9,000 feet in elevation. Forests containing spruce, grand fir, ponderosa pine, tamarack, and lodgepole pine are used by these birds. Nests may be found in spruce, tamarack, pine, cedar, and aspen trees. About 75 percent of their diet is wood-boring insect larvae, mostly beetles, but they also eat much larvae. Although three-toed woodpeckers are major predators of the spruce beetle, they are not effective in significantly reducing epidemic population levels. They forage on a wide variety of tree species depending on location. In Colorado, they prefer to forage on old-growth and mature trees. Fire or insect killed trees are major food sources. Forest fires and areas of insect outbreaks may lead to local increases in woodpecker numbers after 3 to 5 years (Bull et al., 1986; Scott et al., 1980).

Prior to the current spruce beetle outbreak, suitable habitat for the three-toed woodpeckers was present throughout the area in spruce/fir and conifer/aspen stands, most likely associated with small, localized areas of insect activity. In addition, woodpecker activity is present in trees killed by other factors like root rot or fire. The spruce beetle outbreak has created over 11,000 acres of prime three-toed woodpecker habitat across most of the area, and it is expected that colonization to the area will continue within the near future. To this point, of the 11,490 naturally created habitat, approximately 2,447 acres have been or will be harvested. Management strategies have been aimed at maintaining or retaining suitable habitat in places associated with harvested areas.
Neotropical Migratory Birds

Neotropical migratory birds are species that nest and, as a young in North America and migrate to tropical areas in Mexico, the Caribbean, and Central and South America in the winter. These forest birds play an important role in the control of forest insect populations. Many of these species depend on interior forest conditions to provide for their habitat needs. Approximately 150 species, including numerous warblers, vireos, tanagers, grosbeaks, thrushes, hummingbirds, wrens, and thrushes migrate through or winter in more than a dozen countries.

A large landscape-level Neotropical bird survey was conducted on the Ferron District in 1993 and 1994. Neotropical migratory birds can be found within the project area. Songbirds were mostly found within forest edges (especially aspen/conifer) using the thick understory for nesting and foraging. The larger trees were used for perching and escape. A large variety of birds were found to be more concentrated in those areas.

3.9 TRANSPORTATION

The area of analysis for transportation planning contains 70 miles of Forest Development Roads (FDR), 19 miles of nonsystem roads or trails, and 5 miles of motorized trails in an area of 38.4 square miles. The Forest Development Roads consist of arterial, collector, and local roads. The Forest Development Trails are managed for motorized use. The nonsystem roads and trails were developed by motorized vehicle use.

The Ferron-Mayfield Road (FDR #50022) provides east-west access across the Forest between the towns of Ferron and Mayfield. This road currently carries an average of 200 vehicles per day on the west side and between 24 and 49 vehicles per day on the east side. The dividing point between east and west is Twelvemile campground. Use on the west side is estimated at 50 percent recreation, 17 percent fuelwood use, 15 percent wildlife activities, and 8 percent timber uses. Use on the east side is 87 percent recreation, 3 percent fuelwood activities, and 10 percent timber activities.

Traffic Uses

The Skyline Drive (FDR #50152) currently carries an average of 100 vehicles per day on the south side and between 23 and 33 vehicles per day on the north side. The dividing point between east and west is Twelvemile campground. Use on the south side is estimated at 65 percent recreation, 25 percent range, and 12 percent logging activities. Use on the north side is estimated at 68 percent recreation, 7 percent fuelwood activities, and 25 percent range activities.

The Link Canyon Road (FDR #50044) currently carries between 1 and 13 vehicles per day. Estimated traffic use is 30 percent recreation, 12 percent fuelwood activities, and 5 percent range activities.

The Six Mile Road (FDR #50047) currently carries between 4 and 17 vehicles per day. Estimated traffic use is 71 percent recreation, 10 percent fuelwood activities, and 19 percent range activities.
South Manti Timber Salvage Final Environmental Impact Statement
Chapter 3 - Affected Environment

The Duc-Fork Road (FDR #50049) is a higher volume local road that currently carries up to 17 vehicles per day. Estimated traffic use is 84 percent recreation, 4 percent fuelwood activities, and 12 percent range activities.

The remaining open local roads have traffic volumes of under 10 vehicles per day, with peak use occurring from recreation activities during the Big-game hunting seasons.

There are 5 local roads which are under the road management strategy "level 1", meaning they are closed to public use. They are FDRs #51278, #51280, #51281, #51282, and #52059.

Existing Aggregate Sources and Use Status

Three existing aggregate sources are located within the project area: Camel Rock North, Camel Rock South, and Baseball Flat source. Camel Rock North (located in Township 19 South, Range 4 East, section 38) occupies approximately 4.5 acres. Camel Rock North is currently inactive and scheduled to be reclaimed. This source has been exhausted and will no longer serve as a source of aggregate. Camel Rock South (located in Township 19 South, Range 4 East, section 33) occupies approximately 4.5 acres. This source was entered in 1997, 1998, and 1999 to quarry and process rock for road surface courses. The Baseball Flat aggregate source (located in Township 20 South, Range 4 East, section 19) has been developed since 1994.

Travel Time, and Delay

On FDR #50022, the Ferron-Mayfield Road, travel time is approximately 1 hour from Mayfield to the Twentymile Campground. A traveler can expect less than minute delay per hour of travel due to encounters and needing to pull over for passing.

Existing Haul Route

FDR #50022, from Ferron Reservoir to Mayfield, is the arterial serving the Baldy, Six, and Duck Timber Sales. Roadsides improved and additional aggregate was placed in 1997, 1998, and 1999. This section of road has aggregate surfacing from the west Forest boundary to approximately 3.5 miles beyond Twentymile Flat campground. The collector road serving these sales is FDR #50150. Recent improvements include additional roadsides turned, replaced culverts, and aggregate surfacing. Approximately 0.7 miles of local FDR #50044 received similar improvements.

Forest Development

In addition to roads, there are three established motorized system trails with a combined mileage of approximately 5 miles in the project area that are used by recreation traffic: Trail #003, Trail #122, and Trail #007. Trail #003 is within treatment areas D4 and D5 (1.8 miles). Trail #007 is adjacent to treatment area F3 (1.3 miles). Trail #122 generally resides within treatment units G1 and G2 (1.4 miles). It is estimated that on 3 to 5 people use these trails per day as they are used during the Big-game hunting seasons.

User Access

Forest visitors can usually access the higher elevations on the Forest between July 1st and October 31st. Snowdrifts can inhibit or restrict access, and may sometimes be found beyond July 1st. Early snows can also close people out prior to October 31st.

Vehicle travel off roads is common during State and Federal holidays and big-game hunting seasons. Each year some roads are illegally lengthened or created by forest users. Based on a 1995 GPS survey and localized 1997 orthoquad analysis, there are approximately 19 miles of nonsystem roads/trails across the project area which are not needed for future resource management.

There are four cattle and eight sheep allotments that occur, partially or wholly, within the project area. A total of 3,377 cattle and 9,223 sheep graze on these allotments during the grazing season (6/20-9/30) for a total of 32,496 Animal Unit Months (AUMs) of use.

These livestock are owned and managed by 77 permittees, mainly from the communities of Emery, Ferron, Manti, and Mayfield. It is estimated the forage produced on the Forest

provides 25 percent of the yearly forage needs for the base herd and 50 percent of the forage needs for the calf and lamb crop. This high percentage of the required forage is critical in order to maintain livestock operations for most operators. The livestock grazing allotments within the project area are listed in Figure 3-18 Range Allotments.

3.11 VISUAL LANDSCAPE

Some of the VQOs assigned by the Forest Plan allow a noticeable degree of change from the existing condition. Three VQOs assigned by the Forest Plan exist within the project area. Retention (management activities are not visually evident to the casual observer), Partial Retention (management activities may usually be subordinate to the characteristic landscape); and Modification (management activities may visually dominate the landscape, but must borrow from naturally established form, line, texture, and color so that they appear natural to the observer). Forest resource uses or activities should meet the adopted VQO as displayed on the Forest Plan Planned Visual Quality Objective Map, design and management activities should be implemented to blend with the natural landscape (Forest Plan, p. III-17).

Visual sensitivity usually varies along any travel corridor. Exceptional views are available from Skyline Drive (FDR #50150), portions of the Great Western Trail, the proposed Castle Valley ATV Trail System, the Ferron-Mayfield road (FDR #50022) near Ferron Reservoir and Willow Lake, and at points above lakes and reservoirs, deep or expansive drainages, and steep facing slopes. Views from areas of concentrated recreation use (both dispersed and developed) outside of these travel corridors have been classified relative to those who may be camping, viewing, or enjoying the view from their cabin window. Sites of this type are Duck Fork Reservoir, Emerald Lake, Blue Lake, the Ferron Reservoir Recreation Complex, and Twentymile Flat Campground.

In summary, the views associated with major roads and trails in the area have high visual values. They are characterized by mountainous terrain which includes rock formations and glacial cirques, panoramic ridge and valley views (some containing lakes or reservoirs), and wildlife resulting in attractive, yet accessible, subalpine scenery. Lands adjacent to these corridor views are also considered for timber management due to passing degrees of visual sensitivity due to potential recreation use.
3.12 Undeveloped Character

Undeveloped Character is the sense of remoteness and isolation a person may feel by the absence of people and their associated activities. Indicators of this condition are demonstrated by the presence or absence of motorized access network densities (roads and trails), past and current harvest activities, improvements associated with cattle and sheep allotments and their use, and developed and dispersed recreation sites. Measures of these changes or impacts are relative to the experience classes established by the Recreation Opportunity Spectrum (ROS) System, the area’s scenic condition, and acres harvested in unroaded areas.

Overall, the project area has been impacted and influenced by people and their associated activities. Outside of the inventoried roadless areas and unroaded areas, it is difficult to find areas that have not been affected based upon the measures described in this section.

Roads and Trails

Presently, there is a road/trail density of 2.4 miles of motorized network per square mile distributed across the project area. This includes 70 miles of Forest Development Roads, 19 miles of non-system roads and trails, and 5 miles of system motorized roads. Forest Development Roads typically have a 14 foot wide road surface with an additional 4 feet of clearing of vegetation on each side of the roadway (cut and fill slopes are typically associated with these roads). Non-system roads typically are less than 10 feet wide and do not have associated roadside clearing of vegetation or cut and fill slopes. Motorized system trails are generally less than 5 feet wide. Minor cut and fill slopes may be associated with them. Additional narrative and maps showing roads and trails are in Section 3.9 and Appendix F of this EIS.

Harvest Activities

There are past and present timber sales within the central and northern portions of the project area. Past timber sales in the area include the 1992 Timber Canyon (330 acres), 1993 Twelvemile (205 acres), Camel (13 acres), Olga (151 acres), Olga (173 acres), and personal use firewood cutting. Current timber sales in the area include Baldy (496 acres), Duck (726 acres), and Six (351 acres). Additional narrative and maps showing harvest activities are in section 2.4 and figure 2-4.

Recreation Sites

Developed recreation sites include the Twelvemile Campground and the Ferron Reservoir complex. These developed areas are highly used from approximately July 1 through October. Dispersed recreation sites exist throughout the project area, with higher concentrations near water and along access routes. Six Undeveloped Motorized Recreation sites have been identified in the Forest Plan (Figure 3-1 Forest Plan Management Units). These sites are used by hikers, fishermen, and hunters. The heaviest use is by fishermen in the summer and hunters during the fall. There is limited winter recreational use of the area, most of which is snowmobiling.

Range Allotments

There are four cattle allotments (5,377 cattle) and eight sheep allotments (9,223 sheep). These allotments encompass the entire project area. Constructed improvements associated with these allotments are 13 miles of fence, 1 stock pond, 6 troughs, and 4 corrals. Grazing occurs annually from June through September. Information describing range allotments is found in section 3.10 and Figure 3.18.

Recreation Opportunity Spectrum

The Recreation Opportunity Spectrum (ROS) class or condition for the project area is Semi-Primitive Motorized, which has been well interspersed with Roaded Natural Appearing corridors of about one mile in width along the existing roads. Visitors primarily experience the character of the area from Skyline Drive. The small area around the Ferron Reservoir Recreation Complex has been classified as Rural.
Scenic Condition
As derived from a visual resource inventory of the project area, the landscape is classified according to how natural it appears relative to the amount and types of human alterations present. About 30 percent (7,298 acres) of the landscape "appears" intact. Management activities are not readily evident. The vegetation appears undisturbed, but a single road might be visible, especially in natural openings. About 63 percent (15,868 acres) of the landscape "appears" slightly altered. Noticeable deviations remain visually subordinate to the surrounding natural landscape character. About 7 percent (1,818 acres) of the landscape "appears" moderately fragmented. Timber harvesting is more noticeable as units begin to contrast with their surroundings and stand out in the landscape. They either blend well enough with their surroundings or there are so few of them that they do not completely dominate the scene. The level of disturbance is moderate. This would include areas of recovering older harvest that blend moderately well into their surroundings, as well as areas where there may be a road and one or two recent intensive harvest units that do not blend.

The term "unroaded area" refers to lands contiguous with an existing inventoried roadless area; greater than or equal to 1,000 acres, that does not contain classified forest development road networks, provides an important corridor for wildlife movement, or significantly extends a unique value of the already inventoried roadless area (36 CFR 212, February 12, 1999, Administration of the Forest Development Transportation System: Temporary Suspension of Road Construction and Reconstruction in Unroaded Areas, Interim Rule). An inventory of contiguous unroaded areas was conducted specifically for this project and identified three unroaded areas following criteria established in 36 CFR 212, Interim Rule (Project File). Figure 3-20 Roadless and Unroaded Area Map illustrates the location of the six inventoried roadless areas and the three unroaded areas potentially affected by the action alternatives. Comparing Figure 3-20 with Figure 3-2 (Forest Plan Management Unit Map) will facilitate an understanding of the relationship between the location of unroaded areas with existing Forest Plan land use and their association with inventoried roadless areas. The three unroaded areas are described as follows:

There is an unroaded area contiguous with the Big Bear Canyon inventoried roadless area shown on Figure 3-20. The unroaded area is about 7,005 acres, with about 1,452 acres within the project area, and includes portions of the upper reaches of Lake, Duck, and Indian forks to Ferron Creek. Within the unroaded area, duck was dammed to create a reservoir for irrigation. This changed the function of Duck Fork Creek from a free flowing stream to an impoundment of standing water. There is evidence of grazing, past timber harvest, dispersed camping, and ATV use.

A second unroaded area, contiguous with the Muddy Creek-Nelson Mountain inventoried roadless area is shown on Figure 3-20. The unroaded area is about 2,323 acres, with about 1,683 acres within the project area, and includes portions of the upper reaches of the North Fork of Muddy Creek. Within the unroaded area, a branch of the North Fork of the Muddy was dammed to create Emery reservoir for irrigation. This changed the function of this stream from a free flowing stream to an impoundment of standing water. There is evidence of grazing, past timber harvest, dispersed camping, and ATV use.

A third unroaded area, contiguous with the White Mountain inventoried roadless area is shown on Figure 3-20. The unroaded area is about 4,300 acres, with about 2,425 acres within the project area, and includes portions of the upper reaches of Fish Creek and Slide, Mill, and Black forks to the South Fork Muddy Creek. There is evidence of grazing, past timber harvest, dispersed camping, and nonsystem road and trail use.

Cultural Resources

3.13 CULTURAL RESOURCES

Paleontological and Cultural Resources

Paleontological resources include the remains of ancient plants and animals at specific localities. The types of fossils which could be present in the project area include plant fossils found in the Cretaceous Blackhawk Formation, as well as mammal and lizard fossils. Freshwater vertebrates and invertebrates can be found in the Flaggstaff Limestone formation which outcrops at the highest elevations of this project area. Although these are potential resources on the project area, cultural resource surveys have not been conducted.

Cultural resources consist of sites, structures, and objects used by prehistoric, as well as historic peoples. Archaeological evidence shows that the prehistoric period lasted from approximately 10,000 to 600 years ago. Based on archaeological findings in the region, evidence for both Paleo-Indian and Archaic occupation of the high elevations in or near the project area are possible. Use and occupation by the succeeding Fremont people from approximately A.D. 400 to 1300 is evident, but may have occurred mostly at lower altitudes. Based on linguistic and archaeological data, new hunting and gathering groups began occupying much of Utah most certainly in the fourteenth century A.D., and perhaps as early as A.D. 1150 to 1250. These groups may be ancestral to the present day Ute, Paiute, or other Native American peoples in the region. Historically, while early explorers such as traders and trappers may have visited the area, little evidence of their passing was left behind. Beginning in 1850, historic records show that Mormon settlements were established in the region. Included within this broad definition are properties holding special significance to the ways of life, tradition, and social institutions of a local ethnic group, especially Native Americans. For a more detailed historical perspective of the early occupants of the Forest, refer to the Forest Plan (pp. II 24 to II-27).

Due to the high altitude of the project area, prehistoric human use appears to have been seasonal, during the summer months, and oriented toward hunting and gathering. Specific use included procurement of raw lithic material, certain plant nodule found in the Flaggstaff Limestone Formation that run generally north-south through the project area. Edible roots, such as pygmy bitternut (Lupine pygmaea), which is still present at the highest altitudes of the project area, may have also been gathered by prehistoric populations within the project area. Historic evidence of human use appears to be in connection with logging and early ranching activities.

Prior to 1995, intensive archaeological inventory of the project area had been limited to a few sample surveys of small block areas 80 to 160 acres in size. Nine archaeological surveys occurred in and around the project area. Approximately 1400 acres were surveyed, using various levels of intensity, and three archaeological sites were recorded. To guide cultural resource inventory efforts, a predictive model of potential site location for the South Manti project was developed (McDonald 1994). In developing the model, analyses of archaeological site and site information indicated that a high percentage of prehistoric archaeological sites are located on relatively level or gently sloping terrain. Using this information, a strategy for conducting field inventories was formalized in a Memorandum of Understanding (MOU) with the Utah State Historic Preservation Office (USHPO). In addition to establishing field inventory strategies, the MOU outlines procedures for site recording, evaluation, protection and monitoring to ensure that significant historic properties are not affected by a proposed undertaking.

To date, archeological surveys have inventoried approximately 4,100 acres within the South Manti Project area. Under the proposed action alternatives, field inventories are proposed 1,167 acres within proposed harvest units in Alternatives 2 and 3, and
The Forest Plan Final Environmental Impact Statement includes a socioeconomic analysis of effects of timber harvest on communities surrounding the National Forest (pp. III-15 and IV-6). The analysis for this area includes Sanpete and Sevier counties and indirectly Carbon and Emery counties. Timber sales and their associated activities, such as road construction, road reconstruction, and post harvest activities (e.g., tree planting) have an effect on local communities through their impact on employment. Forest management also influences the wood products, government, construction, and recreation sectors. Indirect impacts occur as these sectors conduct additional business with other sectors.

By law, counties receive 25 percent of revenues from Forest Service timber sales. These receipts are designated for use on roads and schools. Local government receipts fluctuate annually depending upon actual timber volume harvested and the price received for the timber harvested. Prices bid for National Forest timber is influenced by a number of factors including the value of the wood products and the operating costs associated with fellling and removing the timber from the woods. Operating costs vary by sale depending upon characteristics of the timber, yarding systems, yarding distances and roadwork. Timber sales with higher operating costs reduce sale revenues which correspondingly reduce the 25 percent payments to counties.

The analysis for this project will use net sale volumes, estimated costs and revenues, and a reasonable selling value as evaluation criteria of the alternatives on local economies and benefits to counties. The multiplier for total jobs and income to communities generated as a result of timber harvest is 10.8 jobs per year per million board feet (MMBF) and an income multiplier of $571,095 per MMBF. This information is based on the Forest's 1997 fiscal year Timber Sale Program Information Reporting System (TSPIRS) report.

The economic analysis is intended to show a relative difference between the alternatives. Operating costs and wood product values are influenced by a variety of factors which can fluctuate unexpectedly and significantly increase or decrease the bid value of timber sale. For example, in September 1992, 2.9 million board feet (MMBF) of dead spruce sawtimber was sold for $115 per MMBF. In September 1993, the high bid on 2.2 MMBF of dead spruce sawtimber was $183 per MMBF. Nationally and regularly, the reduced availability of Federal timber supplies has led to an increasing amount of privately owned timber being harvested by both local wood products manufacturers and companies from outside of Utah. Sawtimber is being harvested for both local processing and shipment by truck or railroad to other processing facilities outside of Utah. The demand for dead spruce trees to supply the house log special product niche is increasing. Dead spruce from previously awarded timber sales on the Forest is being delivered to house log manufacturers in Saguache, Colorado, and Stevensville, Montana. Some private land sawtimber is being shipped to ports in Portland, Seattle, and Los Angeles for export.

A new lumber manufacturing facility was built in Wellington, Utah (8 miles from the town of Price). Sawlogs can be purchased from local sources within a 105-mile radius of the mill. Lumber, pulp, and other by-products would be placed in the local markets or shipped by truck or railroad to Salt Lake City, Denver, Phoenix, or the West Coast. Initially, the sawmill employs 30 people with additional labor of up to 40 employees in the logging operations. Mill capacity is approximately 25 MMBF annually. Employment could eventually total 100 employees.

A new log home manufacturing facility was built near Gunnison, Utah. Sawlogs are purchased from local sources within a 130-mile radius of the mill. Manufactured house logs are generally shipped to the Southeastern states for assembly into log homes. Orders for construction of log homes in the local area are increasing. The sawmill employs 30 to 35 people in the mill with an equal number of workers in logging operations. The mill utilizes about 7 MMBF annually, but has a capacity for 25 MMBF annually.

The term "inventoried roadless area" refers to an area usually of at least 5,000 acres, without developed and maintained roads, and substantially natural that was inventoried as part of either the National Roadless Area Review Evaluation (RARE II) process or the Land and Resource Management Planning process (36 CFR 219.17(a)(1)).

The Colorado (1982) and Utah (1984) Wilderness Acts released National Forest System lands within the Manti-La Sal National Forest to other multiple use management until the next planning cycle. At the end of this period, and during forest plan revision, the inventory of roadless areas and the need for additional

For the existing traffic and timber activity of the project area, an energy analysis was performed using "Methods for Evaluating Energy Effects of Forest Management Alternatives" (Schwarzbart and Schmitz, 1982). The following elements were used in this analysis: Forest management, extraction (logging), road construction and maintenance, product transport to mill, mill processing, and non-logging traffic. Existing energy consumption within the project area was estimated at 139,395 Million British Thermal Units per year. Energy output from recent timber sales is calculated at 165,825 Million British Thermal Units per year.

This issue involves the effects of road building, timber harvest, and other associated human activities on the character of inventoried roadless areas. This issue is important to many people who may want these inventoried roadless areas to be kept unaltered by human activities or recommended for wilderness. It is equally important to others who want these roadless areas developed and made more easily accessible using motorized vehicles.
wilderness may be again evaluated. This document does not evaluate wilderness suitability (36 CFR 219.17(a)(2)) of the inventoried roadless areas.

The Manti-La Sal Land and Resource Management Plan does not provide desired conditions, goals, or standards and guidelines to specifically address or maintain roadless or unroaded character. Some of the lands inventoried as roadless were allocated to management prescriptions that would, generally, result in maintaining roadless characteristics, such as SPR, for semi-primitive areas, KWR for key winter wildlife habitat, and RPI for Research Natural Areas; where those allocations are coincident with the recreation opportunity spectrum classification of semi-primitive, non-motorized. Other lands inventoried as roadless were allocated to management prescriptions that allowed for future road construction and other development such as TBR for timber harvest. The effects of these choices were analyzed and previously decided in the environmental impact statement and record of decision for the Forest Plan (1986).

Figure 3-20 Roadless and Unroaded Area Map illustrates the location of the six inventoried roadless areas and the three unroaded areas potentially affected by the alternatives. Comparing Figure 3-20 with Figure 3-2 (Forest Plan Management Unit Map) will facilitate an understanding of the relationship between the location of inventoried roadless areas and unroaded areas with existing Forest Plan land use emphasis.

The key comparison elements established to disclose and compare effects to roadless character are miles of road construction, acres harvested, and to narratively describe changes in natural integrity, apparent naturalness, remoteness, solitude, special features, and manageability (Chapter 2, section 2.2). The degree to which each roadless area achieves each of these characteristics portrays the area’s condition. Previous studies used to prepare this affected environment include the Manti-La Sal National Forest Roadless Area Review Evaluation (RARE II) analysis (1978) and the “Roadless Areas, A Briefing Guide” used for forest planning (1984).

The following existing condition narrative descriptions outline qualitative attributes for the six inventoried roadless areas using six comparison elements.

Big Bear Canyon

Big Bear Canyon is a 25,782 acre inventoried roadless area identified in the forest planning analysis (Figure 3-20). There is an inventoried area, contiguous with the Big Bear Canyon inventoried roadless area within the project area. The unroaded area is about 7,005 acres, with about 3,383 acres within the project area, including portions of the upper reaches of Lake, Duck, and Indian forks to Ferron Creek. They are both located in Sanpete County, Utah (approximately 18 miles from Castle Dale, Utah). Access is from Skyline Drive (FDR #50150).

Natural Integrity - Use has substantially altered the vegetation and created two-track roads and associated campgrounds. There are 21.8 miles of existing roads, 1.0 mile of fence, and 8 water developments in the roadless area. Watershed activity has effectively divided the Ferron Creek unit, and the undeveloped portion south of Ferron Creek is not unique and is less than 5,000 acres.

Apparent Naturalness - Consistent with all of the other roadless areas located on the Manti division, this roadless area has been extensively used by humans historically for grazing and timber harvest. There is moderate evidence of human disturbance within the inventoried roadless area. The surrounding lands show the same historic use and much evidence of current mechanized activity of watershed and range restoration.

Remoteness - Parts of the area possess a degree of "remoteness" due to relative inaccessibility north of the McEwan Flats area. This area becomes difficult to reach when access roads are wet or snow covered. The section of Skyline Drive (FDR #50150) to the west also becomes impassable under these conditions and access must be gained from FDR #50022 which requires about a 15 mile drive to Ferron.

Solitude - With the exception of winter months, the opportunity for solitude in the roadless area is limited due to ease of motorized accessibility during the summer months (in the southern portion of the unroaded area and the occasional presence of motorized boats on the reservoir). Thus primitive recreation opportunities as well as challenging experiences of a wilderness variety are limited.

Special Features - Attractions are limited to aesthetic viewpoints from isolated vista points. The view east from High Top on Skyline Drive (the highest point in the Manti Division) into the unroaded area is enjoyable to many. The view into Duck Fork displays the reservoir which to some may appear as a picturesque body of water in the mountains. No cultural sites were identified during survey within the project area portion of the inventoried roadless area.

Manageability - Manageability of the area as roadless is low for the area south of Ferron Creek, due to ease of accessibility to and through the unit. It currently receives moderate use during the summer and fall (mostly hunting) by off road vehicles and during the winter by snowmobiles. North of Ferron Creek, use could be more easily controlled.

Black Mountain is a 6,580 acre inventoried roadless area identified in the forest planning analysis (Figure 3-20). It is located in Sanpete County, Utah (approximately 8 miles southeast of Manti, Utah). Access is via Sixmile Canyon Road (FDR #50047). Black Mountain does not have a contiguous unroaded area within the project area (Project File).

Natural Integrity - Historic and current use, especially ORV use, has altered the area. There are 10.3 miles of roads, 2.0 miles of fence, and 2 water developments.

Apparent Naturalness - The area shows little evidence of human presence except for four-wheel driving on primitive roads.

Remoteness - Due to proximity to Manti via Sixmile Canyon Road and additional access from Mayfield via the relatively well travelled FDR #50022, visitors do not gain a measurable sense of "remoteness". The very apparent presence of two-track roads reinforces the lack of secluded sense.

Solitude - Due to vehicle access and relatively high use levels, opportunities for solitude are limited. Primitive recreation, such as camping, hiking, climbing or cross-country skiing and seeing nature completely undisturbed is non-existent. The level of impact to the landscape is minor and could be restored by closing and seeding the roads, and removing fire pits. Challenging wilderness experiences are also limited.

Special Features - The areas special features are Black Mountain and the aspen basins. Other than these scenic attributes, there are no attractions in the unit.

Cultural/paleontological values may be present, due to known sites on adjacent lands. However, nothing of significance has been identified within the area itself.
Maneuverability - Manageability of the area as roadless is poor, due to the extensive four-wheel drive trails and primitive, non-system roads/trails which exist throughout the area.

Helicopter - Helicopter is a 5.1986 acre inventoried roadless area identified in the Forest planning analysis (Figure 3-20). It is located in Sanpete County, Utah (approximately 13 miles east of Mayfield, Utah). Access is via Skyline Drive (FDR #50153) or the Ferron-Mayfield Road (FDR #50022). Helicopter does not have a contiguous unroaded area within the project area (Project File).

Natural Intensity - There are 4.7 miles of existing road. This area is small in size and has received a relatively large amount of impact from off-road vehicle and livestock use, and consequently was not completely carried through the RARE II process.

Apparent Naturalness - In addition to the typical grazing and past timber use, the lands surrounding this area shows evidence of current mechanized activity by the presence of roads and developed recreation sites.

Remoteness - Due to the proximity of the area to a developed campground at Tintwistle Flat and a very accessible recreation complex at Ferron Reservoir, the area has little remote feeling. Any feeling of ascension is gained from the conifers present in the higher elevations of the area.

Solitude - Opportunities for solitude are limited due to the predominance ease of accessibility, which also limits the chance for primitive recreation. Further challenging experiences are almost non-existent outside of off road vehicle travel and snowmobiling.

Special Features - A special feature in this area is a listed threatened plant, Helicopter milk vetch (Astragalus monte). As indicated by Recreation Visitor Day use, there are very limited attractions. Cultural/paleontological values may be present, due to known sites on adjacent lands. However, nothing of significance has been identified within the area itself.

Manageability - Manageability of the unit is very low. Much of the area is accessible via off road vehicles, and it currently receives some off-road use in conjunction with big-game hunting and livestock operations.

Muddy Creek - Muddy Creek-Nelson Mountain is a 54.235 acre inventoried roadless area identified in the forest planning analysis (Figure 3-20). There is an unroaded area, contiguous with the Muddy Creek-Nelson Mountain inventoried roadless area within the project area. The unroaded area is about 2.333 acres, with about 1.683 acres within the project area, including portions of the upper reaches of the North Fork of Muddy Creek. They are located in Sanpete and Sevier Counties, Utah (approximately 4 miles southwest of Ferron, Utah). Access from Ferron is via FDRs #50022 and #50043.

Natural Intensity - Coal exploration and development have created many intrusions into the area, as have other improvements. The intrusions have cut the area into two parts, the Nelson Mountain top and the upper Muddy. The Muddy drainage below the escarpment has an access road to an old coal mine which reduces the natural integrity. The integrity of the rest of the area is diminished by vegetative changes, roads, range, and mineral intrusions. There are 22.8 miles of existing road.

Apparent Naturalness - This area shows evidence of human disturbance and is less than natural.

Remoteness - This area, in addition to being large, is initially difficult to access. The road through Link Canyon is most suited for four-wheel drive vehicles and is challenging when wet or snow covered. Access from other routes is also difficult during similar conditions. An area to the north, west on the mesa lands above the escarpment, is closed during part of the year as a winter refuge for big game. Stands of Ponderosa pine add to the feeling of being in a unique place. While hiking through these wooded areas to the precipitous edge of the canyon walls or escarpments a strong sense of isolation is felt.

Solitude - Opportunities for solitude are limited except on Nelson Mountain and in the Muddy Creek drainage. This opportunity for solitude is retained in these areas because of the poor accessibility, however, a motorized trail bypasses this roadless area. Primitive recreation can occur in these areas in the form of challenging hiking, climbing, and camping.

Special Features - The Muddy Creek drainage provides some attractive canyon walls and related canyon features. Nelson Mountain provides a unique vegetative composition, containing several plant associations, and is designated as a research natural area. Most of the area's recreation use is based on hunting. Many two-track roads extend down ridges deeply into the area. Historical values may be present in the form of historic mining facilities. The view from forest road 50043 into Emery reservoir may appear as some as a picturesque body of water in the mountains. No cultural sites were identified during survey within the project area portion of the inventoried roadless area.

Manageability - Although the area can be difficult to reach, once there, much of the area is highly accessible via off road vehicles. Intrusions have cut the area into two parts, the Nelson Mountain top and the upper Muddy. Nelson Mountain and the area below the escarpments of the Muddy Creek drainage are readily manageable as roadless.

Tintwistle - Tintwistle is a 10,600-acre inventoried roadless area identified in the National RARE analysis. It is located in Sanpete County, Utah (approximately 6 miles east of Mayfield, Utah). Access is by the Ferron-Mayfield Road (FDR #50022) and/or the Beaver Creek Road (FDR #50290). Tintwistle does not have a contiguous unroaded area within the project area (Project File).

Natural Intensity - For the most part, the integrity of the area could be restored by rehabilitating man-made intrusions. The area shows some evidence of human presence in structural range improvements and two-track roads, of which there are 12.4 miles of roads.

Apparent Naturalness - Historic and current use, as well as acts of nature, have altered the appearance of the area so that it may appear to be less than natural. Recent slope failures and mass land movements within the area have caused stream channel damage to Tintwistle Creek and has impacted community and irrigation water supplies. The lands surrounding the area show the same characteristics, and have had additional use in the form of logging, fuelwood gathering, and range improvement.

Remoteness - The rough topography present in the area adds to the visitors sense of remoteness. However, the close proximity to Mayfield and relatively easy access via FDR #50022 lessens one's sense of isolation.
Solitude - Opportunity for solitude is currently fair due to existing ease of accessibility and consequent use. Access could be restricted and opportunities for solitude improved.

Special Features - Special features include the large landslide which occurred in the spring of 1983. Cultural/paleontological values may be present, due to known sites on adjacent lands. However, nothing of significance has been identified within the area itself.

Manageability - Manageability of the area as roadless is fair, due to the four-wheel drive or primitive roads passing through parts of the area and an indefinite boundary in some places. With some effort in closing roads, and with some boundary changes, manageability could be improved.

White Mountain is a 27,700-acre inventoried roadless area identified in the National RARE II analysis (Figure 3-20). There is an unroaded area, contiguous with the White Mountain inventoried roadless area within the project area. The unroaded area is about 4,300 acres, with about 4,245 acres within the project area, including portions of the upper reaches of Fish Creek and Slide, Mill, and Black forks to the South Fork Muddy Creek. These areas are located in Sanpete and Sevier Counties, Utah (approximately 16 miles west of Ferron, Utah). Access is from Skyline Drive (FDR #50150).

Natural Integrity - Non system roads extend into the area from virtually all directions and it currently receives extensive off road vehicle use, especially in conjunction with big game hunting. There are 8.6 miles of roads, 17.5 miles of fence, and 7 water developments.

Apparent Naturalness - The area still shows some evidence of human presence from typical historic use, to a trained observer. The lands surrounding the area show the same use and much evidence of current mechanized activity.

Remoteness - The area is relatively close to Interstate 70 in Salina Canyon to the south and may be readily accessed from there. There is some sense of isolation at the northern and eastern portions. Due to vegetative openness and topography which allow long views of more developed areas, one does not have a sense of isolation while in the other portions to the south and east.

Solitude - Opportunities for solitude are limited by ease of accessibility. Increased use would further diminish the opportunity for solitude, due to the spacing of vegetative cover. Primitive recreation/challenging experiences are almost non-existent.

Special Features - Special features in this area include a prospective research natural area and a listed threatened plant, Heliotrope milk-vetch (Astragalus montii). There is an outstanding lookout point on the northern boundary above the Three Lakes area. No cultural sites were identified during survey within the project area portion of the inventoried roadless area.

Manageability - Manageability of the unit as roadless is very low. The only feature that would facilitate a manageable boundary is the cliff face of White Mountain, which forms half of the northern boundary. The area is easily accessible from improved dirt roads which border it on all sides.
CHAPTER 4
ENVIRONMENTAL CONSEQUENCES
CHAPTER 4 - ENVIRONMENTAL CONSEQUENCES

4.0 INTRODUCTION

The purpose of Chapter 4 is to disclose the potential environmental effects and consequences that could result from implementation of the alternatives considered in detail described in Chapter 2. The information presented in this chapter forms the scientific and analytical basis for comparison between the alternatives.

The analysis for most resources was limited to the project area. However, in some cases, effects beyond the project area were considered and disclosed.

Impacts to the environment which could result from implementation of the alternatives are discussed in terms of their direct, indirect, and cumulative effects.

- **Direct and Indirect Effects:** Direct and indirect effects are those consequences which are expected to occur immediately following implementation of an alternative. Discussion of direct and indirect effects incorporates past and present actions. Direct effects are caused by the action and occur at the same time and place as the action. Indirect effects are caused by the action and occur later in time or farther from the activity.

- **Cumulative Effects:** Cumulative effects result from the impacts of past, present, and reasonably foreseeable future activities (regardless of what agency or person undertakes such actions) combined with the alternatives considered in this document. This analysis of cumulative effects recognizes that separate activities can combine and interact to provide impacts that are beyond those of individual actions. The information in Chapter 3 reflects the cumulative effects of past and present actions up to the current time. Cumulative effects of past, present, and proposed actions are often reflected in the discussion of direct and indirect effects. Additional effects of foreseeable actions are also addressed as cumulative effects.

The methodology used to analyze each alternative was based primarily on the most current mapped resource information. Key map information for each resource was processed in an electronic geographic information system and database. Some mapping analysis was conducted by hand. Effects were analyzed spatially and comparatively. Consideration and disclosure of effects include past, present, and foreseeable actions within the project area (Appendix G - Past, Present, and Reasonably Foreseeable Future Actions). The pertinent analysis results are presented in this chapter by resource/issue topic.

This chapter is divided into the following sections:

- 4.0 Introduction
- 4.1 - 4.15 Effects of the Alternatives by Resource/Issue Topic
- 4.16 Potential Conflicts with Plans and Policies of Other Jurisdictions
- 4.17 Probable Environmental Effects that Cannot be Avoided
- 4.18 Relationship between Short-term Use and Long-term Productivity
- 4.19 Irreversible and Irretrievable Commitments of Resources
- 4.20 Relationship to Forest Plan
- 4.21 Other Specifically Required Disclosures

Supporting information developed for the analyses summarized in this chapter is maintained at the Manti-La Sal National Forest Supervisor’s Office in Price, Utah.

---

4.1 AIR QUALITY

This section discusses potential effects to air quality. Effects to air quality are strongly related to the generation of emissions and their dispersal. Reductions in air quality represent a public health concern. The key comparison element for evaluating how the alternatives considered in detail respond to this issue and their associated effects is projected emissions and their relationship to State air quality standards and the Federal conformity rule.

**DIRECT AND INDIRECT EFFECTS**

**Effects Common to All Alternatives - Class 1 and Non-station Area**

Capital Reef National Park is south of the project area and is not wind down except during unusual events. During calm periods and times when pollutants would drift down-slope, the park is protected by intervening topographic features. Although smoke plumes from wildland and prescribed fires may be visible from the park, emissions should not affect the park.

Potential pollutants should not reach Utah County because winds do not prevail from the south (they are usually from the southwest). Additionally, distance and the elevation of the project area would usually allow for adequate dispersion.

**Effects Common to All Alternatives - Wildland Fire Emissions**

The presence of dead standing trees, downed fuel, fine fuels, and ladder fuels, such as brush and branches that provide a means for fire from the ground to burn into the tree canopy, may result in larger, more-intense wildland fires.

Smoke from wildland fires is unmanageable, and the severity of air quality degradation is unpredictable. The actual impact to air quality depends on the time of year the fire occurs, the characteristics of the fuels burned, the duration of the fire, and the resulting amount of smoke created. Wildland fires may occur during times of poor dispersion. Wildland fires contribute to regional haze and may exceed air quality standards.

The duration of a wildfire could be several days or weeks, depending upon the availability of firefighters and weather conditions. A large, intense wildfire could be expected to burn until the fuels have been consumed or weather conditions change favorably to help control or extinguish the fire.

Adverse effects to human health from smoke could include eye irritation, throat or lung irritation, shortness in breadth, asphyxiation. Extensive exposure to smoke could contribute to emphysema, lung cancer, or heart disease (USDA Forest Service, 1992a)

The following comparison of effects does not include the possible effects of wildland fire.

**Effects of Alternative 1**

Since Alternative 1 would not require the use of equipment run on petroleum and would not include fuel reduction through prescribed fire, there would be no direct effects on air quality or associated human health.
Effects of Alternatives 2, 3, and 4
All action alternatives would produce emissions from equipment, smoke from prescribed fire, and fugitive dust from roadways and open areas. Given the area's high elevation and wind velocities, the potential for dispersion of emissions is high.

Effects Common to Alternatives 2, 3, and 4
Dust
Timber operations and road use will create dust. Effects would be localized to the immediate area and time of disturbance. Dust abatement of the native surface or graveled roadways used as haul routes would be a responsibility of the timber sale purchaser as needed for resource protection or public safety. Additionally, the timing of log hauling could be restricted, if needed. There should be negligible difference between the alternatives in the amount of dust expected due to its localized nature, short duration, and potential to abate.

Effects Differing Between Alternatives 2, 3, and 4
Emissions from Equipment
All action alternatives would generate emissions from equipment run on petroleum products. The concentration of emissions would vary by the type of fuel used, fuel consumption, and the number of motors. Based on the amount of harvest and associated equipment needed to complete that harvest and move the logs to the mill, Alternatives 2 and 3 would generate more engine emissions than Alternative 4. Because of Federal and State laws regulating emissions, standard equipment requirements, the project's remote location, and high elevation air dispersal, no adverse effects from engine-generated emissions are expected. Emissions from equipment were not modeled.

Smoke
All action alternatives include burning of slash piles at log landings and some prescribed burning of logging slash for site preparation and fuel reduction in helicopter units. All burning must comply with the procedures and requirements in the State Smoke Management Plan. The State Program Coordinator must approve burning permits and may reschedule a proposed burn to manage local, area, or State-wide emissions.

The amount of smoke produced from prescribed fire depends primarily upon the amount of fuel consumed, method of ignition, and characteristics of the fuel. FOE/FEM (First Order Fire Effects Model) was used to project emissions associated with jackpot and slash pile burning. Figure 4.1 Projected Particulate Matter Emissions, displays estimates of modeled emissions by alternative.

The projected annual emissions do not violate the de minimis level of 100 tons/year for moderate non-attainment areas (40 CFR 51.853). Therefore, all alternatives meet the conformity provisions of the 1990 amendments to the Clean Air Act and Forest Service guidelines for activities adjacent to non-attainment areas. In addition, smoke emissions will not be produced during the winter, which is the season of concern in the non-attainment area.

South Manti Final Environmental Impact Statement
Chapter 4 Environmental Consequences

Figure 4-1 Projected Particulate Matter Emissions

<table>
<thead>
<tr>
<th></th>
<th>Area Burned (acres)</th>
<th>Total 1. Emissions (tons)</th>
<th>Annual 2. Emissions (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PM10</td>
<td>PM0.5, 2.29</td>
<td>PM0.5, 76</td>
</tr>
<tr>
<td>2</td>
<td>460</td>
<td>PM10, 270</td>
<td>PM10, 90</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PM0.5, 229</td>
<td>PM0.5, 76</td>
</tr>
<tr>
<td>3</td>
<td>470</td>
<td>PM10, 277</td>
<td>PM10, 92</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PM0.5, 235</td>
<td>PM0.5, 78</td>
</tr>
<tr>
<td>4</td>
<td>291</td>
<td>PM10, 171</td>
<td>PM10, 57</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PM0.5, 145</td>
<td>PM0.5, 48</td>
</tr>
</tbody>
</table>

1. Based on the following emission factors (tons/acre): PM10, 0.59; PM0.5, 0.50; PM2.5, 1.00.
2. (Helicopter Units): 0.48; (Tractor Units): 0.30.

Smoke would be expected in the area of prescribed burning for a duration slightly longer than the ignition time. This could temporarily reduce visibility. A reduced visibility could increase roadway safety concerns as well as reduce one's recreational experience. Nearby recreation areas, such as Ferron and Duck Fork Reservoirs, may be affected.

The removal of dead trees represents a reduction of material that could otherwise burn and reduce air quality. The prescribed burning of logging slash further reduces the amount of material that could otherwise burn in a wildland fire. This may reduce the adverse effects on air quality; however, wildland fire emissions are not part of this analysis.

CUMULATIVE EFFECTS

The provisions and permitting processes in the State Smoke Management Plan are in part designed to minimize possible cumulative effects from prescribed and wildland fire. The Forest Service is a participating agency.

Southeast Utah has some of the best remaining clean air in the country (USDA Forest Service, 1992a). This is not expected to change as a result of past, present, and reasonably foreseeable actions.

This section discusses the effects of implementing the alternatives on land stability. Effects to land stability are strongly related to climatic and geologic conditions, soil moisture, and ground distributary. The key comparison elements for evaluating how the alternatives considered in detail respond to this issue and their associated effects include: road construction in unstable and moderately unstable areas, road reconstruction in unstable and moderately unstable areas, and harvest/revegetation in unstable and moderately unstable areas.

4.2 LAND STABILITY
DIRECT AND INDIRECT EFFECTS

Effects Common to All Alternatives

The relative risk of landslides occurring naturally in the project area is a function of climatic and geologic conditions. The risk of human activities triggering landslides or accelerating movement on existing landslides is dependent upon changes to existing conditions caused by specific activities or facilities.

If annual precipitation remains near or below average levels, the potential for inducing landslides or for facilities to be damaged by naturally occurring landslides would be minimal. During cycles of above average precipitation, when slopes and associated surface materials become saturated, the risk of inducing landslides or for facilities to be damaged by natural landslides would be considerably higher.

Mortality of spruce trees in the project area is causing a decrease in land stability. If the spruce beetle infestation continues to kill trees as expected, the decreasing number of live spruce could increase landslide potential and frequency. As the trees die, soil moisture is increased because less moisture is absorbed by the trees and evaporated into the air (evapotranspiration). The result is an increase in ground water retained, greater pore pressures, less cohesion, more lubrication, and increased weight which all work to decrease land stability.

Another factor that decreases land stability is the loss of support or buttressing as the tree root systems decay. The loss of soil support or anchoring provided by the tree root systems would also decrease land stability as the root systems decay. Reports by the Forest Service from southeastern Alaska (Swanson, 1974) indicate that the number of landslides from harvested areas (live harvest) increases within 3 to 5 years after logging. The results from large areas of tree mortality are expected to be similar. However, root decay rates are probably slower in the project area due to lower precipitation.

With increases in tree mortality, the potential for low magnitude/high frequency landslides (isolated landslides that occur due to changes in localized conditions) would increase. The potential for human activities to trigger landslides could also increase. The potential for low frequency/high magnitude landslide events which are attributed to severe regional high precipitation cycles, could also increase slightly. As moisture increases and anchoring by live tree roots decrease, less precipitation is needed to trigger such an event. The recurrence frequency of an event similar to the 1983/1984 flood/landslide event is estimated at approximately 125 years (Godfrey, 1984, p. 8).

The project area contains many existing and ancient landslides. The effects of land instability are common to the area. New landslides and renewed movement of existing landslides would remove vegetation, until it is restored by natural processes, and increase erosion in the landslide area. This could increase sediment production within affected watersheds. Sediment could reach drainage where the landslides extend into them, where vegetation buffers are not adequate to provide an efficient filter, or where topography is such that it routes material toward bodies of water. It is difficult to predict how much sediment production could increase or how much sediment would reach streams.

The area affected by a landslide can range from very localized to several miles downstream within the watershed. Damage to facilities and the potential loss of vegetation would usually occur in the immediate area of the landslide, while effects to water quality from additional sediment production could extend several miles downstream. Landslides generally occur in late winter and spring during wet conditions associated with snowmelt and runoff. Shallow landslides such as rock falls and debris flows occur very rapidly. The area usually becomes stable later in the summer under drier conditions. Deep-seated landslides such as earth flows and complex slides and slumps move slowly, but reach a general state of equilibrium and stabilize during the summer months. Movement can be renewed each spring during wet conditions for many years until the system reaches overall equilibrium. Landslides could damage existing roads and trails requiring repair and increased maintenance.

Effects of Alternative 1

Continued tree mortality would increase the potential for landslides as described in the preceding "Effects Common To All Alternatives" section. If large, intensive wildland fires occur due to the increase of dry fuels (dead trees), land stability would be decreased. The loss of understory vegetation and remaining live trees (spruce, subalpine fir, and aspen) would contribute to the decrease in evapotranspiration caused by the insect infestation.

Under this alternative, there are no specific plans to replace insect killed stands by tree planting. Rehabilitation of burned areas would probably be limited to seeding of understory species. It is therefore assumed that reforestation would occur very slowly by natural processes. It is estimated that in well stocked areas with some live immature spruce that survive, approximately 30 years could be needed for tree growth and reforestation to establish evapotranspiration levels similar to those that existed prior to the recent insect infestation. In other areas, this recovery would take 30 to 100 years, and some formerly timbered areas could revert to meadows.

Effects Common to Alternatives 2, 3, and 4

The removal of dead and dying trees would not, in itself, affect land stability. Increases in soil moisture are already occurring due to tree mortality. The decrease in weight or loading on the land (tree surcharge) by removing dead and dying trees is expected to be a negligible change. Dead and dying trees rapidly decrease in weight by loss of moisture and deterioration.

The potential for inducing new landslides or reactivating existing landslides would be minimized by confining operations to the dry summer months or when the ground is frozen. The potential for log decks and equipment to load the heads of existing landslides and reactivate them is considered to be negligible because existing slides would be avoided and operations would be confined to working in dry conditions or wintertime. Typically, the dry field season is July 1 st to October 1 st. New landslides and renewed movement of existing slides are rare during this time.

Activities that have the greatest potential to decrease land stability include new and temporary road construction, road reconstruction, and staging area development for equipment. These activities could change topography, slope support conditions, and drainage. Reforestation by planting of spruce under the above alternatives could accelerate reestablishment of evapotranspiration and slope support conditions that existed prior to the insect infestation. The potential for reforestation activity to positively affect land stability would be greatest in areas mapped as unstable and least in areas mapped as stable.
Effects Differing Between Alternatives 2, 3, and 4

Although there are some differences in the amount of area treated annually by road work, notable differences in impacts to land stability are not expected between the action alternatives. The extent of area harvested slightly differs between action alternatives (Figure 4-2 Activity in Unstable and Moderately Unstable Areas). The amount of road disturbance in unstable and moderately unstable areas is expected to be less than in unstable areas (Figure 4-2 Activity in Unstable and Moderately Unstable Areas).

<table>
<thead>
<tr>
<th>Harvest/Reforestation:</th>
<th>Alternative 1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvest in Unstable and Moderately Unstable Areas (acres)</td>
<td>3.877</td>
<td>3.877</td>
<td>2.439</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Road Work:</th>
<th>Alternative 1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road Construction in Unstable Areas (miles)</td>
<td>0.3</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Road Reconversion in Unstable Areas (miles)</td>
<td>1.2</td>
<td>1.2</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Total in Unstable Areas (miles)</td>
<td>1.5</td>
<td>1.2</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Road Construction in Moderately Unstable Areas (miles)</td>
<td>0.8</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Road Reconversion in Moderately Unstable Areas (miles)</td>
<td>0.8</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Total in Moderately Unstable Areas (miles)</td>
<td>1.6</td>
<td>0.6</td>
<td>0.6</td>
<td></td>
</tr>
</tbody>
</table>

Cumulative Effects

Human activities and alterations to the land since European settlement have had the general cumulative effect of decreasing land stability. Development of a network of roads in areas mapped as unstable and moderately unstable within and adjacent to the project.

The increased potential is due to changes to natural slope support conditions and drainage.

Overgrazing and extensive human-caused fires in the late 1800's caused extensive decreases in vegetation cover and diversity that have most likely increased the potential for landslides. These changes resulted in increased runoff, severe erosion, and frequent severe flooding and mudflows during the late 1800's and early 1900's (Reynolds, 1911). There is no written information on the occurrence of landslides during this time, but it is assumed that shallow landslides such as debris flows were extensive. This would be the expected outcome of vegetation changes described in early literature and would account for the severe mudflows in the canyons. Intensive management since establishment of the Manti Forest in 1902 and 1903 has resulted in significant increases in vegetation diversity and biomass (USDA Forest Service, 1992c). The decrease in frequency of severe floods and mudflows, especially during the dry summer season, indicates that improved vegetation conditions have decreased the frequency of shallow high frequency/magnitude landslides such as debris flows, but the potential is probably greater than it was before European settlement. The potential for low frequency/high magnitude landslide events has most likely also increased but to a lesser degree.

Specific projects completed within and adjacent to the project area in the last 15 years are listed in Appendix G. Of these, the projects that could have caused changes to land stability include harvest of live trees and prescribed burns. Additionally, tree planting in salvage harvest areas should accelerate reforestation, therefore, increasing land stability.

This section discusses the effects to the soil resource from implementing the alternatives considered in detail. Effects to soil are strongly related to soil type and ground disturbance. The key comparison elements for evaluating how the alternatives respond to this issue and their associated effects are the estimated amount bare soil by logging method, erosion hazard of areas proposed for tractor yarding, and burn intensity.

Direct and Indirect Effects

Effects Common to All Alternatives

Any landslides that may occur could have severe impact on the soil resource by displacement, mixing, and increased surface erosion. Burning can have either adverse or beneficial impacts on the soil. Low intensity prescribed or wildland fires may benefit the soil and vegetation by releasing nutrients. High-intensity wildland fire could eliminate the surface organic cover, reduce microorganisms, burn the soil organic matter, and expose the soil to severe erosion.

Effects of Alternative 1

Under no action alternative, there would be no new soil disturbance from logging and the associated activities, and the soil would develop in a near-natural setting. Large amounts of woody organic materials from dead and dying trees would be added to the ground surface, which would contribute to soil protection and development. Some nutrients would be held in the woody materials until decomposed or released by fire.
There would be no road reclamation with this alternative; however, reclamation associated with other approved projects, like the current salvage sales, would be done.

**Effects Common to Alternatives 2, 3, and 4**

The action alternatives would result in soil disturbance from the contact of logs and equipment with the land surface. Project design features, including Best Management Practices, will be implemented to avoid or minimize possible effects to the soil resource.

Soil compaction would occur on log landings, skid trails, and helicopter pads and other staging areas used for equipment. The best management practices include several measures to control harvest operations during wet conditions when compaction is most likely. The design features and best management practices also include provisions for decompression of landings and other areas of concentrated use. Compaction in harvest units will be minimized by controlling harvest operations when soil moisture is not suitable for ground-based yarding. Controlled burning of slash under the action alternatives would be conducted under prescriptions that should not adversely impact the soil resource.

Most of the forested sites have nearly 100 percent ground cover. In cutting units with tractor yarding, ground cover may be reduced by up to 15-20%, mainly along skid trails and in pockets of dense trees (USDA Forest Service, 1980). Eighty percent ground cover provides adequate soil protection, while the 20% with reduced ground cover or bare soil may provide a seed bed for those species requiring mineral soil. Additionally, best management practices will be used to minimize soil loss. These practices are listed in Appendix D.

Alternatives 2, 3, and 4 include both cable yarding and helicopter yarding. Cable yarding would have an estimated increase in bare % of 5 to 8 percent; helicopter yarding would have approximately 3 to 4 percent (USDA Forest Service, 1980). The amount of optional cable yarding is the same for each of these alternatives (42-54 acres). Cable logging would have a moderate to low impact to soils; helicopter logging would have a low impact. The little amount of soil exposure from cable or helicopter yarding would correlate to an insignificant change in soil erosion rates.

Road reconstruction would be required under each action alternative. Road reconstruction will focus on resolving existing erosion and drainage problems. Approximately 0.5 miles of temporary road construction may be necessary. Soils would be altered along the short segments of temporary road and will result in soil displacement, soil compaction, removal of vegetation, and localized surface erosion. Temporary roads will be reclaimed in a period of 1-2 years, and would return to a vegetated condition. This would allow these areas to support vegetation, absorb precipitation, and filter surface erosion. Erosion control measures would be implemented as a part of all reconstruction and temporary road construction to minimize soil loss and potential sediment routing into water courses.

All action alternatives include reclamation of approximately 24 miles of system and nonsystem roads and trails. This would put approximately 42 acres back into vegetative productivity and have a positive effect on soil stabilization. Soils in these reclaimed areas would eventually support vegetation, allow water infiltration, and limit surface erosion.

---

**Effects Differing Between Alternatives 2, 3, and 4 - Logging Operations**

Alternative 2 would harvest up to 568 acres using tractor yarding. Alternatives 3 and 4 would harvest up to 299 acres using tractor yarding. Assuming that approximately 20% of the tractor yarding treatment would result in bare mineral soil, alternative 2 could create 114 acres of bare mineral soil, while alternatives 3 and 4 could create 60 acres of bare mineral soil.

Figure 4-3 Erosion Hazard and Tractor Yarding, displays the tractor yarding acreage in each action alternative by soil map unit and corresponding soil erosion hazard rating for bare soil. Most ground-based activity would occur on soil map units 415, 416, 600, and 700.

As summarized in Figure 4-4 Summary - Erosion Hazard and Tractor Yarding, most of the ground-based logging activities would occur on soil map units which have a low to moderate soil erosion potential.

**Figure 4-3 Erosion Hazard & Tractor Yarding**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Low</td>
<td>8-10</td>
<td>8-10</td>
<td>8-10</td>
</tr>
<tr>
<td>2</td>
<td>Moderate</td>
<td>4-6</td>
<td>4-6</td>
<td>4-6</td>
</tr>
<tr>
<td>46</td>
<td>Moderate</td>
<td>16-20</td>
<td>2-3</td>
<td>2-3</td>
</tr>
<tr>
<td>415</td>
<td>Low</td>
<td>125-162</td>
<td>82-106</td>
<td>82-106</td>
</tr>
<tr>
<td>416</td>
<td>Moderate</td>
<td>128-166</td>
<td>36-47</td>
<td>36-47</td>
</tr>
<tr>
<td>600</td>
<td>Moderate</td>
<td>88-115</td>
<td>70-92</td>
<td>70-92</td>
</tr>
<tr>
<td>700</td>
<td>Moderate</td>
<td>88-88</td>
<td>28-36</td>
<td>28-36</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>427-568</td>
<td>230-299</td>
<td>230-299</td>
</tr>
</tbody>
</table>

**Figure 4-4 Summary - Erosion Hazard & Tractor Yarding**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>133-173 (30%)</td>
<td>89-116 (30%)</td>
<td>89-116 (30%)</td>
</tr>
<tr>
<td>Moderate</td>
<td>304-395 (70%)</td>
<td>142-184 (61%)</td>
<td>142-184 (61%)</td>
</tr>
</tbody>
</table>

Helmet yarding produces little soil impact; however, the associated landing pads and log landings are cleared and leveled. Reclamation of these areas is specified in the design features and includes reshaping, decomposition, and revegetation. The acreage of helicopter yarding landings varies for each action alternative. Alternative 2 would helicopter yard up to 3,305 acres and have approximately 29 acres in landings (assumed 1 acre, net landing). Alternative 3 would helicopter yard up to 3,773 acres and have 27 acres in landing. Alternative 4 would helicopter yard up to 2,131 acres and have 22 acres in landings.

**Effects Differing Between Alternatives 1, 2, 3, and 4 - Burn Intensity**

Burn intensity and the resulting consumption of organic material on the soil surface is the principle factor used to evaluate fire effects on soils in a burned area. Organic material is important for it's effect on infiltration of precipitation into the ground surface and for it's role as a nutrient source. Infiltration rates are two to three times lower without surface organic material (Zasoski, 1997). Reduced
infiltration rates in areas of moderate to high burn intensity can result in increased runoff and erosion. In areas of low burn intensity, the litter is singed; with moderate intensities, surface litter is charred but notashed; with high intensities, there is no residue or only ashes on the soil surface (USDA-FS, FS92S09.13).

Surface organic material is also important as a source of nutrients for plant growth. Nitrogen and sulfur are the nutrients most affected because they are volatilized as organic material is consumed. In both prescribed and wildfires, nitrogen is lost in proportion to the amount of organic material consumed (Zasoski, 1997). However, fire also releases nutrients when tree boles are laid down, and when woody material is burned without complete consumption. Sulfur is lost, but is replaced from soil/mineral sources. Potassium and phosphorous are generally unaffected, except in very high intensity fires (Zasoski, 1997).

Heat per unit area is an output of the fire behavior model (BEHAVE) used in this analysis. Figure 4-5 displays the modeled heat per unit area by time period and proposed treatment. The range of values is for three groups stratified by initial fuel loadings.

**Figure 4-5 Heat Per Unit Area as an Indicator of Burn Intensity**

<table>
<thead>
<tr>
<th>Year</th>
<th>No Treatment</th>
<th>Helicopter Logged</th>
<th>Tractor Logged</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>125-997</td>
<td>284-877</td>
<td>101-173</td>
</tr>
<tr>
<td>75</td>
<td>1080-1123</td>
<td>144-173</td>
<td>80-95</td>
</tr>
</tbody>
</table>

Using this output as a general indicator of intensity, potential burn intensity increases with time with no logging or other treatments. In areas proposed for helicopter logging, potential burn intensity is similar to no treatment at the beginning of the modeled time period, but is reduced over time. In areas proposed for tractor logging, potential burn intensity is reduced immediately and continues to decline. Therefore, areas actually logged may burn at a lower intensity should a wildland fire occur. In Alternative 1 approximately 21% of the forested (spruce-fir) area in the project area will be logged with timber sales already authorized; with Alternatives 2 and 3, an additional 29-36% (total of 49.57%) would be logged; with Alternative 4, an additional 17-24% (total of 38-45%) would be logged.

**CUMULATIVE EFFECTS**

The currently approved salvage sales have design features and best management practices similar to those proposed for the action alternatives. As noted above, ground cover in logged areas will be sufficient to limit erosion and road reclamation will restore ground cover to approximately 42 acres of roadway. The total impact would be within Regional soil quality standards and guidelines. The standards include maintaining or improving long-term soil productivity and soil hydrologic function. The guidelines include restricting areas of detrimental soil disturbance to no more than 15 percent of the activity area, maintaining sufficient ground cover to limit erosion to near natural rates, and maintaining above-ground organic matter to supply and cycle nutrients needed to maintain site productivity.

**4.4 WATER RESOURCES**

This section discusses the effects of implementing the alternatives on water resources.

**WATER QUALITY**

Sediment is the principle water quality parameter potentially affected by the proposed activities. The key comparison element for evaluating how the alternative sediment water quality is the projected sediment yield from management activities. Other water quality parameters will not be addressed. This is in line with the designation of all waters within the Forest boundary as High Quality Category 1 and that designation's emphasis on maintenance of water quality with little or no degradation.

**DIRECT AND INDIRECT EFFECTS**

The amount of sediment in a stream is the sum of sources from mass movements, stream channel erosion, and surface erosion. Mass movement and land stability are addressed in more detail in Sections 3.2 and 4.2. In headwater areas, stream channel erosion is mostly affected by activities that remove vegetation from the riparian areas or disturb the stream channel. In the lower portions of the Muddy, Twelvemile, and Sixmile watersheds, channel erosion is still a consequence of the major channel changes caused by the 1983 and 1984 landslides and floods. Surface erosion is mostly affected by management activities that reduce ground cover or alter soil properties; these include grading, logging, road construction, and prescribed fires.

A locally developed sediment yield model, SEDROUTE, is used to display differences among the alternatives. This analysis is confined to predictions of the changes associated with the existing and proposed road and trail network. It does not predict sediment volumes from wildfire, historic or current mass movements, or channel erosion. There is no baseline sediment data available for the project area.

For SEDROUTE, the landscape was divided into relatively similar units called land types and/or soil resource mapping units. Erosion and delivery coefficients were estimated for the undisurbed land units and for roads and trails. Eroded materials were then routed to the streams as sediment. Figures 4-6, 4-7, and 4-8 display the model outputs summarized by watershed and subwatershed. Figure 4-5 displays the subwatersheds used in the analysis. Alternative 1 includes the existing road and trail network with roads constructed for the on-going salvage sales in the project area.

**Figure 4-6 SEDROUTE Summary - Sixmile and Twelvemile Creek Watersheds**

Shaded rows are larger/downstream subwatersheds which integrate the results of the analysis of the headwaters plus the additional acreage and roads in the larger areas.

**Table:**

<table>
<thead>
<tr>
<th>Subwatershed</th>
<th>Subwatershed Acreage</th>
<th>Project Annual Sediment Yield and Percent Change Relative to Alternative 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>413 Sixmile</td>
<td>17902</td>
<td>2.01</td>
</tr>
<tr>
<td>414 North Fork</td>
<td>9810</td>
<td>1.03</td>
</tr>
<tr>
<td>415 South Fork</td>
<td>10370</td>
<td>1.01</td>
</tr>
</tbody>
</table>
### Figure 4-7 SEDROUTE Summary - Ferron Creek Watershed

Shaded rows are larger/downstream subwatersheds which integrate the results of the analysis of the headwaters plus the additional acreage and roads in the larger areas.

<table>
<thead>
<tr>
<th>Subwatershed</th>
<th>Subwatershed Acreage</th>
<th>Project Annual Sediment Yield and Percent Change Relative to Alternative 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>305 Lake Fork</td>
<td>1333</td>
<td>0.58</td>
</tr>
<tr>
<td>Creek</td>
<td></td>
<td></td>
</tr>
<tr>
<td>306 Duck Fork</td>
<td>2429</td>
<td>0.74</td>
</tr>
<tr>
<td>Creek</td>
<td></td>
<td></td>
</tr>
<tr>
<td>302 Beaver Creek</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creek</td>
<td></td>
<td></td>
</tr>
<tr>
<td>303 Indian Creek</td>
<td>2698</td>
<td>0.95</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>404 Little Horse Creek</td>
<td>2061</td>
<td>0.51</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Figure 4-8 SEDROUTE Summary - Muddy Creek Watershed

Shaded rows are larger/downstream subwatersheds which integrate the results of the analysis of the headwaters plus the additional acreage and roads in the larger areas.

<table>
<thead>
<tr>
<th>Subwatershed</th>
<th>Project Annual Sediment Yield and Percent Change Relative to Alternative 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>304 Beaver Creek</td>
<td>1762</td>
</tr>
<tr>
<td>306 Mill Fork</td>
<td>2005</td>
</tr>
<tr>
<td>307 Black Fork</td>
<td>2904</td>
</tr>
<tr>
<td>309 North Fork</td>
<td>2103</td>
</tr>
<tr>
<td>Muddy Creek (includes 308, 309, 310)</td>
<td>10862</td>
</tr>
</tbody>
</table>
Effects of Alternative 1

Roads and nonsystem motorized trails would not be reclaimed and would continue to be a source of sedimentation. Reclamation associated with approved projects, like the current salvage sales, would be done. Figures 4-6, 4-7, and 4-8 include the projected sediment yields associated with Alternative 1.

Effects Differing Between Alternatives 2, 3, and 4

Ground-based yarding could result in localized erosion and sedimentation from skid roads and compaction. Design features, BMP's, and site-specific mitigation measures are designed to minimize these effects (Appendix D). The possible, relative effects are proportional to the number of acres proposed in each alternative; Alternative 2 - 437-568 acres, Alternatives 3 and 4 - 230-299 acres.

Road reconstruction is proposed in all the action alternatives; 11.0 miles in Alternative 2, 10.8 miles in Alternative 3, and 9.2 miles in Alternative 4. Reconstruction would include graveling of selected road sections, replacement of culverts, and installation of additional culverts. These improvements should decrease the erosion produced by the roadway and may reduce the connections between the stream network and the road. Sedimentation attributable to the road should be reduced; however, these reductions are not reflected in the SEDROUTE outputs.

Alternative 2

Using the SEDROUTE summaries (Figures 4-6, 4-7, and 4-8) the projected changes in sediment yield in the subwatersheds in the project area range from a 3% decrease to a 3.3% increase in Little Horse Creek. Road construction is proposed in Little Horse Creek.

Alternatives 3 and 4

As displayed in Figures 4-6, 4-7, and 4-8, Alternatives 3 and 4 are the same as Alternative 2 for the majority of subwatersheds. In the few watersheds with differing amounts of projected sediment, the differences can be attributed to the need for fewer helicopter landings need to support logging.

CUMULATIVE EFFECTS

Past land management practices have greatly reduced the surface erosion and sediment loading that began with grazing and logging practices of the early 1900's (Rapin, 1978). Continued improvements in grazing practices have resulted in reduced erosion on many areas that had originally been identified as needing erosion control work, recent evaluations of these areas determined that erosion is now within acceptable levels (Bare, 1994).

In addition to changes in management, several areas were treated in the late 1960's and early 1970's as part of PL 566 Watershed Restoration Projects designed to reduce downstream sedimentation. Most of the project areas were in the Ferron drainage. While Alternatives 2, 3, and 4 could add additional sediment to the stream systems, they should not approach the sediment loads prior to the PL 566 project. SEDROUTE results do incorporate the effects of this project.

The existing salvage sales have design features and best management practices similar to those proposed for the action alternatives. The combined effects of the
logging activities plus road construction, reconstruction, and reclamation comply with the intent and specifics of the State’s High Quality - Category 1 designation and the Forest Plan. Based on SEDROUTE results, the sediment and associated TDS load from National Forest System lands in Twelvemile Creek will not change and may decrease slightly.

As described in Section 4.3 Soils, areas actually logged may burn at a lower intensity. The percentage of logged acres in individual subwatersheds is the factor used to evaluate whether the proposed logging might affect the possible effects of a wildland fire on a watershed scale.

Over time, a wildland fire starting in a logged area will be easier to control. One starting in an adjacent untreated area might be contained in a logged area. To affect the behavior of a wildland fire at the watershed scale, we assumed that at least 20% of the watershed should be treated. The Duck Fork and Little Horse Creek subwatersheds in the Ferron Creek watershed and the Emerald Creek and North Fork Muddy Creek subwatersheds in the Muddy Creek watershed meet this criteria in Alternatives 2 and 3. 25% to 27% of the subwatersheds would be logged. In Alternative 4, the Duck Fork, Emerald Creek, and North Fork Muddy Creek subwatersheds meet the criteria. The percent treated acres in other subwatersheds in the project area range from 3% to 17%.

Typically, less than 50% of the burned area in a wildland fire is severely burned and up to 25% may be improved (Ruby, 1997). Wildland fires over 300 acres would be evaluated under the auspices of the Burned Area Emergency Rehabilitation program. Funding for emergency burned area rehabilitation is not linked to the activities proposed in this EIS.

The key comparison element for evaluating how the alternatives considered in detail respond to the sub-issue of riparian and wetland systems and their associated effects are road construction and reconstruction across perennial streams.

DIRECT AND INDIRECT EFFECTS

Effects Common to All Alternatives

As the beetle killed spruce fall to the ground, they would supply large and small woody debris to the stream that would help in the recovery of the stream system from the impacts of historic overgrazing. The woody debris in the streams helps to support aquatic organisms that are beneficial to fish. The large woody debris in the streams would help to form step-pool features in the channel, dissipating energy of and reducing erosion by the flowing water. The large woody debris would also help to trap sediment and provide a growth media for riparian plants.

Although large, intense wildland fires are not frequent events in these forest types, the high mortality of spruce in infested areas would result in increased fire hazard. Intense wildland fires could have adverse effects on riparian zones, wetlands, and floodplains. In the short term, the degree of effect would depend on fire intensities in the watershed and riparian area, and whether or not floods followed the fire. Flooding may cause scouring and deposition in the riparian system, which would increase the amount of recovery time.

Effects of Alternative 1 - Flood Crossings

The road network and the associated crossings of perennial streams is currently in place. There would be no road reconstruction; therefore, crossings in poor condition would remain so.

Effects of Alternatives 2, 3, and 4

The wetlands/riparian/floodplains analysis is based on aerial photo and topographic map interpretations.

The project design features and BMP’s include requirements which prohibit harvesting or access by mechanical equipment within 100 feet of perennial stream banks, lakes, or the outer perimeter of wetlands. The design features further require that intermittent streams will have a no-harvest zone of 35 feet and a no-access zone of 50 feet. The average width of inventoried riparian areas within potential treatment areas is 28 feet, including the width of the stream. Crossing of stream channels in the course of harvest operations shall be approved by a timber sale administrator.

Effects of Alternatives 2, 3, and 4 - Road Crossings

See Appendix H for maps and descriptions of the individual crossings associated with the alternatives. See Aquatic Habitat and Effects Differing between alternatives for number of crossings by alternative.

Disturbance of stream channels and riparian areas at road crossings must be minimized during reconstruction. Several crossings in poor condition will be reconstructed. Reconstruction can include installing larger diameter or longer culverts, graveling the roadway leading to the crossing, installing cross-drainage to divert ditch water before it reaches a perennial stream or replacing stream fords with culverted crossings. In some areas willows and other riparian vegetation may be transplanted into the crossing area.

CUMULATIVE EFFECTS

The cumulative effects for riparian areas, wetlands, and floodplains are described in the following Aquatic Habitat Cumulative Effects section.

The key comparison element for evaluating how the alternatives considered in detail respond to the sub-issue of aquatic habitat and their associated effects is stream habitat impacts from sediment yields.

Primary effects of concern when assessing timber treatment projects are increases in sediment to streams, which effects spawning habitat quality of resident fish and degrades habitat diversity of aquatic macro-invertebrates. Secondary effects include increases in sediment temperature, introduction of contaminants, and channel degradation that results in loss of important habitat features (e.g. pools, spawning riffles, and bank undercut). New or improved road access to drainages could also result in fish mortality from anglers and harassment of spawning adult fish. Improper culvert design or placement can interfere or prevent fish passage and isolate subpopulations of aquatic species. Implementation of project design features, riparian protection measures, travel management, and carefully designed roads and project layout can prevent or reduce all of these effects.
DIRECT AND INDIRECT EFFECTS

Effects Common to All Alternatives

Increased water yield is expected to occur from loss of live spruce in all the streams of the project area with no differences between the alternatives, including the no-action alternative. The result in increased water yield could be channel down-cutting, channel adjustment, and some loss of aquatic habitat. Habitat loss could potentially occur through channel widening, decreased depth, and reduced pool area (Heed and Rinne, 1990). Increased sediment in streams could also affect success of some life history stages of resident fish. Sediment in streams can overlay eggs or pre-emergent fry in gravels and result in loss of egg and fry survival of resident fish (Hartman et al. 1987 in Meekun, 1991). As sediment migrates through the drainages, fish could be temporarily displaced. Fish densities could increase in some areas and decrease in other areas in response to the potential habitat changes.

Increases in sediment yields may also have minor effects on flat-water aquatic habitat. Increased sediments moving through affected drainages are deposited where flows are slow, accelerating the filling of in reservoirs, lakes, ponds, and deposition of sediments on inlet and outlet spawning areas.

Insect-killed trees would provide an increase in large woody debris in perennial stream channels, increased hiding cover, some debris dam-type pools, and an increase in wood-digesting macroinvertebrate communities. Interimiment channels would also experience an increase in large woody debris over the next 75 years which could help to control channel gradient, slow sediment routing, and potentially control fine sediment routing to downstream aquatic habitat. Fish densities should increase in response to the potential habitat changes discussed above at localized stream segments where quantities of large woody debris is expected to increase from recruitment of dead spruce.

Although large intensity wildland fires are not common in these forest types, such fires could have temporary adverse effects to aquatic habitat. The primary effects of concern would be increased sediment from upland erosion, introduction of excess nutrients (ash), changes in stream temperature, and channel degradation (Everest and Clough, 1982, in Marcus et al. 1990). Wildfire from upland erosion would also have long term positive effects on aquatic communities if fire intensity is low and large woody debris is consumed. There would be an increase in shrub vigor and grass/forb/sedge riparian vegetation which would provide cover, shade, and filtering of fine sediment. The loss of large woody debris in riparian zones from high intensity fires would have the effect of reducing stream channel stability, decrease macroinvertebrate habitat, and decrease hiding cover for resident fish populations. A long term, steady supply of large wood may not be available after a large intense fire in riparian zones, due to the creation of a uniform age class of new trees that replaces existing stands. Large wood provides food, shelter and pool habitat for aquatic species.

Effects of Alternative 1

Effects from Alternative 1 would be the same as those presented in the preceding "Effects Common to All Alternatives" section. Large woody debris in many reaches of streams in the project area would increase. This would potentially improve habitat diversity for aquatic resources.

Road reclamation projects would not occur and current erosion and sediment inputs to stream channels would continue. Forest Development Road #50285, in its current location next to Little Horse Creek, would continue to route fine sediment into the stream and cause long term negative impacts to aquatic resources. Road construction activities would not occur and erosion of road surfaces and some stream crossings would continue to cause long term sediment impacts that degrade aquatic resources.

The risk of large intense wildland fire would be greater with the no action alternative. The fire modeling analysis of potential fire effects shows that BTU's, used as an indicator of fire intensity, would be greater after 75 years (Soils, Chapter 4:3). This indicates that fire intensity, damage to soil productivity, and the risk of fine sediment impacting aquatic habitat would be greater with the no action alternative (see Soils section 4:3).

Effects Common to Alternatives 2, 3, and 4

Harvest activity in the watersheds would increase sediment yield, and affect aquatic habitat; although changes attributable to removal of dead trees would be negligible relative to those resulting from hydrologic effects from the increased fire intensity. The risk and magnitude of these effects would depend on the magnitude of precipitation events during periods of high ground disturbance. In low-water years, little disturbance to aquatic habitat over and above that caused by increased sediment yields from the harvest activity would be observed. Should a high precipitation event occur (or high runoff) during ground disturbance, there could be a temporary degradation of habitat resulting from increased sediment, reducing the quality of spawning habitat. Declines in filter-feeding macroinvertebrate species would also be observed (Brunskill et al. 1973 in Waters, 1996). Implementation of Project Design Features (Appendix O, ps D2-D3) would not eliminate these effects, but should reduce the risk of these effects from occurring.

Perennial streams would have a 100-foot "no harvest zone" and "no mechanical entry zone". Intermittent channels would have a 35-foot "no harvest zone" and 50-foot "no mechanical entry zone" along these. Requirements should reduce negative effects to the structure and function of riparian communities and stream channels. Implementation of these no-harvest zones should filter most sediment generated by harvesting and prevent negative impacts to aquatic resources (Newbold et al. 1980). Dead wood from the insect infestation would enter the stream channel and provide increased food, cover, and pools for aquatic species. If these requirements are followed, harvest activities should have less potential to negatively affect aquatic communities and their habitats (Chamberlin et al. 1991. Belt et al. 1992, Bisson et al. 1987) with the exception of small localized disturbed areas where logging related roads parallel or cross streams.

Best Management Practices provide direction to not conduct gas and diesel fueling activities in riparian zones. There would be no project caused chemical contamination of soils or water quality. Therefore, aquatic species would not be affected by such pollutants.

Effects Differing Between Alternatives 2, 3, and 4

Alternative 2

Removal of insect-killed wood from the watershed using ground-based and helicopter capable harvest techniques would cause small increases in erosion. The
risk and magnitude of such impacts would increase if a large precipitation event occurs during or following ground disturbance.

Implementation of Alternative 2 would require 10 riparian road crossings (Appendix H). Short term impacts from this activity would be soil disturbance, compaction, and increased soil movement. Increased erosion would result in temporary filling of pools downstream and in proximity to these alignments, and possible sedimentation of spawning gravels, causing some fish displacement and short term loss of productivity. Within the entire project area, the greatest risk of short term temporary impacts to aquatic habitat would be in Little Horse Creek where 1.1 mile of new road construction (including three stream crossings) would occur into unit E-3 (see water Resources Section 4.4). Alternatives 3 and 4 do not propose to construct this road. The long term effects from reclaiming the old road prism along Little Horse Creek should be a reduction of erosion and fine sediment in Little Horse Creek.

Alternative 3

Implementation of Alternative 3 would require 8 riparian road crossings within riparian areas. The use of helicopter logging instead of land-based methods would result in less soil disturbance to within harvest units compared to Alternative 2. This alternative would eliminate the need for 2 stream crossings and road construction within the Little Horse Creek watershed, thereby preventing the short term erosion and habitat impacts that would occur with these activities.

Alternative 4

This alternative would result in the removal of less woody material from basins in the southern Muddy, Heliotrope, and Sixmile areas and less potential sediment yield and erosion compared to Alternative 3. Implementation would require 7 riparian road crossings within riparian areas and the same short term impacts previously described with this activity.

Overall, potential impacts to aquatic resources would be less than those projected for Alternatives 2 and 3, because there is less ground disturbance from tractor logging, less potential for soil erosion and sediment delivery to aquatic systems, and less short term disturbance from road/stream crossings from construction and reconstruction.

CUMULATIVE EFFECTS

Livestock grazing and wildlife foraging affect riparian and aquatic habitat in all of the drainages within the project area. These two management activities have reduced vegetation cover, vegetation vigor, and resulted in increased erosion on streambank areas and upland slopes. Continued improvements in grazing practices have reduced erosion throughout most of the project area and now erosion is within acceptable levels (Bane, 1994). Existing roads contribute sediments to streams and flat water habitats, result in aquatic habitat degradation. All of these effects can contribute to sediment loading, bank damage, vegetation loss or disturbance, and accelerated erosion.

Vehicle use, including recreation all-terrain vehicles, has caused soil compaction, vegetation loss and degradation of some riparian areas. Off-road vehicle use (an illegal activity) has impacted riparian areas in the Upper Muddy and Upper Twelvemile drainages (Dufour, 1995). Dispersed recreation sites in Upper Twelvemile, Little Horse Creek, Ducks Fork Creek, Upper Muddy Creek, and in proximity to every lake and reservoir in the project area have degraded riparian areas and some aquatic habitats (Dufour, 1995).

Erosion from these actions increases the amount of sediment moving through aquatic habitats and has subsequent effects on aquatic organisms. Excessive sediment in streams can affect fish of all life history stages, as described above in Effects Common to Alternatives 2, 3, and 4 (Aquatic Habitat, Chapter 4). Dispersed recreation impacts to riparian environments (soil compaction, vegetation loss, increased erosion) is evident in portions of the Upper Muddy, Duck Fork, Little Horse Creek, Twelvemile Creek, and major portions of the shorelines of every lake and reservoir in the project area (Dufour, 1995). All-terrain vehicle crossings are evident in the Twelvemile Basin below Unit G4. Degradation of riparian habitats renders them ineffective at buffering upland runoff and results in increased sedimentation of stream environments. Measurable changes from short and long term sediment in streams and the negative effect to aquatic habitat are not expected to occur from any of the proposed action alternatives. Considering the additive effects from the proposed activity in conjunction with past and foreseeable activities, there would not be any detectable cumulative effects to aquatic habitat. The only exception to this would be in Little Horse Creek. Short term effects from new road construction, with heavy precipitation events, (Alternative 2, Aquatic Habitat, Chapter 4) could have negative cumulative effects to aquatic habitat in this drainage and downstream in Indian Creek. For all streams and reservoir habitats, macroinvertebrate indices would not be expected to fall below Forest Management Plan standards.

DIRECT AND INDIRECT EFFECTS

There are no threatened, endangered, or proposed fish species found within the project area. Downstream from the project area, however, there are four Colorado River fish species which are currently listed as endangered: the Colorado pikeminnow (Ptychocheilus lucius), the Bombayshark (Gila robusta), the Humpback chub (Gila cypha), and the Razorback sucker (Xyrauchen texanus). Primary effects of concern for these fisheries are excessive sediment additions, changes, in water temperature, introduction of contaminants, and changes in water quantity.

Effects Common to Alternatives 2, 3, and 4

Endangered Fishes of the Colorado River: Project activities would be implemented 75 to 100 miles upstream from the habitat of Federally-listed Colorado River fishes. In the context of the Colorado Basin, the effects of this project would be negligible. The effects on these populations are therefore not discussed for the individual alternatives.

Sensitive Fish Species: Project riparian protection measures and BMPs (see Design Features, Appendix D) are expected to be adequate for protecting Colorado River cutthroat trout and Bonneville cutthroat trout habitat. Habitat for these species would experience negligible habitat degradation over those expected from hydrologic changes resulting from natural events such as landslides and flooding. Road reclamation associated with this project should potentially cause long term benefits to resident fish habitat especially in Little Horse Creek, by decreasing chronic fine sediment input to channels. Effects on this subspecies would be the same as described for aquatic habitat (Chapter 4).

THERMINATED, ENDANGERED, AND SENSITIVE AQUATIC SPECIES

THREATENED

Ungulate

DEER

ANTELOPE

EINAGERED

GRAY-LHORSE

BONEFISH

INCORPORATED

or

S: biology, 1994).

Ducks Fork Creek, Upper Muddy Creek, and in proximity to every lake and reservoir in the project area have degraded riparian areas and some aquatic habitats (Dufour, 1995).
Effects Differing Between Alternatives 2, 3, and 4

Alternative 2 would provide the greatest potential for short term impacts to Little Horse Creek due to new road construction activity. Alternative 3 and 4 would provide the least potential for short term effects to habitat in the Little Horse Creek.

CUMULATIVE EFFECTS

Endangered Fishes of the Colorado River: Diversion of water for cultural, agricultural, and hydropower are probably the most important factors affecting the endangered fish species of the Colorado. The timber salvage treatments analyzed in this document in addition to past and foreseeable actions would have "No Effect" to these species or their respective habitats.

Sensitive Fish Species: Based on mitigation measures and BMP's (Design Features, Appendix D) the timber salvage treatments analyzed in this document in addition to past and foreseeable actions would cause "No Impact" to habitat for Bonneville and Colorado River cutthroat trout.

4.5 VEGETATION RESOURCES

This section discusses the effects of implementing the alternatives on the vegetation resources.

The key comparison elements for evaluating effects and displaying how the alternatives considered in detail affect species composition, structural diversity, and stand development are dead/dying spruce stands harvested and reforested, and spruce recovery rate in beetle infested spruce stands. Additionally, this issue will look at a comparison of stand development and changes in vegetation diversity.

Alternatives were analyzed by use of existing stand inventory data, and the Utah variant of the Forest Vegetation Simulation Model #6.2. Detailed analysis information and documentation relative to this issue is available in the project record and in the South Manti Timber Salvage Sales Environmental Assessment and its project record.

DIRECT AND INDIRECT EFFECTS

Effects of Alternative 1

The spruce beetle epidemic, although likely within the natural range of variability for spruce-fir forest types on the Manti-La Sal National Forest, has created stand conditions that are less varied with more created openings than those that previously existed.

Species Composition

Alternative 1 provides for recovery of the Engelmann spruce through natural regeneration. This alternative has no stand treatments and the greatest risk from fire to the vegetation resource of all the alternatives.

As described in Chapter 3 (3.6 Vegetation Resource), past and current experience indicate that as a direct result of the spruce beetle epidemic, a majority of the spruce greater than 8 inches in diameter at breast height (DBH), including the large, mature spruce trees, in the proposed treatment stands have already died. Most of the residual large green spruce component that is still alive will also die unless the spruce beetle population collapses. The effects of this mortality include:

- reduced numbers (abundance) of live spruce trees;
- reduced gene pool of spruce seed source;
- reduced average stand diameter, height, and age class diversity (structural diversity);
- conversion of species composition from a dominant or moderate spruce mix towards subalpine fir;
- reduced seed source in some areas, slowing natural regeneration and recovery of those sites to a forested condition.

Vegetative species diversity has not changed in the project area. Engelmann spruce will remain as a component of the ecosystem. However, the number of live spruce trees has been reduced (particularly large-diameter spruce trees). Any future changes in the number of live spruce in untreated areas is dependent upon the speed at which natural seeding can occur from remaining spruce.

As described in Chapter 3 (Section 3.6), few spruce remain a size and age that can provide a viable seed source in the short and long term. Remaining spruce are generally less than 8 inches in diameter, are not well distributed, and have limited seed production capability. Remaining spruce will have to mature before adequate amounts of seed will be available.

The size of areas where spruce mortality has occurred can also affect the time required to regapulate spruce in locations that have lost a high percentage of available seed sources. Although Engelmann spruce seed is light and primarily wind disseminated, most seed falls relatively close to the tree. Studies show that in good seed years with favorable winds, some seed may spread as far as 600 feet, but most fall within 100 feet of seed trees (USDA Forest Service, Agriculture Handbook 654, p. 190-191).

A Vegetative Structural Stage (VSS) analysis was completed for the project area during FVS modeling for the 1996 South Manti Timber Salvage Sales Environmental Assessment to identify changes in stand size structure and canopy closure. The analysis showed that the VSS class of all stands proposed for treatment at that time were being reduced in average size and canopy closure due to spruce mortality. Average structural stage has been reduced from a mature forest to a seedling/sapling or young forest structure (see VSS analysis in the project file). No mature forest or old forest Engelmann spruce stands remain within the project area. No trees will be harvested that further depletes numbers of large live trees.

The spruce beetle has changed the fire regime and a large intense wildland fire could result in decreased vegetation diversity, increased soil erosion, reduced soil and site productivity, and reduced mycorrhizal development (mycorrhizae provides an important symbiotic nutritional relationship with coniferous trees), as well as changes in other elements of the ecosystem which affect the growth of trees. This alternative has the greatest potential negative effects due to stands being left untreated.

Stand Development

Alternative 1 provides for natural assimilation of the dead wood into the soil and natural succession. Stand development, growth, and production levels are expected to proceed along natural timelines which would be slower than with planting. The stands would be left to regenerate naturally, including minor amounts of aspen sprouting where clones mixed within these predominantly
conifer stands are receiving increased light and reduced competition because of the death of the surrounding spruce.

Within beetle affected areas, there are few live dominant or codominant spruce trees equal to or greater than 15-inches in diameter at breast height left to provide a viable seed source for natural regeneration of spruce (Alexander, 1987). Although spruce and subalpine fir can begin producing cones at heights of 4 to 5 feet, sapling, pole, and small sawtimber size trees are generally poor seed producers. Competition from increased density of herbaceous plants (shrubs, forbs, and grasses) will further limit natural regeneration and growth of tree seedlings (Schmid and Hinds, 1974). 100 to 200 years could be required for many areas to return to pre-epidemic stocking levels. Forest Vegetation Simulator (FVS) indicates that stands moosed to stimulate natural regeneration could require 60 to 70 years longer than planted stands to achieve old forest characteristics.

**Effects Common to Alternatives 2, 3, and 4**

**Species Composition**

Planting will be used to increase the abundance (numbers) of Engelmann spruce and provide an opportunity to introduce a new age class or component within the structure of the treated stands in less time than would occur naturally.

The post-epidemic genetic pool of Engelmann spruce would be supplemented through planting. This provides opportunity to include seedlings from parent trees with desirable traits (diameter growth, height growth, and crown development) from within and around the project area. Seed for planting was collected in 1995 from mature trees of with good characteristics before spruce tree mortality reached extreme levels. Planting in the long term (70 to 100 years), will help to reduce inbreeding and selection towards less successful trees which survived the epidemic due to their small size or young age.

**Stand Development**

Untreated areas would be left to develop similar to those described under Alternative 1. Natural regeneration would include sprouting of aspen clones within stands that are released from the competition and shade. Approximately 100 to 200 years could be required for many areas to return to pre-epidemic stocking levels in the absence of pro-active reforestation measures. Verses 60 to 70 years sooner on treated areas. This is based upon 1994 stand inventory and FVS modeling to project future growth and development of stands following treatment in the 1996 South Manti Timber Salvage Sales Environmental Assessment.

Scarcification of the treated stands, with slopes less than 25 percent, may be necessary to reduce seedling competition from grass, forbs, and shrubs to ensure success of planted or natural regeneration. Machine scarification should result in about 30 percent ground disturbance in treated areas. On slopes greater than 25 percent, hand scarification and/or burning of fuel concentrations may be used to provide adequate site preparation.

Monitoring (see project files) of spruce-fir stands in the project area identified the presence of moderate to high pocket gopher populations. This species can be a serious threat to successful establishment of newly reforested areas if not managed properly. Planted areas could require gopher control (underground strychnine baiting) treatments to ensure establishment and continued growth. Perimeter treatments would be included around planted areas. Information on the northern pocket gopher, treatment methods, and effects is available in the project file (Ronald E. Bonar, The Northern Pocket Gopher Most of What You Thought You Might Want to Know, but Hesitated to Look Up, USDA Forest Service, 9524-2806-MIDC, 1997). Plantations in areas near drainage bottoms and on slopes requiring protection (fencing, livestock reductions, etc.) from livestock to ensure seedling establishment and growth for up to 20 years.

**Effects Differing Between Alternatives 2, 3, and 4**

**Species Composition and Stand Development**

Long-term site recovery of treated stands would vary relative to the amount of planting or reforestation activities included in each action alternative. The more acres planted, the greater the recovery and future stand benefits would be. Figures E-1 in Appendix E shows the amount of planting and associated treatments for reforestation needs included for each alternative.

The post-epidemic genetic pool would be beneficially supplemented to varying degrees by the action alternatives relative to the amount of planting included on each. The more acres planted, the greater the contribution to the genetic pool would be.

The opportunity to return spruce to a component of treated stands in a shorter time than would occur naturally, while introducing a new age class or component within the structure of treated stands, would be provided to varying degrees by the action alternatives relative to the amount of planting included in each. The more acres planted, the more areas that would have an accelerated return of spruce stands.

Alternative 2 would include reforestation (Figure E-1) across a total range of 1,469 to 1,909 acres (497 and 646 acres would be within timber emphasis management areas). Planting would occur on between 551 and 716 acres (186 and 242 acres would be within timber emphasis management areas). Machine scarification is proposed on 426 to 554 acres. Natural reforestation would be prescribed on 311 to 404 acres within timber emphasis management areas. Gopher control treatment may be necessary on 606 to 788 acres.

Alternative 3 would include reforestation (Figure E-1) across a total range of 1,469 to 1,909 acres (497 and 646 acres would be within timber emphasis management areas). Planting would occur on between 720 and 936 acres (257 and 347 acres would be within timber emphasis management areas). Machine scarification is proposed on 257 to 334 acres. Difference in scarification is due to the mechanical scarification in inventory roadless areas allowed for under this alternative. Natural reforestation would be prescribed on 230 to 299 acres within timber emphasis management areas. Gopher control treatment may be necessary on 792 to 1,030 acres.

Alternative 4 would include reforestation (Figure E-1) across a total range of 855 to 1,150 acres (219 and 285 acres would be within timber emphasis management areas). Planting would occur on between 332 and 431 acres (82 and 107 acres would be within timber emphasis management areas). Machine scarification is proposed on 257 to 334 acres. Natural reforestation would be prescribed on 37 to 78 acres within timber emphasis management areas. Gopher control treatment may be necessary on 365 to 474 acres.
In general, Alternatives 2 and 3 would provide similar levels of species composition and stand development of the action alternatives. Alternative 4 would provide less based on its reduced amount of treated areas.

**CUMULATIVE EFFECTS**

Due to the extent of the epidemic and the associated high level of tree mortality, cumulative effects on species composition, structural diversity, and stand development in untreated areas are as described in effects in Alternative 1. The primary difference between no action and the action alternatives is related to the degree that spruce is reestablished through planting treatments and the timing required to bring stands back to forested conditions that approximate stocking and production levels that existed prior to the epidemic. Approximately 60 to 70 years would be required. Smaller trees would dominate the sites, but the cover provided and the size of the trees would give to the feeling of being in forested stands. Although trees would be small, spruce would be an integral component of these stands sooner than would be possible under conditions that allow natural seeding and succession. The time needed to fill open sites with trees would be less. Planting provides the opportunity to have 4-5 foot trees in open areas in about 30 years, as opposed to achieving similar conditions in 100 years or more when no seed source remains available to reforest the area naturally.

Unless environmental conditions cause spruce beetle populations to collapse naturally, spruce beetles could continue to spread north infesting areas of suitable host type. This has continued to the current time (Figure 3.11 Landscape Spruce Beetle Infestation Map). When considered with the treatments that have been already completed within the project area, species composition and stand development would be proportionally increased with any of the action alternatives, as it will increase the genetic diversity, and increase growth and yield over a greater area.

La Farge (1990), when evaluating genetic diversity relative to clearcutting stated, “natural regeneration offers the least opportunity to manage for genetic diversity when a clear cut is implemented”. He does, however, state that natural regeneration is desirable when you wish to favor genotypes adapted to the local environment.

Steinhoff (1990), when evaluating genetics and seed-tree regeneration methods states that “if closely related trees are left to supply seed and outside pollen and seed production is limited, diversity may be substantially reduced”. “Because of the widely scattered distribution of seed trees, the seedlings around each tree will be more likely to be closely related than under a shelterwood or clear cut and plant program. Such clusters of related individuals could result in reduced diversity in subsequent generations if outside pollen is limited.”

Because of high mortality levels, the existing seed producing Engelmann spruce population has been reduced to levels that approximate those in a clear cut or seed-tree configuration. Few, if any, spruce trees of seed-bearing age exist within the project area. Planting of spruce seedlings provides the opportunity to restore some genetic and species diversity back into these ecosystems through planting of seedlings grown from seeds collected from selected parent trees (growing within and adjacent to the project area) before the outbreak killed most of the mature spruce. La Farge (1990) states, “modeling experiments show that forest ecosystems which have undergone severe changes in the past will not revert to their former pristine states if left unattended.” In the same article. La Farge suggests that planting provides the opportunity to combine benefits of planting stock from seed of known, vigorous trees of desirable character with natural regeneration that occurs from existing seed sources to improve genetic diversity.

It also provides the opportunity to plant seedlings in the ground now, rather than wait 30 or more years until remaining sapling and pole size trees have reached an age that they can produce some seed to reestablish spruce. It also allows us to get new trees started before competition from expanding grass, forbs, and shrubs reach densities that hinder the reestablishment of trees. In many cases, there is no residual spruce of any size and any recovery would occur over a 100-200 year period.

In excess of 30,000 acres have been affected by high levels of spruce mortality forest-wide (Figure 3.11 Landscape Spruce Beetle Infestation Map). Vegetation diversity and stand development is being affected similarly to effects in this project in adjacent areas where the spruce beetle has spread. All untreated areas having spruce trees affected by spruce beetle would be more open than prior to infestation and would be subject to natural regeneration through seeding or (where present) clonal sprouting of aspen.

Large, intense wildland fire co-occur change stand composition and structure, depending on the size and number of fires that might occur within the project area. Wildland fires could further reduce the vegetation diversity by killing remaining live trees species of all sizes and age classes. Consequently, these types of fires would also result in further losses of genetic diversity, as they would intensify the effects of the spruce-beetle epidemic.

The key comparison elements for evaluating the alternatives considered in detail respond to the sub-issue of noxious weeds, and their associated effects, is soil disturbance. Noxious weed establishment and invasion is also discussed in this section. Alternatives were additionally analyzed to determine the effect they would have on rangeland vegetation health and productivity.

Information used for the analysis was obtained from long-term records kept at the Ferron Ranger District and information contained in the Manti-La Sal Noxious Weed Environmental Assessment.

**DIRECT AND INDIRECT EFFECTS**

**Effects Common to All Alternatives**

**Noxious Weeds**

Noxious weed populations would continue to be treated in accordance with existing decisions and agreements. Should new populations of noxious weeds be introduced within the project area, the weeds would be treated expeditiously.

**Rangeland Vegetation**

Forest and area specific grazing requirements would continue to be implemented across range allotments within the project area.

**Effects of Alternative 1**

**Noxious Weeds**

Noxious weeds would continue to spread, but it would be at a lower rate than that of the action alternatives. Weed establishment would come from natural seed dispersal (e.g. wind, wildlife, livestock) and other forest users (e.g. recreationists, hunters).
Rangeland Vegetation

Vegetation trends and production would improve, but it would be at a slower rate than that of the action alternatives. Beetle-induced spruce mortality would change the stand structure and reduce the overstory canopy, increasing the amount of sunlight that reaches the ground. This increased sunlight would allow for natural regeneration of forage species. However, log and wood piling from dead trees that have fallen on the ground would inhibit establishment of understory vegetation more than that of the action alternatives.

Effects Common to Alternatives 2, 3, and 4

Noxious Weeds

Areas of disturbed, exposed mineral soil are conducive to the establishment of noxious weeds. Ground disturbance caused by road work, ground-based and cable yarding, and landing areas would disturb soils and increase the risk of noxious weed spread. All of the action alternatives include these types of activities. Establishment of isolated plants along roads, skid trails, landing areas, and the general area could result in the establishment of an eventual population.

If noxious weeds become established on disturbed sites associated with harvesting before desirable vegetation is established, it is likely other species would not be able to compete with the weeds. This could result in a greater amount of undesirable exotic plant species and less desired plant species. This would be detrimental to the local environment, wildlife, and local economies due to the loss of forage (ALMA), and the cost to treat the weeds.

To minimize the introduction of noxious weeds to the treatment sites, project design features require the Timber Sale Purchaser to furnish proof of weed-free equipment before moving into the treatment unit. Should new populations of noxious weeds be introduced within a sale area, the weeds would be treated under the existing decisions and agreements mentioned above.

Rangeland Vegetation

Vegetation trends and production would improve in localized areas due to an increase in sunlight reaching the forest floor, a lack of competition with conifers. The improvements could take several years due to the lack of a seed bank. Trends would depend on the pre-treatment density of the stand that influence the number and amount of species in the understory.

As new growth occurs, both cattle and sheep would seek it due to its high palatability (depending on the species). In the case of cattle, the Forest has seen good establishment of new vegetation following reclamation of gas wells and coal core drilling projects without fencing, and natural establishment following prescribed burning. The Forest has also seen good regeneration success of aspen under sheep grazing following prescribed burning in the Duck Fork area. Yet in some cases, fencing of reforestation areas has been necessary to prevent livestock damage (e.g. Steep Flats).

The success of understory vegetation regeneration may be attributed to rest from grazing the year following treatment and deferred grazing the second year to trample seed into the soil for germination.

Cattle and sheep both seek shade during the heat of the day. This can impact vegetation in pocket areas, but such areas are usually less than 1 acre in size.

Vegetation trends in the surrounding plant communities, suitable to livestock grazing, are trending toward desired condition. It is expected that harvested stands will follow similar trends until the overstory once again limits understory vegetation.

Effects Differing Between Alternatives 2, 3, and 4

Based upon the soil’s analysis (bare ground from ground-base and helicopter yarding in Section 4.3), alternative 2 is predicted to have 143 acres of disturbed soil, alternative 3 - 87 acres, and alternative 4 - 82 acres. Because fewer acres would be treated and less acres disturbed under Alternative 4, there would be less of an impact.

Cumulative Effects

Noxious weeds are generally increasing throughout the Forest. Any ground disturbing activity could be conducive to noxious weed invasion and spread. Recreationists and livestock are also likely to be introducing and spreading noxious weeds in the area.

The key comparison elements for evaluating how the alternatives considered in detail respond to the sub-issue of threatened, endangered, and sensitive terrestrial plant species and their associated effects, are total acres of suitable habitat within harvest units for each species.

Direct and Indirect Effects

Effects Common to All Alternatives

There are no plants within the project area that are proposed for listing, or their habitat.

The threatened Heilotrope milk-vetch exists within the project. This plant and its critical habitat is located outside of the proposed treatment units. There would be no effect to this species or its habitat.

No endangered plant species, or their habitat, would be affected by any of the alternatives. Carrington daisy (Eriophorum carringtoniae), Arizona willow (Salix arizonica), Musinia groundsel (Senecio musinius), and Maguire campion (Silene petersonii) are sensitive plant species which occur within the project area. Carrington daisy populations and its habitat areas are not found within the proposed treatment areas. There would be no impact to this species or its habitat.

Arizona willow populations and its habitat are not found within the proposed treatment areas. However, it does occur in riparian habitat adjacent to a Forest Development Road along the potential haul route. Project design features prohibit timber harvest within riparian zones. The project would have no impact on this species or its habitat.
South Manti Final Environmental Impact Statement
Chapter 4 Environmental Consequences

Musinea groundsel populations and its habitat are not found within any of the proposed treatment units. However, it does occur in the North Camel and South Camel gravel pits within the project area. A 1997 Biological Evaluation regarding development of these gravel sources determined that Musinea groundsel may be impacted (USDA, Forest Service 1997). Since that evaluation was completed, the North Camel gravel source has been exhausted and stockpiled, and would not be used for this project. Mitigations to reduce or eliminate impacts were included as part of the 1997 Biological Evaluation, the applicable mitigations are incorporated into this project as design features regarding use of the South Camel rock pit (USDA, Forest Service 1997). An additional project design feature prohibiting advancement of the pit to the north would further protect known plant locations. Use of the South Camel Rock pit for this project, and other Forest gravel needs, "may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species." This "may impact" determination is based upon the fact that it is only applicable to use of the existing South Camel gravel pit. After crushing activities are complete, there may be a beneficial impact to this species as the resulting loose crushed rock surface provides habitat conducive for establishment of this plant. The present number of plants suggests that it will expand into the new habitat as it seeds itself. Efforts, independent of this project, are also being made to collect seed for planting as a mitigation measure. Project activities independent of the South Camel rock pit would have "no impact" to Musinea groundsel.

Depending on the alternative, four to eight acres of suitable habitat for Maguire campion are found within the edges of several proposed helicopter treatment units. Suitable habitat is found on barren outcrops of flagstaff limestone. No harvest activities (timber harvest, road construction, or landings, etc.) are planned for these areas. This species is also found within the project area in the exhausted North Camel Rock gravel pit, which would not be used by this project. A 1997 Biological Evaluation regarding development of the North Camel and South Camel gravel sources determined that Maguire campion may be impacted (USDA, Forest Service 1997). Since that evaluation was completed, the North Camel gravel source has been exhausted and would not be used for this project. Mitigations to reduce or eliminate impacts were included as part of the 1997 Biological Evaluation (USDA, Forest Service 1997). The continued use of the stockpiled gravel from this pit for Forest gravel needs and incidental activities within several proposed treatment units "may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species."

**Effects of Alternative 1**

Impacts to Musinea groundsel and Maguire campion are associated with the development and use of gravel of the North and South Camel rock pits. Continued use of these pits "may affect" these plants as presented in the preceding "Effects Common to All Alternatives" section. Musinea groundsel and Maguire campion would be expected to continue existing and created suitable habitat in and surrounding the pits.

**Effects Common to Alternatives 2, 3, and 4**

No quantifiable differences in effects between the action alternatives would be expected.

**Effects Differing Between Alternatives 2, 3, and 4**

Alternatives 2 and 3 each contain 8 acres and Alternative 4 contains 4 acres of suitable habitat for Maguire campion within proposed treatment units. Because no harvest activities are planned within any of the areas of suitable habitat, no quantifiable differences in effects between the action alternatives would be expected.

**CUMULATIVE EFFECTS**

Potential use of the established aggregate sources to support reasonably foreseeable future activities has been considered. For the same reasons presented above, there would be a "may impact" determination for Maguire campion and Musinea groundsel for reasonably foreseeable future activities.

In this section, the key comparison elements for evaluating how the alternatives considered in detail respond to this issue and their associated effects, are fuel reduction, post-treatment fuel loading, predicted fire behavior and resulting rate of spread, and potential escape for initial attack resources.

The overall effect fuel accumulation would have on the potential for wildland fire size was assessed by comparing the actual stand fuel loading data photo points and photo points taken in the treatment areas. Three representative Fuel Loading Groups were identified. All the treatment areas, based on the similarity of the photo points were categorized in to one of the three Fuel Loading Groups. Based on similar current fuel loading and stand structure treatment units were grouped into the following three Fuel Loading Groups for fire behavior analysis.

Fuel Loading Group 1: A1, A3, A6, C3, C6, D2, E1, E4, G1, G2, G3, G4, G6
Fuel Loading Group 2: A7, A8, A9, C1, C2, C4, C7, D1, D3, D4, D5, E2, E3, F1, G5
Fuel Loading Group 3: B4, F3

For assumption purposes, a large, intense wildland fire is being defined as 200 acres or greater in size, 50% or greater tree mortality of sub-alpine fir, greater than 100 tons/acre of PM10 emissions, and 50% or greater dust consumption or greater than 2 inches of dust removal.

**DIRECT AND INDIRECT EFFECTS**

As the dead, down fuel loading increases in each individual stand over time, the potential for escape from initial attack resources and the potential for larger than normal wildland fires will increase. A decrease of dead and down fuel loading and an interruption in the continuity of the fuels, would decrease the potential for escape from initial attack resources and larger than normal wildland fires. It is assumed that in untreated areas during periods of low humidity, high temperatures, and wind, that fire suppression of a wildland fire would be unsafe for fire fighters to directly attack due to the amount of large fuels. Consequently, untreated areas would be allowed to burn and would be contained at treated areas and/or other areas where the fuel is non-continuous (i.e. meadows, aspen stands, rock outcrops).

**Fire Susceptibility**

Fuels and vegetation are continuous in the north facing spruce/fir stands. Outside of these stands, on the East, West, and South facing slopes, the fuels are broken and non-continuous consisting of sage-grass, mountain brush, aspen stands, and barren rocky areas. If a stand replacement fire were to occur in a spruce-fir stand, it would burn that stand and potentially stands with-in spotting distances. Based upon viewing the 1980 Forest Cover Type Map (Figure 3-13)
and on the ground review, a conservative estimation of 75% of the spruce stands are connected or within 1/2 mile from the next stand. Some stands are too far apart for spotting to be a concern and would burn in isolation. Projections for the maximum spotting distances from one tree torching with 20 m.p.h. winds 20 feet above the residual live canopy would be approximately 0.3 of a mile or 1,580 feet. The projection for three or more trees torching with 20 m.p.h. winds 20 feet above the residual live canopy would be approximately 0.5 of a mile or 2,640 feet. A 20 m.p.h. wind event rarely occurs (<10% of the time). The probability of ignition in a closed north facing stand if a fire brand were to land on receptive fuels at 73 degrees F and 15% RH would be approximately 50%.

The potential for large fires in spruce-fir stands due to beetle infestations can increase over time, but is not as serious a problem as it can be in other timber types (i.e. lodgepole pine). J.M. Schmid and T.E. Hinds cite in their paper that " widespread fire seems to be a rare event in spruce-fir type". In can be concluded that large, intense, wildland fires in the project area would have a low probability.

Dead and Down Fuels

For untreated areas, dead and down fuels would increase as a result of beetle-induced spruce tree mortality. James L. Miekle (December 1950) on the Dixie National Forest reported "Although dead for about 25 years, in 1948, 84 percent of the beetle killed trees of all sizes were still standing on Boulder Mountain and only 16 percent were down." He goes on to state "All indications suggest that in stands not removed by salvage the dropout will continue to be gradual for a number of years in the future. " With the use of a regression analysis, it was determined that 90% of the beetle killed trees would be on the ground at approximately 75 years from the date they died. That would be approximately the year 2075 in this area. As beetle killed trees fall to the ground, large and fine fuel would accumulate. Current fuel loading within the project area varies from approximately 10 to 32 tons per acre of dead down fuel, with an average of 22 tons per acre. The average size of the existing ground fuels is generally greater than 3 inches in diameter.

Effects of Alternative 1

Fire Susceptibility

The potential for large intense wildland fire would continue to increase over time. This would result directly from continued increases in down fuel loading as trees killed by the spruce beetle fall to the ground. This alternative has the greatest amount of susceptibility due to no treatment.

Dead and Down Fuels

As the dead spruce trees fall to the ground, the average fuel loading would increase from approximately 22 tons/acre in 2000 to approximately 55 tons/acre by the year 2075 (Figure 4-10). The primary down dead fuel factor that governs the fire behavior is the fuel loading of the 1, 10, and 100 hour time lag fuels. Overall, this alternative would have the greatest amount of dead and down fuel due to no treatment.

<table>
<thead>
<tr>
<th>Fuel Loading Groups</th>
<th>Year</th>
<th>Fuel Load, 1-Hr, dead, tonnes</th>
<th>Fuel Load, 10-Hr, dead, tonnes</th>
<th>Fuel Load, 100-Hr, dead, tonnes</th>
<th>Fuel Load, &lt;3 in. dead, tonnes</th>
<th>Fuel Load, Total dead, tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2000</td>
<td>0.47</td>
<td>0.35</td>
<td>1.25</td>
<td>1.17</td>
<td>18.12</td>
</tr>
<tr>
<td>2</td>
<td>2020</td>
<td>0.27</td>
<td>0.28</td>
<td>1.84</td>
<td>1.84</td>
<td>21.00</td>
</tr>
<tr>
<td>3</td>
<td>2075</td>
<td>0.44</td>
<td>0.89</td>
<td>5.83</td>
<td>6.26</td>
<td>24.00</td>
</tr>
<tr>
<td>4</td>
<td>2075</td>
<td>1.41</td>
<td>2.71</td>
<td>2.48</td>
<td>8.79</td>
<td>49.11</td>
</tr>
<tr>
<td>5</td>
<td>2075</td>
<td>1.48</td>
<td>2.51</td>
<td>2.21</td>
<td>8.00</td>
<td>48.00</td>
</tr>
<tr>
<td>6</td>
<td>2075</td>
<td>1.64</td>
<td>2.73</td>
<td>2.29</td>
<td>8.66</td>
<td>55.49</td>
</tr>
</tbody>
</table>

Fire Behavior

Most spruce-fir stands would reach their highest down, dead fuel loading by 2075. At that time, most of the dead standing spruce trees would have fallen to the ground. With the aid of the Fire Behavior Prediction System BEHAVE predictions were made for a fire in a spruce-fir stand located on a north aspect at 9,000 feet elevation under fire weather and fuels moisture conditions that could be experienced at that elevation (Representative NFDRS Weather Station Brune Point, Elevation 9200 Feet, 90th Percentile Weather Conditions, project record).

Based upon the above parameters, the following table shows the fire behavior outputs from the BEHAVE runs by treatment area under Alternative 1 in the years 2000 and 2075. The site protections assume that there is no suppression action occurring in the first 4 hours. This is the approximate time it would take for initial attack resources to be notified and arrive on site and begin suppression action. The initial attack suppression force modeled are two type 6 engine modules with three persons/mODULE and a 5 person hand crew. Due to the inaccessible nature of the typical timber stand in this area, the engine modules are not utilizing water and are represented as hand crews. Fire sizes under the column heading After 4 Hours of Initial Attack (Acres) represent fires that escaped initial action. The last column on the right rates the potential for initial attack escape as either low, moderate or high. If a fire is contained in the first 4 hours by the initial attack resources, it is rated Low. If it is just barely contained or close to being contained, it is rated Moderate. If it is not contained, it is rated as High (Figure 4-11).

At the current time, Treatment Group 1 is not a fire suppression problem since the rate of spread would be 1 chain (66 feet) per hour. The potential for initial attack escape is Low. Treatment Group 2 currently would have the largest rate of spread at 6 chains per hour and would have a potential for initial attack escape of High. Fuel Loading Group 3 currently has a spread rate of 4 and would have a potential for fire escape from the initial attack resources of Moderate.

In the year 2075, after almost all of the trees have fallen to the ground and there is high volume of small material less than 3 inches in diameter, there would be a rate of spread of approximately 8 chains per hour and a potential for fire escape from initial attack of High in all three Fuel Loading Groups.
Effects Common to Alternatives 2, 3, and 4

All alternatives include the removal of dead trees, whole tree yarding in tractor areas, log and scatter of helicopter areas, jackpot burning in helicopter areas, piling and burning of logging slash (landings), and mechanical scarification throughout the treatment units. If cable yarding is utilized, whole tree yarding will be required. Such fuel reduction efforts would reduce the potential of a high intensity, stand replacing wildland fire. The post-project fuel loading in treated areas would be considerably less than if left untreated.

Helicopter and or Cable Units - Years 2000 to 2075

Dead and Down Fuels

As the dead spruce trees are harvested in the helicopter and or cable units the tops (to a 6 inch diameter) and limbs would be lopped and scattered. Over the next 75 years, the dead down material will slowly decompose and be reduced in tons/acre. Following harvest, the average fuel loading would increase from approximately 22 tons/acre in 2000 to 33 tons/acre (Figure 4-12). After 75 years, due to decomposition, the average fuel loading would be approximately 27 tons/acre.

Figure 4-12 Downed Dead Fuel Loading-Helicopter and or Cable


Fire Behavior

Following harvest, Fuel Loading Groups 1 and 2 would have a rate of spread of approximately 8 chains per hour and would have potential for escape from initial attack of High (Figure 4-13). Fuel Loading Group 3 would have a rate of spread of 5 chains per hour. The model indicates that a fire could be contained at approximately 40 acres in 3.9 hours. This would be the upper limits of the fire suppression initial attack resources and there is the possibility that a fire in this Fuel Loading Group could escape initial attack. Consequently, it is given a rating of Moderate for a potential for escaping initial attack.

By the year 2075, due to decomposition of the fuels less than 3 inches in diameter, the rate of spread in all three Fuel Loading Groups would be approximately 2 chains per hour and an escape potential from initial attack of Low.

Figure 4-13 Fire Behavior Outputs Alternatives 2, 3, and 4 - Helicopter and or Cable

Fuel Loading Groups Year Rate of Spread (Chains/hr) Flame Length (Feet) Size in First 4 Hours Containment Size After 4 Hours of Initial Attack (Acres) Containment Time (Hours) After 4 Hours of Initial Attack (Acres) Potential for Initial Attack Escape 1 2000 1 3.8 28 9.0 Moderate 2 2000 1 3.8 28 9.0 Moderate 3 2000 1 3.8 28 9.0 Moderate 1 2075 1 1.0 3.4 5.0 Low 2 2075 1 1.0 3.4 5.0 Low 3 2075 1 1.0 3.4 5.0 Low

Tractor Units - Years 2000 to 2075

Dead and Down Fuels

As the trees are harvested in the ground-based areas, the average fuel loading would remain at approximately 25 tons per acre (Figure 4-14). This figure does not take into account that the yarding of existing down material would take place. Existing down logs are usually still merchantable for houselogs and frequently removed as included material under the terms of the timber sale contract. If no further fuel treatments were to take place, the average fuel loading in the year 2075 would decrease due to decomposition to approximately 24 tons per acre. Most of the decrease would occur in the 3 inch DBH or smaller sizes.

Figure 4-14 Downed Dead Fuel Loading - Ground Based

Fuel Loading Groups Year Fuel Load, 1/yr, tonnes Fuel Load, 10/yr, tonnes Fuel Load, 100/yr, tonnes Fuel Load, <3 in., tonnes Fuel Load, >3 in., tonnes Total dead, tonnes 1 Post treatment 2000 0.47 3.56 7.65 13.17 18.12 18.12 2 Post treatment 2000 0.47 3.56 7.65 13.17 18.12 18.12 3 Post treatment 2000 0.44 1.59 5.03 8.26 12.50 12.50 1 Post treatment 2075 0.26 0.36 0.37 1.23 24.43 24.43 2 Post treatment 2075 0.26 0.36 0.37 1.23 24.43 24.43 3 Post treatment 2075 0.26 0.47 0.28 1.00 28.80 28.80

Fire Behavior

Following harvest Fuel Loading Groups 1, 2, and 3 would have a rate of spread of approximately 1 chain per hour and would have a potential for escape from initial attack of Low (Figure 4-15). By the year 2075, the rate of spread in all
three Fuel Loading Groups would be approximately 2 chains per hour and an escape potential from initial attack of Low.

**Figure 4-15 Fire Behavior Outputs Alternatives 2, 3, and 4 - Tractor**

<table>
<thead>
<tr>
<th>Fuel Loading Groups</th>
<th>Year</th>
<th>Rate of Spread (Chains/hr)</th>
<th>Flame Length (Feet)</th>
<th>Size in First 41 Acres (Acres)</th>
<th>Containment Size After 4 Hours of Initial Attack (Acres)</th>
<th>Containment Time (Hour)</th>
<th>Potential for Initial Attack Escape</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2000</td>
<td>0.6</td>
<td>0.7</td>
<td>1.0</td>
<td>0.5</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2000</td>
<td>0.7</td>
<td>0.5</td>
<td>1.0</td>
<td>0.4</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2000</td>
<td>&lt;1</td>
<td>0.4</td>
<td>0.2</td>
<td>0.2</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2075</td>
<td>0.7</td>
<td>2.3</td>
<td>3.0</td>
<td>1.0</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2075</td>
<td>0.7</td>
<td>2.1</td>
<td>3.0</td>
<td>1.0</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>2075</td>
<td>0.7</td>
<td>2.3</td>
<td>3.0</td>
<td>1.0</td>
<td>Low</td>
<td></td>
</tr>
</tbody>
</table>

**Effects Differing Between Alternatives 2, 3, and 4**

**Fire Susceptibility - Fuel Loads, and Behavior**

Each action alternative would reduce fire susceptibility and fuel loadings relative the acreage they would treat.

Alternative 2 would reduce fire susceptibility and treat fuels as follows: remove dead trees through harvesting on 3,174 to 4,127 acres, whole tree yard an estimated 437-568 acres, top and scatter 2,896 - 3,505 acres in helicopter yarded areas; jack-

burn 270-351 acres of helicopter yarded areas; and mechanical scarification on 426-554 acres associated with reforestation needs. This alternative would have the greatest impact on reducing fire susceptibility and treatment of fuels.

Alternative 3 would reduce fire susceptibility and treat fuels as follows: remove dead trees through harvesting on 3,174 to 4,127 acres, whole tree yard an estimated 230-290 acres, top and scatter 2,903 - 3,773 acres in helicopter yarded areas; jack-

burn 290-377 acres of helicopter yarded areas; and mechanical scarification on 257-334 acres associated with reforestation needs.

Alternative 4 would reduce fire susceptibility and treat fuels as follows: remove dead trees through harvesting on 1,912 to 2,485 acres; whole tree yard an estimated 230-299 acres, top and scatter 1,639 - 2,313 acres in helicopter yarded areas; jack-

burn 164-213 acres of helicopter yarded areas; and mechanical scarification on 257-334 acres associated with reforestation needs. This alternative would have the least impact on reducing fire susceptibility and treatment of fuels as it treats less acreage when compared with the other action alternatives.

**CUMULATIVE EFFECTS**

**Fuel Loading**

Past timber sales (Figure 2-4) within the project area, utilizing tractor whole tree yarding has reduced fuel loadings to less than 10-15 tons per acre (Fuel Model II, based on field walk through estimates). Timber sale purchasers have been removing existing down material that meets houselng specifications. These areas account for approximately 21% (2,447 acres treated out of an existing 11,480 acres of spruce-fir) of the affected spruce-fir areas within the Project area. In addition, it has been surmised that past grazing practices have reduced the fine herbaceous fuel loadings in and around these harvested areas.

The proposed timber management activities in the project area have a similar potential for reducing both present and future fuel loadings as previously shown in this chapter (except for the short term -10 to 20 years), where higher fuel loadings of the less than 3 inch material in the helicopter units will initially exist.

The fuel loading reduction is summarized below by percentage of affected Spruce stands:

<table>
<thead>
<tr>
<th>Cumulative Reduction %</th>
<th>Alt 1</th>
<th>Alt 2</th>
<th>Alt 3</th>
<th>Alt 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>49-57</td>
<td>49-57</td>
<td>38-43</td>
<td></td>
</tr>
</tbody>
</table>

There are no further harvesting operations planned for the Project area. However, as the areas of harvesting are opened up, it is presumed that they will be colonized in the immediate future by grasses and forbs. This will in turn attract grazing into the area with a corresponding reduction in fine herbaceous fuel loadings.

**Forest Susceptibility to Wildland Fire**

Reducing the natural buildup fuels by harvesting and implementing slash disposal mitigations, and breaking up the continuous fuels within stands should reduce the risk for a large intense fire in each treated stand. The stands are susceptible to intense, wildland fires when the following extreme conditions are present: low humidities; high temperatures; and wind. The probability of these events occurring is low in any given year. However, over time, the probability is increased.

**Wildland Fire Behavior**

Treatments of the spruce-fir stands increases the potential to contain wildland fires. Fires in untreated areas, when weather conditions are extreme, have the potential to wear crews out, as regular line construction and burnout efforts are less effective (Wildland Fire Suppression Tactics Guide, 1996). Consequently, under extreme weather conditions, fires in this area would pose a safety threat to hand crews. Suppression efforts would be indirect, as treated stands and areas of non-continuous fuels would be used to contain a large, intense wildland fire. Consequently, it can be concluded that risk of a large, intense wildland fire has increased.

It is also expected that current grazing practices would continue into the future. These practices would continue to reduce the fine flashy fuels (grasses and forbs) This has the potential to reduce rapid fire spread through the fine fuels after they have cured in the fall.

**4.7 WILDLAND RESOURCES**

This section discusses the effects of implementing the alternatives on the wildlife resources.

Timber harvest activities impact wildlife species both adversely and favorably by altering their habitat. Impacts to habitat usually comes from two main areas. These are impacts to productive cover and impacts to sources of food. Protective cover can be in the form of vegetative cover or geographic features, and food sources are forage, vegetation or other species of wildlife. The importance of these will vary from species to species. As a result, one of the best ways to evaluate impacts to wildlife is to analyze impacts to vegetation.
The over all effect to wildlife habitat was analyzed by assessing the impacts to Management Indicator Species that are identified in the Forest Plan. These species represent a variety of habitat types and impacts to them can be extrapolated to other species. Additional impacts to sensitive and other wildlife species are discussed in the following sections.

The key comparison elements for evaluating how the alternatives considered in detail respond to the sub-issue of management indicator species, and their associated associated effects are: Elk and Deer - hiding habitat, foraging habitat, vulnerability, and use of available habitat; Blue Grouse - wintering habitat and Douglas-fir stands affected; Golden Eagles - prey base.

A. ELK AND DEER

DIRECT AND INDIRECT EFFECTS

Effects Common to All Alternatives

Although individual elk and deer, and their habitat, may be affected, no alternative would contribute to a loss of population viability. Deer and elk would remain an important hunting and viewing resource value for the many recreation visitors. Beetle-induced spruce mortality and timber harvesting activities have had and will continue to have an adverse impact on big-game, viewing, and hunting opportunities within the project area. As the area becomes reforested and access is managed, these adverse impacts will gradually reduced to pre-infestation conditions. Herds would continue to be managed accordingly by the Utah State Division of Wildlife Resources.

Beetle-induced spruce mortality has increased visibility within timbered spruce/fir areas thus reducing hiding cover. Compared to pre-infestation conditions, hiding cover has been reduced about a third within spruce/fir stands not proposed for treatment by the action alternatives and by more than two thirds within the areas proposed for treatment by the action alternatives. Since the area is not used for winter range, the amount of winter (thermal) cover is not relevant.

Effects of Alternative 1

Under Alternative 1, the elk herd probably remain the same and the deer herd should continue to steadily increase.

Alternative 1 would retain the existing hiding cover in the spruce/fir areas affected by the spruce beetle. The character of this cover would continue to change over time. The dead spruce trees currently providing hiding cover would fail to the ground, resulting in a reduced level of cover. Regrowth of shrubs and trees would occur, providing some additional habitat in cover and forage. An indirect adverse effect of no action is the delay of time for conifer regrowth to occur (approximately 10-20 years or longer).

Short-term loss of hiding cover, combined with existing hunter and recreation access to the area, could increase elk vulnerability and possibly lead to increased hunter success during the general season hunts.

Figure 4-16 Big Game Habitat, displays the miles of roads and trails (system and non-system), road density, hiding cover/forage ratio.

<table>
<thead>
<tr>
<th>Post-Activity Open Roads (miles)</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>Alternative 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>94</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Post-Activity Open Road Density (mi/ha)</td>
<td>2.4</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
</tr>
<tr>
<td>Post-Activity Hiding Cover/Forage $^{1}$</td>
<td>12,452/21,619</td>
<td>8,852/17,219</td>
<td>8,852/17,219</td>
<td>10,852/15,959</td>
</tr>
<tr>
<td>Hiding Cover/Forage (acre)</td>
<td>48/52</td>
<td>34/66</td>
<td>34/66</td>
<td>39/61</td>
</tr>
<tr>
<td>Habitat Effectiveness (acres)</td>
<td>0</td>
<td>2.400</td>
<td>2.080</td>
<td>2.080</td>
</tr>
<tr>
<td>Short Term Reduction from Alternative</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cumulative Effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>During Harvest</td>
<td>29,760</td>
<td>22,160</td>
<td>21,840</td>
<td>31,840</td>
</tr>
<tr>
<td>Post Harvest/Reclamation Effects</td>
<td>29,760</td>
<td>22,720</td>
<td>22,400</td>
<td>22,400</td>
</tr>
</tbody>
</table>

$^{1}$ Overall, the project would improve habitat effectiveness for wildlife in the area by a maximum of 7.880 acres.

Effects Common to Alternatives 2, 3, and 4

All action alternatives would directly decrease the amount of hiding cover and indirectly increase the amount of forage during the time of increased utilization. Hiding cover is directly decreased by tree removal within treatment units and by road construction. Forage is increased through the creation of openings. Increasing the amount of spring, summer, and fall forage for these species is of minor consequence in this area because this type of habitat is not limiting.

Big game security is indirectly affected by human access and use of the area. Big game security would be decreased from improved access, new road access, and noise from logging operations.

Increased utilization of current roads and development of additional roads and their use would reduce habitat effectiveness. Studies have shown that elk use of available habitat is reduced as open road densities increase. Even though the habitat near roads is physically available to elk, it is often not fully utilized. For example, the Lyon model (1979) indicates that elk avoid areas adjacent to open roads (with 1/4 to 1/2 mile) and spend more time in whatever other dense cover they can find.

With the included project design features, effects to elk and deer from wintertime log hauling across the lower elevation winter range would be minimal.

Noise from logging operations could displace elk and deer in the short term. Unlike ground-based logging where noise is relatively localized to the harvest area, the noise from helicopter logging spans a greater area due to the aerial transport of logs from the harvest unit to the landing area. The availability of undisturbed habitat would be continually affected during harvest operations.

Any factor which increased the likelihood of hunters shooting an elk increases elk vulnerability (Moroz, 1991). An increase in disturbance to big-game animals increases displacement and decreases security. During the hunting season, this leads to an increased vulnerability. Timber harvesting activities contribute to increased disturbance, and therefore, vulnerability. With road reclamation (approximately 24 miles), vulnerability would decrease over time and habitat effectiveness for wildlife would improve by 7,880 acres.
Effects Differing Between Alternatives 2, 3, and 4

Alternative 2

In the short term, Alternative 2 would increase the amount of available forage (by 4.127 acres) and decrease the same amount of security cover (by 4.127 acres).

Alternative 2 would construct 1.1 mile of road. If Alternative 2 is implemented, it is estimated that the 4.916 acres of the spruce-fir type would remain unharvested.

Habitat disturbance under Alternative 2 would include about 85 percent helicopter yarding and 15 percent ground-based yarding of the 4.127 acre spruce/fir and aspen/conifer types proposed for harvest.

Under Alternative 2, the newly constructed roads (1.5 miles of newly constructed and temporary roads) would be closed to vehicular traffic by the general public during logging operations through closure orders and signing.

Alternative 3

Habitat disturbance under Alternative 3 would include 91 percent helicopter yarding and 9 percent ground-based yarding of the 4.127 acre spruce/fir and aspen/conifer types proposed for harvest. There would be no new permanent roads constructed.

In the short term, disturbance here is about the same as Alternative 2, but considerably greater than the Alternative 1, except for a small difference in habitat effectiveness. The difference in road construction under Alternative 3 allows for a slight increase in forage and cover opportunities within the analysis area.

Under Alternative 3, newly constructed temporary roads would be closed to vehicular traffic by the general public during logging operations through closure orders and signing.

Alternative 4

Habitat disturbance under Alternative 4 would include 85 percent helicopter yarding and 15 percent ground-based yarding of the 2.485 acre spruce-fir types proposed for harvest.

Cover/security habitat would be greater with this alternative than that of Alternatives 2 and 3. Habitat effectiveness based on road density would be the same as the Alternative 3.

Under Alternative 4, the newly temporary constructed roads would be closed to vehicular traffic by the general public during logging operations by closure orders and signing.

B. BLUE GROUSE

DIRECT AND INDIRECT EFFECTS

Effects Common to All Alternatives

The spruce cover type plays no or a very minor role in winter cover habitat for Blue Grouse. Therefore, beetle-induced spruce mortality has made little change to the function of the spruce cover type as Blue Grouse habitat.

Effects of Alternative 1

Since no harvest or harvest related activities would occur under Alternative 1, no adverse effects would be expected to Blue Grouse. Potential effects, if any, would come from natural succession.

Effects Common to Alternatives 2, 3, and 4

There would be only minor, if any, impact from the harvest of dead spruce to the local population of Blue Grouse, and population viability would not be at risk. Overall, there would be very limited impacts to Blue Grouse from implementing an action alternative. Blue Grouse would mostly be affected by each alternative’s direct impact to aspen and fir trees. Direct impacts would primarily come from harvest related activities and road work that inadvertently removes or damages aspen or fir trees. These direct impacts would be short-term (10 to 20 years) and should not cause a noticeable difference in Blue Grouse populations.

The southern part of the project area, including the “D” units, contain more aspen than the other units proposed for harvest. Activities in this area, would have greater impacts to aspen habitat than activities elsewhere.

Fir species, particularly Douglas-fir, represent a minor component of the project area. The main exception to this is near Julius Flat Reservoir where there is a 105-acre stand of Douglas-fir. The area of this Douglas-fir stand would not be affected by the alternatives.

Effects Differing Between Alternatives 2, 3, and 4

The degree of overall potential impact is relative to the amount of area each alternative would treat.

Differing from Alternatives 2 and 3, Alternative 4 would harvest less area in the southern portion of the project area (Unit D4-5) where the amount of aspen within the spruce-fir stands are higher.

C. GOLDEN EAGLES

DIRECT AND INDIRECT EFFECTS

Effects Common to All Alternatives

Spruce in the project area plays a role in habitat for prey species that eagles forage upon. The change in cover type due to the beetle epidemic has altered the function of the spruce component to one of more open habitat. Because of this change, there would be a slight impact on the type of prey species (interior dependent species) eagles forage on. This change would have no overall impact on foraging habitat for eagles because of their opportunistic behavior. Prey species dependant on open forest habitat would become more available for golden eagles.
Effects of Alternative 1

Since no harvest or harvest related activities would occur under Alternative 1, no adverse effects would be expected to Golden eagles. Potential effects, if any, would come from natural succession.

Effects Common to Alternatives 2, 3, and 4

None of the action alternatives should have a noticeable adverse effect on Golden eagles. A Golden eagle could consume a treated gopher, however gopher control would utilize underground methods to prevent eagle and gopher interaction. The most effective and the least likely method to cause damage to wildlife is underground baiting. Underground baiting for gopher control using strychnine presents minimal hazards to nontarget wildlife, either by direct consumption of bait or by eating poisoned gophers (Hygstrom et al., 1994). Treatment of gophers would occur only where needed.

Effects Differing Between Alternatives 2, 3, and 4

No differences in effects between the action alternatives would be expected.

TREE CAVITY DEPENDANT SPECIES

The key comparison element for evaluating how the alternatives considered in detail respond to the sub-issue of tree cavity dependant species, and their associated effects, is snag habitat availability.

DIRECT AND INDIRECT EFFECTS

Effects Common to All Alternatives

Dead trees (snags) provide tree cavity habitat. All alternatives would continue to provide an abundance of tree cavity habitat. The larger diameter dead spruce trees are expected to provide tree cavity habitat for many years. Few trees would fall until they have been dead for at least 20 years. It is projected that 90% or more of the dead trees will fall in approximately 75 years.

Effects of Alternative 1

There are 11,490 acres of spruce-fir habitat across the project area. Of this, 2,447 have been impacted by existing salvage logging. Consequently, 9,043 acres of spruce-fir habitat remains. This does not include 3,000 acres of Douglas-fir and aspen stands adjacent to the beetle affected spruce-fir stands. Alternative 1 would have no effects on tree cavity habitat or tree cavity habitat dependant species, as trees would be harvested.

Effects Common to Alternatives 2, 3, and 4

All action alternatives would retain a high number of existing snags at varying levels. Adverse impacts to cavity dependant species are not expected.

Within treatment areas, live trees and dead Douglas-fir trees would not be harvested. Project design measures such as snag retention requirements and riparian protection would also retain about 350 acres of available tree cavity habitat within the treatment units. The trees not harvested within the treatment units, specifically Douglas-fir, would provide for snag maintenance and recruitment of tree cavity habitat into the future.

Additional snags include several thousand acres of adjacent habitat that would be available within the Douglas-fir and aspen sites where no harvest would occur.

Effects Differing Between Alternatives 2, 3, and 4

Figure 4-17 Snag Habitat Affected, displays how the each action alternative affects snags within the spruce-fir habitat.

Figure 4-17 Snag Habitat Affected

<table>
<thead>
<tr>
<th></th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>Alternative 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spruce-fir Tree Cavity Habitat Affected Acres</td>
<td>6,217</td>
<td>6,217</td>
<td>2,285</td>
</tr>
<tr>
<td>Percent</td>
<td>30%</td>
<td>30%</td>
<td>22%</td>
</tr>
<tr>
<td>Spruce-fir Available Not Affected Acres</td>
<td>5,076</td>
<td>5,076</td>
<td>5,076</td>
</tr>
<tr>
<td>Percent</td>
<td>54%</td>
<td>54%</td>
<td>54%</td>
</tr>
</tbody>
</table>

1. Based on about 9,043 acres of spruce-fir habitat (No Action).

The key comparison elements for evaluating how the alternatives considered in detail respond to the sub-issue of proposed threatened, and endangered species, their associated effects, is the effect determination to such species.

The project area contains habitat for the following listed species: Canada Lynx (threatened), bald eagle (threatened), and Southwest willow flycatcher (endangered). Refer to Appendix J - Biological Assessment for additional information.

DIRECT AND INDIRECT EFFECTS

Effects Common to All Alternatives

There would be "no effect" to Southwest willow flycatcher (endangered) from implementation of any of the alternatives.

Effects of Alternative 1

Alternative 1 would have "no effect" to the proposed and listed species: Canada lynx (threatened), bald eagle (threatened), and Southwest willow flycatcher (endangered).

Effects Common to Alternatives 2, 3, and 4

The action alternatives "may affect individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species" of Canada lynx (threatened). Adverse habitat impacts from the action alternatives would be as a result of increased human activities in winter habitat. However, there has not been a sighting of lynx in this area since the 1950's. Beneficial habitat impacts from the action alternatives would occur from reforestation.

The action alternatives "may affect individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species" of bald eagle (threatened). There are no bald eagle nests within or near...
the project area. Impacts from the action alternatives include possible disturbance from helicopter activity during eagle migration through the area.

There would be "no effect" to Southwest willow flycatcher (endangered) from implementation of any of the alternatives.

**Effects Differing Between Alternatives 2, 3, and 4**

No differences in effects between the action alternatives would be expected.

The key comparison elements for evaluating how the alternatives considered in detail respond to the sub-issue of sensitive animal species and their associated effects, is the impact determination to each species.

The project area contains habitat for the following sensitive species: Northern goshawk, flammulated owl, three-toed woodpecker, spotted bat, Townsend's Big-eared bat, and peregrine falcon. Refer to Appendix J - Biological Evaluation for additional information.

**A. NORTHERN GOSHAWK**

**DIRECT AND INDIRECT EFFECTS**

**Effects Common to All Alternatives**

Long-term impacts could occur from natural succession as the conifer species begin to out compete and convert the current suitable habitat (conifer/aspen mix) to pure conifer (20-35 years).

**Effects of Alternative 1**

Alternative 1 would have no direct or indirect impact on Northern Goshawk. Within the conifer/aspen forests, impacts would come from the natural loss of the spruce overstory layer needed for nesting purposes.

**Effects Common to Alternatives 2, 3, and 4**

The action alternatives may impact nesting and foraging habitat, but will not likely contribute to a trend to Federal listing or loss of viability to the population or species. The project design features and implementation of the recent Forest Plan amendment for management of Northern Goshawk habitat would adequately provide for the needs of Northern Goshawk.

Timber harvest has a direct and indirect impact to prey species used by the goshawk. Goshawks in the area are known to prey largely on snowshoe hare and flickers. Timber harvest would increase populations of some prey species (especially small mammals) and decrease populations of others (such as woodpeckers). Therefore, it is likely that impacts to prey species would not make much difference in the overall availability of prey. In the long term, natural succession accelerated by the spruce beetle also has an indirect impact to prey species. Like timber harvesting, a change in prey due to the loss of the overstory habitat would occur but over a longer time frame.

The direct project impacts to goshawk habitat is short-term relative to the amount of harvest within suitable nesting habitat. However, implementation of the Conservation Strategy and Agreement for the Management of Northern Goshawk Habitat in Utah (Utah N.P. s. et. al., 1998; Graham, 1998) is incorporated into the project design features to allow for conserving and protecting the Northern Goshawk and its habitat. Also, the alternatives are consistent and comply with the Utah Northern Goshawk Forest Plan Amendment signed on April 14, 2000. This direction provides protection for both foraging and nesting habitats.

**Effects Differing Between Alternatives 2, 3, and 4**

Each action alternative would affect suitable goshawk nesting habitat to varying degrees (Figure 4-18 Project Activity within Suitable Nesting Habitat). The degree of impact is relative to the amount of harvest within suitable goshawk nesting habitat. Alternatives 2 and 3 would have similar impacts. The impact of Alternative 4 would be approximately one-third lower than the other action alternatives.

**Figure 4-18 Project Activity within Suitable Nesting Habitat**

<table>
<thead>
<tr>
<th></th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>Alternative 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Activity</td>
<td>841</td>
<td>841</td>
<td>560</td>
</tr>
<tr>
<td>Suitable Nesting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Habitat (acres)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**B. FLAMMULATED OWL**

**DIRECT AND INDIRECT EFFECTS**

**Effects Common to All Alternatives**

There are no effects expected to be common to all alternatives.

**Effects of Alternative 1**

Alternative 1 should have no impacts on the flammulated owl. All Douglas-fir would be maintained within the project area.

**Effects Common to Alternatives 2, 3, and 4**

The timber harvest may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species within the area. Flammulated owls prefer foraging in areas with open canopies and have been known to avoid cut-over areas. Therefore, the more acres cut, the greater the potential for adverse impacts (the more foraging area impacted).

Impacts to flammulated owl nesting habitat could occur in spruce stands containing Douglas-fir located along ridge-tops and upper slopes.

Harvesting large-diameter snags of any species in these areas could impact nesting habitat. However, the only stand of Douglas-fir is located near Julius Flat Reservoir in the southern portion of the project area. None of the Alternatives allow the harvest of Douglas-fir. One of the project design features common to all action alternatives is for the retention of all large snags containing cavities and to retain smart pockers or dense vegetation along ridge tops. This should reduce any possible adverse impacts to flammulated owl nesting habitat (refer to the previous discussion of tree cavity habitat).
Effects Differing Between Alternatives 2, 3, and 4

Alternative 2 and 3
Alternatives 2 and 3 would allow harvesting on 4,127 acres. This potentially could be the greatest impact (highest acreage of all action alternatives) on felled trees because they may avoid the area due to harvested cuts. Snag retention levels and residual fir trees during harvest could influence current and future nesting and cover habitat. Within the cutting units, there would be riparian protection trees, designated wildlife spruce snags, and residual fir trees that would provide habitat for wildlife. Outside of cutting units, 4,918 acres (54%) of the spruce-fir habitat will not be treated.

Alternative 4
Alternative 4 would allow harvesting on 2,485 acres. This should have the least impact (least acreage of all action alternatives) on felled trees because avoidance of harvested areas would be less. Snag retention levels and residual fir trees could influence current and future nesting and cover habitat. Within the cutting units, there would be riparian protection trees, designated wildlife spruce snags, and residual fir trees that would provide habitat for wildlife. Outside of cutting units, 6,558 acres of the spruce-fir habitat will not be treated.

C. THREE-TOED WOODPECKER

DIRECT AND INDIRECT EFFECTS

Effects Common to All Alternatives

Three-toed woodpeckers specialize in feeding and capitalizing on available dead trees, especially those infested with the spruce beetle. Three-toed woodpeckers have been found to follow the general movement of a beetle infestation. Beetle activity is moving north of the project area. An increase in population is expected as their territory of available food is expanded. Eventually, as prey species (spruce beetle) decline, the density of this woodpecker would decrease (Koplin, 1988). Once prey species have declined, three-toed woodpeckers should continue to inhabit the area but at much lower population densities. Studies indicate, that outside of large areas of bark beetle infestations, three-toed woodpeckers resume foraging on windthrown trees and cull logs that have beetles, but at much lower population levels. The resulting infestations in down logs are often a major source of mature beetles that perpetuate local populations for three-toed woodpeckers (Baldwin, 1968).

Effects of Alternative 1

There are 11,490 acres of spruce-fir habitat across the project area. Of this, 2,447 have been impacted by existing salvage logging. Consequently, 9,043 acres of spruce-fir habitat remains. This does not include the additional 3,000 acres of five Douglas-fir and aspen stands adjacent to the beetle affected spruce/fir stands. Alternative 1 would have no effects on tree cavity habitat or tree cavity habitat dependent species, as trees would be harvested.

Effects Common to Alternatives 2, 3, and 4

The timber harvest may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species within the area. Untreated areas are found throughout the project area and would provide habitat for three-toed woodpeckers. Removal of beetle killed trees directly reduces the specialized habitat. Therefore, impacts of the harvest alternatives are directly associated with the amount of harvest that occurs or the amount of dead trees removed from availability.

All action alternatives would retain enough snags within the harvest units (300 per 100 acres) to allow three-toed woodpeckers use. Additional untreated acres that would provide habitat include aspen (2,857 acres) and Douglas-fir (105 acres) where no harvesting would occur.

Effects Differing Between Alternatives 2, 3, and 4

Figure 4-19 Three-Toed Woodpecker Habitat Affected, shows the amount of habitat affected for each of the alternatives and the percentage of beetle created habitat that would be affected within the spruce-fir habitat.

Figure 4-19 Three-Toed Woodpecker Habitat Affected 1.

<table>
<thead>
<tr>
<th>Habitat Affected</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>Alternative 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acres</td>
<td>0</td>
<td>4,127</td>
<td>4,127</td>
<td>2,485</td>
</tr>
<tr>
<td>Percent</td>
<td>0%</td>
<td>46%</td>
<td>46%</td>
<td>27%</td>
</tr>
</tbody>
</table>

1. Based on about 9,043 of current habitat acres available.

Of the action alternatives, Alternatives 2 and 3 harvest the most three-toed woodpecker habitat (4,127 acres). Because of this, they would have the greatest impact on three-toed woodpeckers.

Of the action Alternatives, Alternative 4 would harvest the least amount of three-toed woodpecker habitat (2,485 acres). Because of this, it would have the least impact of the action alternatives on Three-toed Woodpeckers.

D. SPOTTED BAT & TOWNSEND'S BIG-EARED BAT

DIRECT AND INDIRECT EFFECTS

Effects Common to All Alternatives

Spotted and Townsend's Big-eared bats would continue to forage mostly along forest edges and over water. Over time, forest edge within the spruce/fir would continue to decrease resulting in less edge habitat for the bats. It is possible surface water (small ponds, springs, seeps) areas would increase because of the loss of the large, water pumping spruce trees.

Effects of Alternative 1

Roosting areas would not be affected by this Alternative, however it is possible that other non-project activities could disturb potential roosting areas (limestone cliffs) such as using the Camel Rock quarry source for road gravel.
Effects Common to Alternatives 2, 3, and 4

The timber harvest may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species within the area. Spotted and Townsend's Big-eared bats would continue to forage mostly along forest edges and over water. Mainly because bats forage at night and not in stands of timber harvest, activities should not impact bat foraging. Both of these bats are known to use limestone cliffs for roosting. Timber harvesting activities that impact limestone cliffs, such as quarry sites for road gravel, could impact these species. The only quarry site adjacent to cliffs is the Camel Rock quarry. Effects to the bats regarding potential occurrence relative to the rock quarry activities have been analyzed and mitigation measures have been implemented to address possible impacts. Findings indicated there were no bats roosting in the area at the time of inventory. However, a "May Impact" finding was disclosed due to the proximity of habitat within the rock quarry sites (refer to the Camel Rock Quarry Biological Evaluation, 1997).

Effects Differing Between Alternatives 2, 3, and 4

No unique impacts between action alternatives would be expected to spotted and Townsend's Big-eared bats.

5. PEREGRINE FALCON

DIRECT AND INDIRECT EFFECTS

Effects Common to All Alternatives

The project area does not contain suitable habitat for peregrine falcons and no peregrine falcons have been found there. Therefore, none of the alternatives would have an effect upon peregrine falcons or their habitat.

INTERLOPER MIGRATORY BIRDS

DIRECT AND INDIRECT EFFECTS

Effects Common to All Alternatives

Impacts (positive and negative) to neotropical migratory birds would occur mainly due to natural forest events. Declines in interior species has been due to habitat loss from spruce beetle mortality and development of more edge, which has reduced the amount of interior habitat.

For many of the same reasons described above concerning cavity dependant species and three-toed woodpeckers none of the alternatives should threaten the overall population viability of neotropical migratory birds. The spruce cover type has and is continuing to rapidly evolve from a closed overstory to more of an open overstory. This change should benefit those species dependant upon more open forest settings and negatively impact those species dependant upon a closed, interior forest setting.

Effects of Alternative 1

Alternative 1 would have no unique impacts to Neotropical migratory birds.
Forage competition with livestock would become less of a concern as more forage species become available.

Grazing by livestock and big game has been identified as one of the main impacts to brood rearing habitat for Blue Grouse. Because livestock grazing would be restricted in areas being reforested, it is likely that the overall impact would be favorable during the short-term (20 years). The long term (greater than 20 years) impacts would also be favorable because the reforested areas would result in improved winter foraging areas.

Other planned, current, or reasonably foreseeable actions include recreation use (camping, fishing, travelling). Recreation is becoming a primary use within the project area. Summer camping, viewing, hiking, hunting, and bicycling all bring a large number of recreationists into the area during the summer and early fall months. Impacts from recreation would mostly come from travelling within areas with no roads and on unauthorized roads and trails. Effects result in many acres of lost foraging habitat (removal of herbaceous and browse species through soil compaction) and encroachment of wildlife security zones (habitat effectiveness concern).

Noxious weed invasion and the lack of aspen regeneration play an important role within the project area. As more forest users interact with this local landscape, the risk of continual weed encroachment increases. Currently, musk thistle, white top and Canada thistle are the dominant invaders within and near the analysis area. Acres may increase as human activities and natural dispersion continue. These noxious weeds slowly decrease the quality and quantity of the forage habitat needed by deer, elk, blue grouse, and other wildlife.

In the short term (1-5 years), additional planned prescribed burns (for aspen regeneration) would impact security/cover habitat because it increases the foraging habitat. However, after 5 years, aspen regeneration greatly increases the amount and the existence of habitat that is needed for cover. The short-term effects should not affect the overall populations of deer, elk, and blue grouse.

The total effects from the proposal relative to all present, past and foreseeable actions should have few harmful impacts upon the local wildlife species provided all the design features are implemented. However, as future human actions increase, additional uses from possibly mining, more grazing, fire suppression, harvesting, prescribed burns, special uses, etc. would continue to affect the existing habitat. At this point, it is not really known if those affects would be negative or positive.

4.5 TRANSPORTATION

This section discusses potential effects to Transportation. The key comparison elements for evaluating how the alternatives considered in detail respond to this issue, and their associated effects, are: Forest Development Road construction and reconstruction; reclamation of Forest Development Roads and nonsystem roads/trails; post project Forest Development Road, nonsystem road, and motorized trail access and density; traffic mix conflicts; and delays in travel from logging traffic and associated road work.

Forest users of all types require roads to access the resources. Transportation planning efforts consider the type and quantity of vehicles which need a road, how often, and for what duration. In conjunction with the Forest Plan and other management decisions, a transportation system plan is developed to accommodate users in travel need and safety. Road management is a combination of construction, maintenance, restrictions, and closures, depending upon resource and access needs (Appendix F for a summary of anticipated road work and Appendix D for Best Management Practices). Roads are reclaimed when they no longer are needed for management of National Forest resources (Appendix F, protocol for road reclamation).

A transportation analysis was performed on the South Mani Timber Salvage Sales Environmental Assessment and is used for this analysis. Rangers and specialists went to look at resources, traveler needs, and existing Forest Development Roads and nonsystem roads. Some roads were noted to be causing resource damage, others were noted as causing a higher access density than necessary. The Interdisciplinary Team determined that many of the nonsystem roads were not
needed and should be reached as funding becomes available. Roads that could be used for harvest and removal of timber would be improved as necessary. One area needed a new road constructed to facilitate the removal of timber. The new road would be for both short- and long-term timber access. Access needs and durations were analyzed, consequently, roads not needed for resource management activities were identified for reclamation.

The desire to harvest trees from the project area, location of the sale units, and the condition of the existing facility were the initiating drive for proposed road reconstruction. Aerial photography, topographic maps, and field reconnaissance were used for preliminary analysis.

DIRECT AND INDIRECT EFFECTS

Effects Common to All Alternatives

Existing Forest Development Roads would continue to receive maintenance. Unauthorized, unwanted additions to local roads will continue by Forest users.

Effects of Alternative 1

Transportation System

There would be no effect to the transportation system from road construction or reconstruction. The road and motorized trail density in the area would remain at 2.4 miles per square mile, unless additional unauthorized motorized trails/roads are established by Forest users.

Visitor Safety

Forest visitors may encounter up to 200 vehicles per day; every encounter has the potential to be an accident. Dispersed recreation, hunting recreation, fuelwood activities, range activities, and timber activities would continue to contribute to seasonal traffic volumes in and around the project area.

Access

Access would remain the same.

Effects Common to Alternatives 2, 3, and 4

Transportation System

Some road segments would receive reconstruction. The road parallelising Little Horse Creek would be reclaimed.

All action alternatives would include at least the following: 9.2 miles of Forest Development Road reconstruction; 19.3 miles of non-system roads, not used for this project, to be reclaimed as funding becomes available.

Some roads would be improved by aggregate surfaceing. Aggregate may be acquired off the Forest, however there are 2 aggregate sources in the project area that could be used. Other potential sites, not currently planned for use, also exist which could be developed contingent upon approval.

No roads would be constructed or reconstructed into any of the RARE II inventoried roadless areas.

Visitor Safety

Forest visitors would encounter more vehicles on roads in the project area and on the Ferron-Mayfield road. With higher traffic volumes, there is an increased probability of accidents. Warning signs would be used to caution travelers of logging traffic and activities, traffic control flaggers would be used if necessary to ensure safety on Forest roads open to public travel. Additional project design features would be included to maintain visitor safety and their recreation experience (Appendix D).

Increased vehicles on non-paved roads would displace and temporarily suspend dust particles which could affect road users. This could be a problem for visibility and vehicle control on washboard areas. However, dust abatement would be used to keep dust down and act as a particle binder to reduce washboarding.

Access

Through improvement of existing roads, timber sale purchasers would have an adequate transportation system to facilitate log removal. Over time, forest users would see a decrease in roads from the current condition. This reduction would be due to the reclamation of roads not needed for future resource management.

Reconstructed roads would provide Forest visitors more safe and dependable access through aggregate placement, road widening, improved sight distance, and improved turnouts. Improved access could increase the number of visitors to the Forest.

Non-system roads and trails would be reclaimed as funding becomes available. Approximately 70 miles of Forest Development Roads and motorized trails would remain in place for use by forest visitors. Road density (including all system and non-system roads and trails) would decrease from 2.4 to 1.8 miles per square mile.

Access on Forest Development Road (FDR) #50049, Duck Fork, would be restricted at approximately 0.4 miles beyond the dam. Motorized vehicles would be restricted to those with tread width less than 50 inches. This restriction would remain in place until resource management needs change, all though no changes are anticipated. User developed roads adjacent to FDR #50049, specifically in the segment between Duck Fork Reservoir and Lake Fork Creek would be reclaimed as funds become available. The number of miles of user-developed road in this area is approximately 0.9, estimated by aerial photos and orthogonals (Appendix F, Figure F-1).

Travel Delays

In 1992, Forest visitors had very little logging related traffic to contend with. Drivers expected to meet cars, small trucks, and campers while traveling to and within the Twentymile area. The Ferron-Mayfield road was designed for 25 miles per hour travel speed, slower as conditions dictated. With timber hauling vehicles using the road, travelers need to be cautious and travel at reduced speeds. All action alternatives would increase travel time about a minute for passing vehicles and an additional 1.5 minutes (average) when speed is reduced.
by 10 miles per hour per mile of road. During reconstruction of roads, delay may be two hours on average. Delays would be expected on Forest Development Roads: #50044, #50049, and #52333. When necessary, these roads could be temporarily closed for longer blocks of time to facilitate reconstruction activities on an as-needed basis. Travel delay does not vary greatly between alternatives.

Effects Differing Between Alternatives 2, 3, and 4

Transportation

Alternative 2 is the only alternative which includes the construction of a new Forest Development Road, approximately 1 mile. If constructed, it would be placed into maintenance level 1. If the road is closed to public use, other activity proposed in the Heliotrope Forest Plan inventoried roadless area would be road reconstruction of FDR #52070 (0.1 miles) and FDR #52085 (0.2 miles) and pre-haul maintenance on FDR #52070 (0.2 miles). Note, part of FDR #52070 is not in the roadless area (0.2 miles) but would receive reconstruction (0.1 miles) and pre-haul maintenance (0.1 miles). This alternative also includes spot reconstruction on FDR #50150. FDR #51278 is currently managed for level 1 maintenance, would be used for timber haul, then reclaimed. Proposed road construction and reconstruction would be wholly within a roaded portion of the Heliotrope inventoried roadless area.

Alternative 3 road management would be similar to Alternative 2 except that the 1 mile of Forest Development Road would not be constructed nor 0.2 miles of FDR #52085 reconstructed in the Heliotrope Forest Plan inventoried roadless area. Like Alternative 2, road reconstruction and maintenance would be allowed in the Heliotrope Forest Plan inventoried roadless area to the corrals. Approximately 0.5 miles of FDR #50049 would have a post harvest vehicle restriction on vehicles wider than 50 inches; vehicles with width less than 50" would be allowed to continue using the road. The proposed restriction is north of Duck Fork Reservoir.

Alternative 4: No reconstruction or maintenance associated with timber harvest would occur within inventoried roadless areas. No reconstruction would occur on FDR #50150 above Emerald Lake.

Visitor Safety

Higher traffic volumes would increase the probability of accidents. With Alternatives 2 and 3: Forest visitors would encounter an estimated 28 additional vehicles per day on FDR #50022. With Alternative 4, Forest visitors would encounter an estimated 17 additional vehicles per day.

Access

Alternative 2's road construction into the Heliotrope area would be a long-term addition to the system and placed in the category "Level 1 maintenance" after post-sale activities (fuel reduction and initial restoration work) are completed. Level 1 maintenance is not open to public motorized travel.

Alternative 3 and 4 would not construct the road into the Heliotrope Forest Plan inventoried roadless area.

CUMULATIVE EFFECTS

Visitor Safety: Cumulative effects under the 1996 South Manti Timber Salvage Environmental Assessment projected 25 vehicles per day (VPD) from the combination of the Twelvemile timber sale, two exploration wells for oil and gas, and possibly two quarries opened for other projects. Since the publishing of the 1996 Environmental Assessment, the Twelvemile Timber Sale was completed thereby reducing 25 vehicles per day to 18 vehicles per day.

The Baisy Timber Sale, adding approximately 4 VPD, is active until the end of the 2000 harvest season. The Six Timber Sale, adding approximately 7 VPD, is active until the end of the 2001 harvest season. The Duck Timber Sale, adding approximately 7 VPD, is active until the end of the 2003 harvest season. For the next 4 years, total cumulative VPD is estimated at:

2000: 36 VPD
2001: 32 VPD
2002 and 2003: 25 VPD

Access: Construction activities associated with other timber sales in the area would be complete, therefore no additional effects to the system are anticipated. There is the potential for additional road construction to occur over the next 10 years associated with oil and gas exploration and quarry development. These areas have not been identified, but if developed in or near the project area, they could add to the road density.

Travel Delay: Impacts to general recreational travel would be minimized by several hauling restrictions (Appendix F: Summary Road Information).

4.9 RANGE ALLOTMENTS AND IMPROVEMENTS

This section discusses potential effects to Range. The key comparison elements for evaluating how the alternatives considered in detail respond to this issue, and their associated effects, are suitable rangeland restricted for timber regeneration, livestock restrictions, and range improvements affected.

DIRECT AND INDIRECT EFFECTS

Effects of All Alternatives

As spruce trees die, vegetative production would increase due to decreased competition with conifers and increased sunlight.

Dead spruce would continue to fall over time. With no treatment to break up or reduce fuel loading, there would be a risk of significant impacts from wildland fire. The fire would burn until either fuels have been consumed or the conditions change to aid in extinguishment. Stand replacement fires could effect range conditions. The degree of effect will depend on the time of year, the size and duration of the fire, and grazing schedule. Following prescribe burns in conifer stands to regenerate quaking aspen, one year rest and one year of deferred grazing has allowed understory vegetation to become established. However, following wildland fire in very heavy fuels, establishment of understory will probably take longer.
Livestock Grazing

Reductions and altered management to some allotments could occur due to the loss of suitable range. Suitable range is defined as range accessible to livestock which can be grazed on a sustained yield basis without damage to the resource. There is the need to keep livestock out of the reforestation plantations long enough for the conifer seedlings to grow to a height of 4 feet because the seedlings are susceptible to damage from livestock. In some situations, sheep removal could occur for 7 to 10 years. In other situations, livestock removal could occur for 15 to 20 years. Possible means of accomplishing this could be through fencing, herding, scheduling, and altered management, or any combination of techniques. The effects would be similar with all alternatives but would vary according to the amount of the allotment impacted. Figure 4-21 Decrease in Suitable Rangelands, displays the percent decrease in suitable rangelands by allotment and by alternative.

Figure 4-21 Decrease in Suitable Rangelands

<table>
<thead>
<tr>
<th>CATTLE ALLOTMENTS</th>
<th>ALLOTMENT ACRES</th>
<th>SUITABLE ACRES</th>
<th>DECREASE IN SUITABLE ACRES</th>
<th>PERCENT DECREASE IN SUITABLE RANGELAND</th>
</tr>
</thead>
<tbody>
<tr>
<td>Twentynine</td>
<td>35,588</td>
<td>17,376</td>
<td>572</td>
<td>3.0</td>
</tr>
<tr>
<td>Sixmile</td>
<td>17,057</td>
<td>9,001</td>
<td>224</td>
<td>2.5</td>
</tr>
<tr>
<td>Emery</td>
<td>69,948</td>
<td>26,767</td>
<td>296</td>
<td>1.1</td>
</tr>
<tr>
<td>Total</td>
<td>84,449</td>
<td>54,449</td>
<td>1,864</td>
<td>2.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SHEEP ALLOTMENTS</th>
<th>ALLOTMENT ACRES</th>
<th>SUITABLE ACRES</th>
<th>DECREASE IN SUITABLE ACRES</th>
<th>PERCENT DECREASE IN SUITABLE RANGELAND</th>
</tr>
</thead>
<tbody>
<tr>
<td>Island Lake</td>
<td>4,576</td>
<td>1,662</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Fork River</td>
<td>4,950</td>
<td>2,010</td>
<td>384</td>
<td>1.9</td>
</tr>
<tr>
<td>Bighorn</td>
<td>5,024</td>
<td>1,462</td>
<td>684</td>
<td>12.8</td>
</tr>
<tr>
<td>Helper</td>
<td>4,948</td>
<td>1,365</td>
<td>44</td>
<td>3.0</td>
</tr>
<tr>
<td>Prepine</td>
<td>4,731</td>
<td>1,804</td>
<td>190</td>
<td>10.5</td>
</tr>
<tr>
<td>Blue Lake</td>
<td>2,856</td>
<td>2,103</td>
<td>160</td>
<td>7.6</td>
</tr>
<tr>
<td>Sixmile</td>
<td>17,057</td>
<td>10,085</td>
<td>224</td>
<td>2.2</td>
</tr>
<tr>
<td>Total</td>
<td>44,491</td>
<td>30,617</td>
<td>1,762</td>
<td>4.7</td>
</tr>
</tbody>
</table>

1. 1,088 Acres Suitable for Sheep Allotment Included in Total.

Although some acres may be closed to grazing, the impacts to the allotment may not directly correlate with the amount of suitable range impacted. An example of this may be an area that has 10 percent of the suitable range impacted, but only 2 percent of the animal unit months (AUM, the amount of feed necessary to support one thousand pound cow) come from that area due to the fact that some timber areas produce less forage per acre and are inaccessible. Some pastures in the cattle and sheep allotments may have to be closed because controlling sheep at night and the additional expense of fencing and maintenance may not be practicable. Some roads may be closed to livestock grazing for two to three years to provide for revegetation.

The impact to individual permittees may be adverse when they are required to alter management of their allotments. Additional costs could make some marginal operations economically unfeasible under current market prices. Some permittees have two or more allotments impacted by the timber sale (project file).

Range Improvements

Short-term impacts to range improvements could occur, however any damage to improvements would be repaired or replaced by the timber sale operator in a timely manner. Impacts could include tearing down and removal of fences and damage to cattle guards by heavy equipment.

CUMULATIVE EFFECTS

Economic revenue generated through grazing may decrease when required reductions are added to other reductions taking place throughout the forest. Some permittees have recently been required to reduce their permitted numbers to bring their allotments in line with carrying capacity. Additional reductions or increased herding costs could make marginal operations economically unfeasible.

This section discusses potential effects to the visual landscape. The key comparison element for evaluating how the alternatives considered in detail respond to this issue, and their associated effects, is post activity visual quality condition.

4.10 VISUAL LANDSCAPE

Effects Common to All Alternatives

The landscape’s visual diversity is not static. The effects of beetle-induced tree mortality has affected, and will continue to affect, the area’s visual condition. Gradual change to visual character may be accelerated by effects of the beetle infestation and subsequent consequences (e.g. changes in the color of affected spruce trees, changes in vegetation, and increased potential for wildland fire effects).

Over time, the natural processes may result in vegetative conditions more diverse with a richer variety in color and texture. Until visual recovery, some Forest visitors may prefer to view dead spruce trees in the short-term instead of management induced patterns from harvest areas and road work.

Although high intensity (stand replacement) wildland fires are not frequent events in the forest types present, the high mortality of spruce increased the fire hazard. Intense wildland fires could cause short-term adverse effects to visual quality by reducing the amount of green vegetation. In the long term, an intense wildland fire could increase the landscape’s color and texture through natural regeneration and the creation of openings. The increased risk of mass soil movement, as discussed in the soils section, would be the greatest long-term effect to visual quality an intense wildland fire could be expected to have.

Effects of Alternative 1

Present viewsheds and their Visual Quality Objectives (VQOs) would not be altered by management activities. Changes would be shaped by natural events. Views of beetle infested areas, as perceived by the average Forest visitor, would not gain the relatively short-term improvement in color and texture that could result from removal of dead spruce and the long term improvements from reforestation.

Scenery would be subject to inclement, natural disturbance processes such as fire, wind, drought, and vegetation succession. In approximately 100 years, the dead and dying spruce trees would be naturally regenerated and/or replaced by other...
species. Views would return to their pre-infestation condition or perhaps show improvement to the condition which existed immediately prior to infestation.

**Effects Common to Alternatives 2, 3, and 4**

Disturbance caused by the construction of roads and the associated harvest of trees would have an impact on visual quality. This impact would be caused by contrasts created between the natural landscape and the managed landscape. This contrast involves changes in form, line, color, and texture of soil and vegetation.

In evaluating the specific effects for each alternative relative to scenic value, several variables come into play. Information such as road construction mileage and location, unit treatment, and unit size are relative to distance, angle, and duration of the view. For the purpose of this analysis, certain information is required to gauge the total change caused by an alternative in relation to meeting established visual quality objectives (VQO). This interpretation is based on aerial photography, topographic maps, existing Forest Plan VQO maps, and field reviews.

The relative dominance of management activities (harvest and roadbuilding) must be identified to determine if the activities are consistent with Forest Plan VQO's. If activities are designed to repeat form, line, and texture common to the characteristic landscape to a degree that changes in these characteristics are not evident to the casual Forest visitor, a VQO of retention would be achieved. If these changes are evident, but remain visually subordinate to the characteristic landscape, a VQO of partial retention would be achieved. If changes in the landscape visually dominate the landscape, but borrow from naturally established form, line, color, or texture so completely and at such a scale that its visual characteristics are those of natural occurrences within the surrounding area, a VQO of modification would be achieved.

Short-term improvements to visual qualities of color and texture should result from removal of dead spruce trees. With the possible exception of some roads, landings, and skid trails, potentially dominant negative effects are far from permanent and would likely become non-apparent as slash was removed or burned and revegetation occurs.

The selective nature of the proposed salvage harvest would minimize the impact to visuals, leaving residual five trees. The post-harvest reforestation should further accelerate visual recovery where it occurs. The duration of recovery is directly related to the extent of disturbance. In 2 or 3 years, herbaceous vegetation should cover most disturbed sites. Within 25 to 30 years, vegetation should grow to the point where the visual impact is unnoticed. Opportunities to minimize visual effects are greatest on ground with slopes less than 30 percent. This is because the size and shape of a harvest unit can be manipulated on the gentler slopes more easily to achieve an "unnoticed" visual condition, even low standard roads can remain noticeable for generations.

The visual management system defines three distance zones: foreground is the distance at which detail such as tree limbs can be identified (usually up to 1/4 mile to 1/2 mile from the observer); middleground extends from foreground to 3 to 5 miles from the foreground (texture is emphasized); and background is everything beyond middleground (colors and patterns dominate the visual impression).

Timber salvage operations (i.e. landings, stump, slash) would be visible in foreground and middleground, and could dominate sensitive foreground views. However, when design features (including revegetation) are properly implemented, foreground partial retention would be met. Harvested units of high insect infestation density, particularly if silhouetted against a backdrop of sky forming unnatural openings, may be noticeable at background distances. Middleground, partial retention would not be achieved & harvest areas greatly differ in form and scale from the natural openings found in the surrounding landscape. Due to the nature of the infestation pattern, harvested edges would follow natural contours and generally reflect the natural form and line of historic openings created by fire and beetle mortality.

Disturbance associated with roads could dominate wherever it is visible, particularly in long views where an unnatural line may be apparent. The visually apparent results of road building (i.e. cut banks, fill slopes, right-of-way/shoulder clearing) would be clearly apparent in the foreground, some would be visible in the middleground, and may appear as a dominant element of line in the background view.

Recreation-related scenic viewing from roads and trails would be similar for all action alternatives, although the degree would differ. Recreation use patterns associated with visual quality could change in and adjacent to harvested areas. Disturbed areas could become less attractive to visitors who prefer an un-managed scenic character. These visitors may choose not to return and go elsewhere.

For the duration of the salvage harvest and for a period related to regeneration afterward, some recreation users would be displaced to remaining or adjacent, less developed areas. This displacement could add to the sensation of being crowded as their traditional recreation spots are used by more visitors. However, improved access could make areas available for more recreational use, such as short duration hunting trips and for mountain bike or ATV users. Once roads are reclaimed, their presence remains to some extent, and their presence provides increased access for hikers and those with horses to enter the area.

Most of the project area is in partial retention, and very little is in retention (Figure 3-19 Visual Quality Objectives Map). There is little proposed road construction/reconstruction in the visually sensitive viewsheds along major roads and trails, nor in any of the inventoried roadless areas (except for Helitrope). Therefore, these areas of the project would remain consistent with forest plan VQO's based upon implementation of the identified design features.

Throughout the entire project area, approximately 9 to 11 miles of roads would be reconstructed within areas designated as Partial Retention. Only the infested, dead and dying spruce would be harvested using ground-based yarding techniques on slopes less than 40 percent, and cable or helicopter logging would be used on slopes greater than 40 percent. Natural and artificial reforestation activities would be employed. New roads associated with salvage operations...
would be revegetated following completion, road/soil scarring could possibly remain as a dominant visual element for many years.

Effects Differing Between Alternatives 2, 3, and 4

Alternative 2 would have the greatest potential direct effects to the visual landscape based upon the amount and character of activities it includes. The road construction included in Alternative 2 would be within an area designated as partial retention.

With Alternative 3's exclusion of road construction within inventoried roadless areas and requirement of helicopter yarding within inventoried roadless areas, it would have less direct effects than Alternative 2 to the visuals of these areas. Since Alternative 3 would not construct the Forest Development Road proposed in Alternative 2, the potential visual effects of that road would be removed.

With Alternative 4's exclusion of activity within inventoried roadless areas, there would be no direct impacts to their aesthetics. Overall, Alternative 4 would have the least amount of impacts to the visual landscape in comparison to the other action alternatives.

CUMULATIVE EFFECTS

Past roadbuilding has left a long-term effect upon visuals. On-the-ground reviews of past harvested areas show that they blend in with the surrounding landscape due to the amount of residual trees and snags retained. Other past vegetation treatments have likewise had minor effects to visuals. The action alternatives would add to the visual effects of unnaturally appearing line, texture, form, etc. already caused by management in the area. Nineteen miles of road will be reclaimed in the project area. Over time, the reclaimed roads could blend with the surrounding landscape.

4.11 UNDEVELOPED CHARACTER

This section discusses potential effects to undeveloped character. The key comparison elements for evaluating how the alternatives considered in detail respond to this issue and their associated effects are scenic condition, recreation experience, and acres harvested in unroaded areas.

DIRECT AND INDIRECT EFFECTS

Effects Common to All Alternatives

Overall, the project area has been impacted, and influenced by people and their activities. Outside of the inventoried roadless and unroaded areas, it is difficult to find areas having an undeveloped character (Figure 4-33, Alternative 1 Map and Section 3-12).

The overall undeveloped character of the area is not expected to notably change because the types of activities, facilities, recreational experiences, and scenery available should remain essentially the same for all alternatives due to developments and activities that already exist.

Effects of Alternative 1

Alternative 1 would neither directly increase nor decrease the undeveloped character of the project area. However, there may be indirect effects to potential Forest visitor use and experience as a result of the dead and dying trees across the landscape.

Alternative 1 has 94 miles of FDRs, nonsystem roads and trails, and system motorized trails. These 94 miles of motorized access represents a motorized network density of 2.4 miles per square mile within the project area. Implementation of the Alternative 1 would not reduce the motorized access and its effects to undeveloped character would persist. The unroaded areas contiguous with the inventoried roadless area would remain the same (Figure 4-33).

Effects Common to Alternatives 2, 3, and 4

Undeveloped character of the area could be affected by timber harvest and roadbuilding. In general, increased timber harvest and roadbuilding is likely to reduce undeveloped character. The potential to impact is also related to the yarding system used. Since helicopter yarding typically results in less on-the-ground impacts than ground-based yarding, it would be expected to have less of an impact to undeveloped character than ground-based yarding. Cable yarding is perceived to have a greater degree of ground disturbance than helicopter, but a lesser degree of ground disturbance than conventional ground-based yarding.

The relative difference in ground disturbance, may have a correspondingly similar effect to undeveloped character.

Some impacts, such as the sounds of project activities, would occur only during the immediate time of the activity. Other impacts, such as tree marking paint, skid trails, and logging slash, would be short term (up to 10 years). And yet, other impacts such as roads (cut slopes, fill slopes, roadway) and tree stumps would be evident much longer (20 to 40 years).

Implementation of the Alternatives 2, 3, and 4 would reclaim approximately 4.1 miles of Forest Developed Roads and 19.3 miles of nonsystem roads and trails. This would reduce the motorized access to 70 miles, with a corresponding motorized network density of 1.8 miles per square mile. The reduced access and rehabilitation of an unnatural features, roads and trails, would positively affect undeveloped character and the unroaded areas.

Given the current managed state of the area, Forest users may not further differentiate the impacts from the action alternatives upon the existing conditions. The selective nature of the proposed harvest plays a key role in minimizing one's potential perceived landscape alteration. Impacts from any of the action alternatives to undeveloped character are not expected to notably alter the recreational use patterns of the area.

A summary of potential impacts to undeveloped character can be qualitatively made by the resulting scenic condition.

In areas where the existing scenic condition has a Natural Appearing scenic condition (30%), the undeveloped character should largely remain intact due to planned avoidance of these areas.

The majority of the project area (63%), which has a Slightly Altered scenic condition, would be temporarily impacted. Eventually, after salvage harvest operations and restoration is complete, the affected areas should return to a level still within the subordinate parameters of Slightly Altered scenic condition.

The small percentage of Moderately Altered scenic condition (7%), which presently exists as a fragmented landscape, should be able to absorb salvage-related impacts (including roadwork). The casual Forest visitor should not notice much change from the existing condition, and if so, only temporarily. In
fact, in areas of these Moderately Altered landscapes, road reclamation should improve the present level of undeveloped character in the longer term.

Unroaded Areas

Figure 4-22 Unroaded Area Impact Summary, summarizes the current size, road, and harvest within the affected unroaded area. Figure 4-22 also summarizes the proposed new Forest Development Road mileage, net harvest acreage, and resulting percent of the unroaded area affected.

All action alternatives would harvest about 484-630 acres (90% helicopter) in the unroaded area contiguous with the Big Bear Canyon inventoried roadless area. The harvest is within units F1 and F3. Stumps in units F1 and F3 probably would not be visible as seen from Skyline Drive because variation in texture becomes obscured at longer distances and helicopter harvest methods typically do not create linear impacts. During and following harvest, for about 30 years, stumps would be visible to a casual visitor in unit F1 standing on the Duck Fork Dam or fishing on the reservoir. Stumps and trtcrtor skid trails would also be visible to a casual visitor hiking or hunting in the units F1 and F3. The direct effects would be a reduction in apparent naturalness, solitude, and a related reduction in a sense of remoteness.

In the southern portion of the unroaded area, FDR #50062 is identified to access the tractor portion of unit F1, and is an existing system road that is not apparent to a casual forest visitor from Skyline Drive. Following harvest, portions of this road could be apparent to a visitor as seen from Skyline Drive because a linear road feature could become apparent following removal of the vegetative screen. The direct effects would be a reduction in apparent naturalness, solitude, and a related reduction in a sense of remoteness.

All action alternatives would harvest about 46-60 acres (all helicopter) in the unroaded area contiguous with the Muddy Creek-Nelson Mountain inventoried roadless area. The harvest is within units A9 and C3. Stumps in units A9 and C3 could be visible as seen from FDR #50044. As seen from FDR #50043, stumps might be visually apparent, but not obvious because variation in texture becomes obscured at longer distances and helicopter harvest methods typically do not create linear impacts. During and following harvest, for about 30 years, stumps would be visible to a casual visitor hiking or hunting in units A9 and C3. The direct effects would be a reduction in apparent naturalness, solitude, and a related reduction in a sense of remoteness.

All action alternatives would harvest about 710-923 acres (97% helicopter) in the unroaded area contiguous with the White Mountain inventoried roadless area. The harvest is within units D1, D2, D3 and D4/5. Stumps in the northern portion of unit D1 probably would be visible as seen from FDR #50013. Stumps in the northern portion of unit D3 probably would be visible as seen from FDR #50333. As seen from FDR #50181, stumps would probably not be visible to the east because of topographic screening. The direct effects would be a reduction in apparent naturalness, solitude, and a related reduction in a sense of remoteness.

Alternatives 2, 3, and 4 would reclaim portions of FDR 50333 (Appendix F). A direct effect of the action alternatives to this unroaded area would be an increase in size from 4,300 to 4,490 acres, an increase of 190 acres (4 percent). Following the alternative implementation natural integrity, apparent naturalness, solitude, and remoteness would improve as reclamation vegetation blended with surrounding vegetation.

Lands harvested (helicopter, tractor, or cable yarding) or impacted by associated road activities would likely be excluded from the forest inventory of roadless areas until such time the evidence of human development is not substantially noticeable, which could be 30 to 40 years. Developed lands removed from the inventory would likely not be considered for wilderness suitability during subsequent revisions of the forest plan and therefore, could remove or limit future opportunities to consider and recommend wilderness.

Effects Differing Between Alternatives 2, 3, and 4

Based upon yarding systems and their relative ground-disturbance, Alternative 2 would have the greatest potential to affect undeveloped character. Correspondingly, Alternative 3 would have a slightly less potential than Alternative 2 affect due to helicopter yarding in the inventoried roadless areas. With less acreage harvested, Alternative 4 would have the least impacts as it treats the least amount of acres and it stays out of inventoried roadless areas.

Figure 4-22 Unroaded Area Impact Summary

<table>
<thead>
<tr>
<th>Unroaded Area</th>
<th>Alternative 1</th>
<th>Alternative 2 and 3 and 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unroaded Area Contiguous to Big Bear Canyon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acres of Unroaded Area</td>
<td>7,005</td>
<td>7,005</td>
</tr>
<tr>
<td>Miles of New Road</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Net Acres of Harvest</td>
<td>484-630</td>
<td>0</td>
</tr>
<tr>
<td>Percent of Unroaded Area Affected</td>
<td>7.9%</td>
<td>0%</td>
</tr>
<tr>
<td>Unroaded Area Contiguous to Muddy-Nelson</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acres of Unroaded Area</td>
<td>2,323</td>
<td>2,323</td>
</tr>
<tr>
<td>Miles of New Road</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Net Acres of Harvest</td>
<td>484-630</td>
<td>0</td>
</tr>
<tr>
<td>Percent of Unroaded Area Affected</td>
<td>2.3%</td>
<td>0%</td>
</tr>
<tr>
<td>Unroaded Area Contiguous to White Mtn.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acres of Unroaded Area</td>
<td>4,490</td>
<td>4,300</td>
</tr>
<tr>
<td>Miles of New Road</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Net Acres of Harvest</td>
<td>710-923</td>
<td>0</td>
</tr>
<tr>
<td>Percent of Unroaded Area Affected</td>
<td>16-21%</td>
<td>0%</td>
</tr>
<tr>
<td>Percent Increase in Unroaded Area</td>
<td>4%</td>
<td>0%</td>
</tr>
</tbody>
</table>

CUMULATIVE EFFECTS

In general, the types of activities, facilities, recreational experiences, and scenery available in the area will remain the same for all alternatives due to the amount of impacts that already exist in the project area. Timber harvest within the past 3 years has taken place in all three unroaded areas. Proposed harvesting within these unroaded areas would comply with the interim rule.

As described earlier, all evaluation criteria (natural integrity, apparent naturalness, solitude, remoteness, manageability, and special features) are proportionally impacted. The White Mountain unroaded area will increase in overall acreage (4 percent) following implementation. Even with this increase, all action alternatives would still cumulatively impact up to 17 percent of the unroaded areas.

From the 1996 South Manti Timber Salvage Sale decision, approximately 2,447 acres of timber have been or will be harvested within the next 3 to 5 years within the project area. This harvest may indirectly affect the area’s unroaded character in
terms of apparent naturalness and remoteness due to noise and the presence of management activities in distant views.

Figure 4-23 Unroadd Area Cumulative Impact Summary, summarizes the cumulative
site that are within the affected roadd area. By definition, unroadd areas do not
contain any classified system roads. Nonroadd roads/trails may be present.

Figure 4-23 Unroadd Area Cumulative Impact Summary

<table>
<thead>
<tr>
<th>Unroadd Area Contiguous to Big Bear Canyon</th>
<th>Alternatives 2, 3 and 4</th>
<th>Alternative 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past Acres of Harvest</td>
<td>7.005ac</td>
<td>7.005ac</td>
</tr>
<tr>
<td>Present Net Acres of Harvest</td>
<td>348</td>
<td>348</td>
</tr>
<tr>
<td>Reasonably Forseeable Future Acres of Harvest</td>
<td>484-600</td>
<td>0</td>
</tr>
<tr>
<td>Cumulative Acres of Harvest</td>
<td>978</td>
<td>348</td>
</tr>
<tr>
<td>Cumulative Percent of Unroadd Area Affected</td>
<td>14%</td>
<td>5%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unroadd Area Contiguous to Muddy-Nelson</th>
<th>Alternatives 2, 3 and 4</th>
<th>Alternative 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past Acres of Harvest</td>
<td>2.322ac</td>
<td>2.322ac</td>
</tr>
<tr>
<td>Present Net Acres of Harvest</td>
<td>301</td>
<td>301</td>
</tr>
<tr>
<td>Reasonably Forseeable Future Acres of Harvest</td>
<td>48-60</td>
<td>0</td>
</tr>
<tr>
<td>Cumulative Acres of Harvest</td>
<td>361</td>
<td>301</td>
</tr>
<tr>
<td>Cumulative Percent of Unroadd Area Affected</td>
<td>16%</td>
<td>13%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unroadd Area Contiguous to White Mtn.</th>
<th>Alternatives 2, 3 and 4</th>
<th>Alternative 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past Acres of Harvest</td>
<td>4.490ac</td>
<td>4.300ac</td>
</tr>
<tr>
<td>Present Net Acres of Harvest</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Reasonably Forseeable Future Acres of Harvest</td>
<td>710-923</td>
<td>0</td>
</tr>
<tr>
<td>Cumulative Acres of Harvest</td>
<td>953</td>
<td>30</td>
</tr>
<tr>
<td>Cumulative Percent of Unroadd Area Affected</td>
<td>21%</td>
<td>0.7%</td>
</tr>
</tbody>
</table>

4.12 CULTURAL RESOURCES

This section discusses potential effects to cultural resources. The key
comparison element for evaluating how the alternatives considered in detail respond to
this issue and their associated effects, is the potential to affect known and expected
paleontological sites and cultural resources determined or believed to be eligible for the
National Register of Historic Places.

The importance or significance of historic and archaeological sites are measured by
criteria established in 36 CFR 60.4. These criteria consider if archaeological or historic sites
(a) are associated with events that have made a significant contribution to the broad patterns of our history; (b) are associated with the lives of persons significant in our past; (c) embody distinctive characteristics of a type, period or method of construction, possess
high artistic, cultural, or aesthetic values or represent the work of a master; and (d) have yielded or are capable of yielding information important to prehistory or history. In addition, the revised 36 CFR 800 regulations incorporate consideration of those sites which are determined by Tribes to have cultural or religious significance to in significant.

In accordance with the implementing regulations (36 CFR 800.4) of the National Historic Preservation Act (NHPA), the Forest Service is required to determine if historic properties (e.g., those determined or believed to be eligible for listing in the National Register of Historic Places) will or will not be affected by the proposed action or action

alternatives. If it is determined that the proposed action(s) will affect historic properties, it must be determined if such affects will be adverse.

Effects are considered to be adverse when the proposed action(s) alter the characteristics of a historic property that qualify the property for inclusion in the National Register of Historic Places in a manner that diminishes the integrity of the property's location, design, setting, materials, workmanship, feeling or association. Examples of adverse effects include actions which would lead to: destruction or alteration of all or part of the property; isolation from its surrounding environment; or introduction of visual, audible or atmospheric elements that are out of character with the property or alter its setting.

DIRECT AND INDIRECT EFFECTS

In accordance with the Memorandum of Understanding between the Utah State Historic Preservation Office (SHPO) and the Manti-La Sal National Forest, all historic properties will be protected in place by avoidance or project modifications. Avoidance of all substantial paleontological and cultural resources in place is the preferred management option. Archaeological monitoring conducted in the summer of 1998 of active and past timber sales within the South Manti area demonstrated that protection procedures were effective in avoiding sites (project file). However, if avoidance is not possible or feasible, appropriate measures to mitigate impacts through site recording, scientific excavation, analysis, and reporting will be developed and implemented in consultation with the Utah SHPO, and the Advisory Council on Historic Preservation and consulting parties. This work will be conducted following Federal and Agency requirements.

Effects of Alternative 1

With no proposed ground disturbance, there would be no direct or indirect effects
to cultural resources from proposed agency actions.

Effects Common to Alternatives 2, 3, and 4

Timber harvest, road work, and associated project activities have the potential to directly and indirectly affect cultural resources. Increased access and ground disturbance increases the potential to affect cultural resources.

Ground based yarding systems pose the most potential to impact cultural resources. Helicopter yarding is considered to have the lowest potential of impacting sites because of less ground disturbance.

Post harvest activities such as restorestation or resource surveys within surveyed
harvest units would not require additional cultural resource inventory.

Indirect effects, such as site damage or unauthorized artifact collection, could potentially result from increased access. After completion of the project, closing temporary roads used for the project should protect sites and discourage unauthorized collection of artifacts.

Potential effects to paleontological and cultural resources have been assessed within areas proposed for timber harvest and associated ground disturbance areas. The risk of impacting historical and archaeological sites is assumed to be greatest in areas where significant archaeological and historic properties are...
located in areas of proposed timber harvest, road construction, reconstruction, obliteration; and other areas where ground disturbance will occur.

No known paleontological resources would be affected. If paleontological or cultural resources are discovered during implementation of the project, timber sale contract stipulations specify that these resources would be documented, evaluated, and protected as appropriate.

By following the terms of the MOU to avoid significant sites through minor modifications in project design, there should be no direct effects to known and subsequently identified cultural resources. Where direct effects to known sites or sites inadvertently discovered (during project implementation) cannot be avoided, plans for mitigation via data recovery (e.g. archaeological excavation and analysis) or other treatment measures would be developed in consultation with the SHPO, Advisory Council on Historic Preservation Office, consulting parties as appropriate.

Effects Offering Between Alternatives 2, 3, and 4

Cultural resource survey has identified 33 archaeological/historic properties within the South Mami Project Area. Most sites are small in size and are located in relatively level or gently sloping terrain. Figure 4-24 Harvest Area Surveyed displays the amount of acres surveyed to date.

Under Alternatives 2 and 3, 15 sites have been documented within harvest units or other associated activity areas; an additional 6-7 sites are anticipated to be identified with completion of remaining survey. Under Alternative 4, 14 sites have been documented within harvest units or other associated activity areas. It is expected that survey of remaining areas will identify three prehistoric sites within or near affected areas.

Figure 4-24 Harvest Area Surveyed

<table>
<thead>
<tr>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>Alternative 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acres Proposed for Harvest</td>
<td>0</td>
<td>6,349</td>
<td>6,349</td>
</tr>
<tr>
<td>Harvest Area Surveyed (acres)</td>
<td>N/A</td>
<td>1,187</td>
<td>1,187</td>
</tr>
<tr>
<td>Survey Results (Sites identified)</td>
<td>33</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

Although following the MOU would protect sites, the potential risk of affecting paleontological and cultural resources is relative to the access of an area and ground disturbance. Alternatives 2 and 3 have the greatest potential to affect cultural resources in terms of access and ground disturbance. Although Alternative 3 would harvest the same acreage as Alternative 2, it would have less potential to affect paleontological and cultural resources since it would not construct roads into the inventoried roadless areas. Of the action alternatives, Alternative 4 would have the least potential impact on paleontological and cultural resources because it would harvest less acreage, include less road work, and not enter inventoried roadless areas.

Some areas remain to be surveyed for each of the action alternatives. Pending inventories would be conducted consistent with the accepted modeling protocol before project implementation. Actions would be taken in compliance with the MOU, to afford subsequently identified sites appropriate protection. Figure 4-25 provides estimates of the number of new prehistoric sites expected to be located within affected areas and estimates of the remaining acreage to be surveyed in each sensitivity zone and the number of prehistoric sites expected to occur (based on the survey model).

4.13 ECONOMICS

Although following the MOU would protect sites, the potential risk of affecting paleontological and cultural resources is relative to the access of an area and ground disturbance. Alternatives 2 and 3 have the greatest potential to affect cultural resources in terms of access and ground disturbance. Although Alternative 3 would harvest the same acreage as Alternative 2, it would have less potential to affect paleontological and cultural resources since it would not construct roads into the inventoried roadless areas. Of the action alternatives, Alternative 4 would have the least potential impact on paleontological and cultural resources because it would harvest less acreage, include less road work, and not enter inventoried roadless areas.

Some areas remain to be surveyed for each of the action alternatives. Pending inventories would be conducted consistent with the accepted modeling protocol before project implementation. Actions would be taken in compliance with the MOU, to afford subsequently identified sites appropriate protection. Figure 4-25 provides estimates of the number of new prehistoric sites expected to be located within affected areas and estimates of the remaining acreage to be surveyed in each sensitivity zone and the number of prehistoric sites expected to occur (based on the survey model).

CUMULATIVE EFFECTS

All projects (past, present, and reasonably foreseeable) are to be in compliance with laws, regulations, and policies regarding cultural resources, thereby reducing potential effects.

The continued use of the area for recreation has the potential to indirectly affect cultural resources with unauthorized collecting of artifacts. Natural erosion and soil depositional processes will continue to affect cultural resources. Sites located near or within road corridors will be affected through continued vehicle use. As surveys are completed for other proposed actions, additional resources will be located and will require evaluation and protection. Some may warrant stabilization and protection. Focused inventory would assist in identifying significant sites warranting protection and enhancement.

This section discusses potential effects to economics. The key comparison elements for evaluating how the alternatives considered in detail respond to this issue is the direct and indirect effects which are projected employment, payments to Counties, and economic efficiency.

DIRECT AND INDIRECT EFFECTS

Effects Common to All Alternatives

A comprehensive economic analysis was completed as part of the Forest Plan planning process. That analysis addressed both amenity (market, consumptive) and non-amenity (non-market, non-consumptive) resources. Non-consumptive resources include such things as recreation opportunities, outdoor resources, wildlife habitat, etc. The purpose of the economic analysis for this project is to provide a comparison of economic viability between alternative actions.

Each alternative has an array of non-amenity costs and benefits which are difficult, if not impossible, to accurately model. Non-amenity costs and benefits are beyond the scope of this analysis.

Effects of Alternative 1

The direct and indirect effects of implementing Alternative 1 are presented in Figure 4-28 through Figure 4-30. A benefit-cost ratio was not calculated for...
Alternative 1 because it does not create benefits in the form of revenue. Alternative 1 would not provide additional employment and income opportunities, and returns to the Counties as payments in lieu of taxes would be foregone.

**Effects Common to Alternatives 2, 3, and 4**

Timber salvage harvest of the dead and dying spruce trees is a tool which is responsive to the identified purpose and need for the project. It may be the most effective and efficient tool currently available. Other contractual arrangements such as service contracts with salvage rights also remain viable methods for salvage removal.

Spruce trees are a preferred species for house logs, and currently there is a market for dead and dying spruce trees. The demand for house logs is increasing, as are inquiries to the Forest about the availability of dead spruce trees. The dead spruce trees within the project area could supply a portion of the raw material for the house log demand. Each action alternative would harvest merchantable timber for use as house logs and/or other wood products.

All of the action alternatives would contribute to employment and income opportunities through the harvest of timber (i.e. timber sale preparation, logging operations, trucking, timber processing, and post sale activities). Induced economic benefits to primary and secondary businesses would be expected.

Twenty-five percent of timber sale receipts would be returned to counties as payments in lieu of taxes to fund schools and roads. The remaining receipts could be deposited in the Salvage Sale Fund, KV (Knutson-Vandenberg) Fund, or returned to the National Treasury.

Estimation of benefits for the economic analysis modeling were revised from the values used in the DEIS. For benefits, a reasonable selling value is used rather than an appraised value. A reasonable selling value was determined by reviewing the values of recently sold timber sales on neighboring forests and the Manti-La Sal National Forest. Sales with dead Engelmann spruce sawtimber, tractor and helicopter yarding methods, and other similar sale characteristics were reviewed. For this analysis a reasonable selling value for sales with helicopter yarding was determined to be $25.00 per MBF.

To model benefits, three sales were simulated. Volume to be removed per acre was estimated to be 10,000 board feet per acre. Acres harvested were based on treating 50% of the gross acres in any one unit.

Estimation of costs for the economic analysis were revised from the values used in the DEIS. Sale preparation costs are reduced because trees to be cut will be designated by species rather than individually paint marked. Sale administration costs are reduced since more volume is harvested during the sale administrator’s work day. Reforestation acreage is reduced because planting will only be considered in timber emphasis management areas for analysis purposes. Planting outside of timber emphasis areas is not part of the purpose and need, and not required under NFMA. Mechanical site preparation acreages are reduced since tractors will not perform work in inventoried roadless areas for Alternative 3. Road construction and reconstruction mileages were reduced (see Draft Environmental Impact Statement).

Areas are identified for harvest based on technical operability, environmental acceptability, and the need to remove dead and dying timber as a step in ecosystem
rehabilitation. Increased helicopter yarning volume reduces the likelihood that all areas identified for harvest would in fact be harvested.

Economic considerations suggest that offering different combinations of the proposed harvest units for sale could improve the economic viability for prospective timber purchasers. For example, offering a sale with less helicopter yarning and more ground-based yarning would likely improve the sale's viability. Such sale packaging would: a) eliminate or help offset some of the high costs of helicopter yarning.

Helicopter yarning costs are estimated to vary from $203.50 to $346.90 per MBF depending upon the unit and landing location. Average helicopter yarning costs are about $283.37 per MBF for Alternative 2, $289.74 per MBF for Alternative 3, and $273.99 per MBF for Alternative 4.

Cable yarning costs are estimated to be $86.83 per MBF.

Ground based yarning costs are estimated to be $43.00 per MBF.

Road construction and reconstruction costs are estimated to be $308,000 for Alternative 2, $214,000 for Alternative 3, and $175,000 for Alternative 4.

Economic considerations also suggest that combination of proposed harvest units from this project with other harvest areas outside of this project could improve the economic viability for prospective timber purchasers.

The amount that would be contracted and harvested depends upon market conditions which vary through time and the specifics of the contractual instrument used to authorize removal (e.g. timber sale contract, service contract).

Effects Differing Between Alternatives 2, 3, and 4

The direct and indirect differences between the action alternatives are strongly related to the amount of timber to be harvested, how the timber would be yarked, and the amount of associated road work. The values for each of these characteristics are presented in Figure 4-26 Key Characteristics Affecting Economics. The estimated low value of dead timber and expected post harvest costs are characteristics common to all action alternatives.

Figure 4-26 Key Characteristics Affecting Economics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>Alternative 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timber Harvest (MBF)</td>
<td>3</td>
<td>32</td>
<td>32</td>
<td>19</td>
</tr>
<tr>
<td>Ground based Logging (MBF, % of Total Harvest)</td>
<td>0%</td>
<td>5%</td>
<td>14%</td>
<td>9%</td>
</tr>
<tr>
<td>Helicopter and Cable Logging (MBF, % of Total Harvest)</td>
<td>0%</td>
<td>27.5%</td>
<td>29.6%</td>
<td>16.7%</td>
</tr>
<tr>
<td>Road Construction (miles)</td>
<td>0</td>
<td>11.0</td>
<td>10.8</td>
<td>9.8</td>
</tr>
<tr>
<td>Road Reconstruction (miles)</td>
<td>0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

The number of jobs that would potentially be created from implementation of each alternative are presented in Figure 4-27 Jobs Created and Induced Income. The potential increase in jobs and income could benefit both local and regional economies.

### Table: Jobs Created and Induced Income

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Jobs Created</th>
<th>Income Produced</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>0</td>
<td>$0</td>
</tr>
<tr>
<td>2.</td>
<td>346</td>
<td>$18,275,000</td>
</tr>
<tr>
<td>3.</td>
<td>346</td>
<td>$18,275,000</td>
</tr>
<tr>
<td>4.</td>
<td>205</td>
<td>$10,851,000</td>
</tr>
</tbody>
</table>

1. Jobs created were derived from the multiplier of 10.8 jobs per million board feet (MMBF).

### Table: Generated Revenue and Payments in Lieu of Tax

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Generated Revenue</th>
<th>Total PILT</th>
<th>Sanpete County PILT</th>
<th>Sevier County PILT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>$0</td>
<td>$800,000</td>
<td>$800,000</td>
<td>$475,000</td>
</tr>
<tr>
<td>2.</td>
<td>$0</td>
<td>$200,000</td>
<td>$200,000</td>
<td>$119,000</td>
</tr>
<tr>
<td>3.</td>
<td>$0</td>
<td>$150,000</td>
<td>$150,000</td>
<td>$89,000</td>
</tr>
<tr>
<td>4.</td>
<td>$0</td>
<td>$50,000</td>
<td>$50,000</td>
<td>$30,000</td>
</tr>
</tbody>
</table>

1. Numbers are rounded to the nearest thousand dollars.

The economic efficiency of each alternative was analyzed using the present net value of revenues and costs expected during the life of the project. Present net value can be viewed as the amount of money the decision maker would or would not have in hand as a result of implementing an alternative. The present net value presented for this project only considers the economic costs and returns of implementing the project. Revegetation costs are included for acreages within Forest Plan timber management emphasis units.

The present net value for modeled sales in Alternatives 2 and 3 are positive. Alternatives 1 and 4 have negative present net values. A negative value indicates that more money would be spent to implement the entire project (including post harvest activities) than would be made from the sale of timber. Figure 4-29 Year 2000 Present Net Value, displays the present net value for each alternative.

### Table: Year 2000 Present Net Value

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Interest rate at 4%</th>
<th>Interest rate at 6%</th>
<th>Interest rate at 7%</th>
<th>Interest rate at 10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>$94,000</td>
<td>$311,000</td>
<td>$381,000</td>
<td>$524,150</td>
</tr>
<tr>
<td>2.</td>
<td>$92,000</td>
<td>$342,000</td>
<td>$408,000</td>
<td>$516,000</td>
</tr>
<tr>
<td>3.</td>
<td>$91,000</td>
<td>$352,000</td>
<td>$418,000</td>
<td>$513,000</td>
</tr>
<tr>
<td>4.</td>
<td>$89,000</td>
<td>$368,000</td>
<td>$420,000</td>
<td>$508,000</td>
</tr>
</tbody>
</table>

1. Numbers in parentheses are negative. Numbers are rounded to the nearest thousand dollars. Revenues and costs were specifically developed for the project reflecting local, current values. Only revenues and costs to implement the project were considered. Harvest was modelled over the years of 2000 through 2005. Reformation - was modelled over the years 2000 through 2015.
Timber prices were estimated using a reasonable selling value of $25.00 per MBF. Optional cable logging, although less expensive, was modeled as helicopter logging. All alternatives include the cost to prepare this document, estimated at $93,648. The INVEST V (1994) economic analysis model was used to determine the present net value.

While the present net value is useful for a comparison between alternatives, it should not be misinterpreted to imply the overall value of an alternative. There are both non-amenity costs and benefits not represented in this calculation of present net value of recovering a marketable product. Examples of non-amenity benefits could be fuel reduction, reduced soil erosion, reduced long-term sediment in streams, and safer travel corridors from improved system roads.

When costs for timber sale preparation and harvest operations are incurred, fuel reduction costs are inherently a part of the overall timber cost. The economic benefit of a reduced probability for a wildfire start is difficult to compare with the negative costs associated with loss of soil productivity from wildfire. Other sections in this document discuss the environmental relationships of an intense wildfire.

Other benefits which cannot be easily measured in dollar quantities include reduced soil erosion and effects on wildlife and vegetation following closure and reclamation of Forest Development Roads and nonsystem roads; long term sediment reduction in streams resulting from reconstruction of existing roads (reconstruction includes gravel to stabilize road travel surfaces and repair of stream crossings); improved travel of Forest Development Roads following reconstruction due to increased turn-outs, graveling of road surfaces, and increased sight distance. Timber salvage harvest activity is probably the least cost method to accomplish rehabilitation in the spruce stands.

Alternatives 2 and 3 have similar present net values. Alternative 3 is slightly higher because of less road construction and reconstruction costs. Alternative 4 is defit because it harvests less timber and receives less revenue to cover costs.

The benefit-cost ratio, with a 4 percent interest rate, is summarized in Figure 4-30 Benefit Cost.

<table>
<thead>
<tr>
<th>Benefit ($)</th>
<th>Cost ($)</th>
<th>Benefit-Cost Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative 1</td>
<td>0</td>
<td>93,648</td>
</tr>
<tr>
<td>Alternative 2</td>
<td>3,050,000</td>
<td>2,737,265</td>
</tr>
<tr>
<td>Alternative 3</td>
<td>3,050,000</td>
<td>2,669,121</td>
</tr>
<tr>
<td>Alternative 4</td>
<td>1,425,000</td>
<td>1,658,997</td>
</tr>
</tbody>
</table>

1 Interest rate discounted at 4%.

CUMULATIVE EFFECTS

Between 1992 to 1997 the Timber Canyon and Twelvemile Timber Sales harvested about 5 MBMF of insect infected and dead spruce trees from the project area. These sales contributed to the local and regional wood products industries. These sales generated an estimated 60 jobs and 3.2 million dollars in income and Sanpete County received approximately 203,500 dollars as payments in lieu of taxes.

The Olga, Camel, Oley, Baldy, Six, and Duck Timber Sales were sold to harvest about 21 MBMF of old and dead spruce trees from the project area within the next 4 years. Of these sales, the Camel Timber Sale was completed in 1997. Camel, Oley, and Olga have been completed. These sales will and have contributed to the local and regional wood products industries. These sales are expected to generate an estimated 232 jobs and 12.3 million dollars in income and Sanpete County should receive approximately 326,700 dollars as payments in lieu of taxes.

Six timber sales located outside the project area, but on the Manti Division of the Manti-La Sal National Forest are likewise contributing to the local economy. Four of those sales (Four Mile II, Four Mile III, Spoon Creek II, and Bear Ridge) are completed and harvested 3 MBMF. About 3.3 jobs and 1.7 million in income were generated by this harvest. Payments in lieu of taxes from these sales would be about 8,500 dollars to Emery County, 1,500 dollars to Juab County, 1,200 dollars to Sanpete County, and 4,500 dollars to Utah County. Two of the sales (Spoon Creek III and Spoon Creek IV) will harvest about 1.7 MBMF over the next two years. About 19 jobs and 1.0 million in income may be generated from these two sales. Emery County would receive about $6,100 for payments in lieu of taxes.

This section discusses potential effects to energy. The key comparison elements for evaluating how the alternatives considered in detail respond to this issue and their associated effects is fuel consumption and output.

DIRECT AND INDIRECT EFFECTS

Effects Common to All Alternatives

With the increasing world demand for fossil fuels and escalation of energy prices, energy characteristics of forest management are a concern, which merits consideration. Disclosure of energy consumption is required under the National Environmental Policy Act (40 CFR 1502.16). Energy consumption was calculated using “Methods for Evaluation Energy Effects of Forest Management Alternatives” (Schwarzbart and Schmitz, 1982).

Effects of Alternative 1

There would be no direct or indirect effects to the energy resource with implementation of Alternative 1.

Effects Common to Alternatives 2, 3, and 4

Timber harvest activities, associated road work, and project traffic would contribute to the consumption of energy.

Effects Differing Between Alternatives 2, 3, and 4

The direct and indirect effects of implementing the action alternatives are presented in Figure 4-31 Direct and Indirect Effects to Energy.
Effects of Alternative 1

Figure 4-33, Roadless and Unroaded Areas, Alternative 1, shows the location of inventoried roadless areas, contiguous unroaded areas, and pre-existing harvest units for Alternative 1 (no action).

Alternative 1 would not enter the inventoried roadless areas with vegetation treatments or road work, nor would it treat lands adjacent to these areas. Therefore, there would be no direct or indirect effects to natural integrity, apparent naturalness, remoteness, solitude, special features, and manageability and these areas and their characteristics.

However, following the mortality of spruce by the beetles, some existing roads and trails within roadless areas and existing unauthorized, nonsystem roads and trails may have become visible. Areas containing, or visually adjacent to, roads would be proportionately modified in natural integrity and apparent naturalness.

Differing from the action alternatives, Alternative 1 would not recalm additional Forest Development Roads, nonsystem roads, or nonsystem motorized trails. Correspondingly, the potential benefit of improvements in manageability (limited motorized access) and a corresponding increase in remoteness and apparent naturalness would not be realized with no action.

Effects of Alternatives 2, 3, and 4

Effects Common to Alternatives 2 and 3

Figure 4-32 inventoried Roadless Area Impact Summary, summarizes the current size, roadding, and harvest within the affected inventoried roadless area. Figure 4-32 also summarizes the proposed new Forest Development Road mileage, harvest acreage, and resulting percent of the roadless area affected.

Figures 4-34/35 Roadless and Unroaded Areas Maps, Alternative 2 and 3 shows the location of inventoried roadless areas, contiguous unroaded areas, and harvest units for Alternative 2 and 3. Figure 4-36, Roadless and Unroaded Area Map, Alternative 4 shows the location of inventoried roadless areas, contiguous unroaded areas, and harvest units for Alternative 4.

Timber harvest and associated road construction would directly change the physical and biological aspects of the land, consequently affecting the six roadless characteristics. The modified setting would heighten one’s sensation of being in a developed area. The character of the landscape would change because the sights, sounds, and other evidence of people would be noticed for some distance beyond the area directly affected by the action alternatives.

Some vegetation management effects on roadless characteristics would be short-lived (e.g., five to ten years) such as unit flagging, tree paint, trees left with scars from logging such as where they were bumped by a felled tree or logging equipment. Other changes to the roadless character from the vegetation management would be long-lived (e.g., 30 to 60 years) such as road construction cut and fill slopes, cut tree stumps, skid trails, skidding openings, and changes in the vegetative patterns. Only alternative 2 has constructed road work.

Helicopter, cable, and tractor yarding would have ground disturbing impacts to roadless areas, including areas used as helicopter landings (approximately 1 acre per landing). The causal forest visitor would see stumps if they hiked through a
typical harvest unit. These stumps could be noticeable to the casual forest visitor for about 30 to 40 years. after which, the stumps begin to decay and are shielded from view by other vegetation. This estimate (personal communication, interdisciplinary team member, 2000) is based on numerous visual inspections in the project area and other locations on the Wasatch Plateau, Ferron, Price, and Sanpete Ranger Districts. During these inspections they observed the discoloration and decay rate of stumps and the growth rate of vegetation following past logging (occurred over the past 30 years).

Areas containing or visually adjacent to roads and harvest areas would be proportionately modified in natural integrity and apparent naturalness. In these areas, opportunities for solitude and a related sense of remoteness would be reduced or eliminated when harvest activities are occurring because they could be seen and heard. After harvest activities have ceased, and if the openings were viewed within 1/4 mile or less, a visitor may see stumps. The project's impacts to the inventoried roadless areas could change the recreational use of the area. Potential forest users seeking a relatively primitive recreation experience might choose not to visit the area subsequent to increased development, and the number of forest users seeking a more modified setting could increase. Indirectly, salvage activity occurring outside of the roadless and unroaded areas themselves could also have the effect of encouraging recreationists to use the relatively less developed areas for camping, etc. The remoteness and solitude of these areas located near the timber sale could be degraded as recreationists move into these areas in order to avoid logging activities and to seek a more unmodified natural setting.

Lands harvested (helicopter, tractor, or cable yarding) or impacted by associated road activities would likely be excluded from the forest inventory of roadless areas until such time the evidence of human development is not substantially noticeable, which could be 30 to 40 years. Developed lands removed from the inventory would likely not be considered for wilderness suitability during subsequent revisions of the forest plan and therefore, could remove or limit future opportunities to consider and recommend wilderness.

None of the alternatives would harvest or construct roads in the Big Bear Canyon and Muddy Creek-Nelson Mountain inventoried roadless areas. Consequently, there would not be direct effects to these roadless characteristics of these inventoried roadless areas.

### Table 4-32 Inventoried Roadless Area Impact Summary

<table>
<thead>
<tr>
<th>Inventoried Roadless Area</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Big Bear Canyon</strong> (25,782 Acres, 21.8 Miles Existing Roads)**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miles of New Road</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Net Acres of Harvest</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Percent of Roadless Area Affected</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Number of Helicopter Landings</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Black Mountain</strong> (6,580 Acres, 10.3 Miles Existing Roads)**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miles of New Road</td>
<td>0</td>
<td>231-300</td>
<td>231-300</td>
</tr>
<tr>
<td>Net Acres of Harvest</td>
<td>759-969</td>
<td>759-969</td>
<td></td>
</tr>
<tr>
<td>Percent of Roadless Area Affected</td>
<td>15-19%</td>
<td>15-19%</td>
<td></td>
</tr>
<tr>
<td>Number of Helicopter Landings</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Helesiopse</strong> (5,196 Acres, 4.7 Miles Existing Roads)**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miles of New Road</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Net Acres of Harvest</td>
<td>758-969</td>
<td>759-969</td>
<td></td>
</tr>
<tr>
<td>Percent of Roadless Area Affected</td>
<td>15-19%</td>
<td>15-19%</td>
<td></td>
</tr>
<tr>
<td>Number of Helicopter Landings</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Muddy Creek-Nelson Mtn.</strong> (54,235 Acres, 22.5 Miles Existing Roads)**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net Acres of Harvest</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Percent of Roadless Area Affected</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Number of Helicopter Landings</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Twin creek</strong> (10,600 Acres, 12.4 Miles Existing Roads)**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miles of New Road</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Net Acres of Harvest</td>
<td>15-20</td>
<td>15-20</td>
<td></td>
</tr>
<tr>
<td>Percent of Roadless Area Affected</td>
<td>0-0.2%</td>
<td>0-0.2%</td>
<td></td>
</tr>
<tr>
<td>Number of Helicopter Landings</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>White Mtn.</strong> (27,700 Acres, 8.6 Miles Existing Roads)**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miles of New Road</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Net Acres of Harvest</td>
<td>255-332</td>
<td>255-332</td>
<td></td>
</tr>
<tr>
<td>Percent of Roadless Area Affected</td>
<td>1-1.2%</td>
<td>1-1.2%</td>
<td></td>
</tr>
<tr>
<td>Number of Helicopter Landings</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL DIRECT IMPACT TO INVENTORIED ROADLESS AREAS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miles of New Road</td>
<td>1.1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Net Acres of Harvest</td>
<td>1,259</td>
<td>1,259</td>
<td></td>
</tr>
<tr>
<td>Number of Helicopter Landings</td>
<td>1.637</td>
<td>1.637</td>
<td></td>
</tr>
</tbody>
</table>

Effects common to alternatives 2 and 3 specific to individual inventoried roadless areas are presented below.

**Big Bear Canyon Inventoried Roadless Area**

Apparent naturalness could be reduced indirectly from the effects of helicopter logging on adjacent, steep and consequently more obliquely apparent viewpoints as seen from within the Big Bear Canyon inventoried roadless area. From within the eastern-most area of Cove Mountain, the steeper slopes of Unit F3 would be fully visible and Unit F1 would be partially visible. The higher ridge above Duck Fork Reservoir, between these units and the southern portion of the inventoried roadless area, prevents longer views of these harvest areas.

Further away, high elevation helicopter logging should have no affect to naturalness or sense of remoteness. Variation in texture becomes obscured at longer distances and this harvest method avoids creating linear impacts. The negative visual effect
associated with distant views of high, steep forested slopes would tend to, until the units were revegetated.

In summary, visitors using the Big Bear Canyon inventoried roadless area would perceive moderate changes in roadless characteristics from visible activity within the northern portion of the area.

Black Mountain Inventoried Roadless Area

The special features associated with Black Mountain and the scenic aspen basins would remain the same regardless of any action alternative. There would be some indirect effect to apparent naturalness and a sense of remoteness from within this inventoried roadless area while viewing proposed harvest areas to the east. Although the view would be limited by the divide at Skyline Drive, visitors within the roadless area could see human-caused activity nearby.

Heliotrope Inventoried Roadless Area

Heliotrope is relatively roaded. Forest Development Road #50022 on the northern border would be used as a haul route for the project. Vehicle use of this road would have indirect audible effects near the entire northern margin of the inventoried roadless area. During the RARE II evaluation process, the Heliotrope roadless area was dropped largely due to ease of vehicle accessibility and livestock use. Manageability of the Heliotrope inventoried roadless area is already low due to past impacts and off road vehicle use. Additional access opportunities would further reduce the area's manageability. No special features were noted.

Muddy Creek-Nelson Mountain Inventoried Roadless Area

Muddy Creek-Nelson Mountain inventoried roadless area is located far enough away or screened from adjacent potential activities to preclude visual or audible affect to its roadless characteristics. From within the Muddy Creek-Nelson Mountain inventoried roadless area, adjacent helicopter harvested slopes in Unit C1/2 could be seen from within the northwest corner of the roadless area. This indirect affect would potentially reduce one's sense of apparent naturalness, remoteness, and solitude.

Twelvemile Inventoried Roadless Area

Due to topography, the consequences of proposed harvest adjacent to the Twelvemile inventoried roadless area would not reduce its undeveloped characteristics.

White Mountain Inventoried Roadless Area

Topography and openness of vegetation adjacent to proposed harvesting outside of this inventoried roadless area in Units D2, D3 and D4/5 could be seen from within the White Mountain inventoried roadless area. This would have an indirect affect to the roadless characteristics of the area.

During and following harvest, for about 30 years, stumps and tractor skid trails would be visible to a casual visitor hiking or hunting in units D1, D2, D3 and

D4/5. The direct effects would be a reduction in apparent naturalness, solitude, and a related reduction in a sense of remoteness.

Effects Differing Between Alternatives 2, 3, and 4

The potential direct impacts to each inventoried roadless area for Alternatives 2 and 3 are shown in Figures 4-34/35, Inventoried Roadless and Unroaded Area Maps. The potential direct impacts to each inventoried roadless area for Alternative 4 are shown in Figure 4-36 Inventoried Roadless and Unroaded Area for Alternative 4 Map.

Since Alternative 4 would not harvest or include road work within roadless areas, it would have no associated direct effects. Alternative 4 would have the same direct effects to roadless character as Alternative 1. Alternative 4 would have the same indirect effects to roadless character as Alternatives 2 and 3, due to visual and audible perceptions of unscreened, adjacent harvest activity (primarily higher elevation slopes). However, Alternative 4 would have the least amount of impacts to roadless character in comparison to the other action alternatives. Alternative 2 would have the greatest impacts to roadless character as it allows for road construction and tractor yarding to remove included timber.

Effects differing between action alternatives specific to individual inventoried roadless areas are presented below.

Big Bear Canyon Inventoried Roadless Area

There would be no unique effects between the action alternatives to the Big Bear Canyon inventoried roadless area.

Black Mountain Inventoried Roadless Area

Both Alternatives 2 and 3 would harvest two units (G1 and G2) within the eastern margin of the Black Mountain inventoried roadless area. This activity could directly affect 4.5 percent of this inventoried roadless area. The amount of acreage directly affected by harvest could possibly reduce the Black Mountain's total size to 6,115 acres. This reduced acreage could move the area closer to the 5,000 acre minimum and also lower opportunities for remoteness and solitude.

Except for a 20-25 acre difference in yarding methods, both Alternatives 2 and 3 would harvest Units G1 and G2 within the roadless area. Alternative 2 would harvest 20-25 acres of G1 with ground-based equipment, whereas Alternative 3 would harvest the same 20-25 acres. This helicopter yarding would be somewhat less impacting to the area characteristics of apparent naturalness and remoteness.

Heliotrope Inventoried Roadless Area

Alternative 2

Alternative 2 includes four units (E1, E2, E3, E4) and 1.1 miles of road in the northwestern portion of this roadless area. Approximately 473-815 acres would be helicopter yarded and 263-342 acres would be ground-based yarding. Approximately 758-985 acres, or 15-19 percent of the total Heliotrope inventoried roadless area, would be directly affected by harvest. Two helicopter landing would be constructed to yard logs in E3. Road density could increase from 0.58 to 0.74 miles per square mile, negatively affecting the area's roadless character.
Due to the small size of this roadless area (5,196 acres), direct impacts from harvest and road building would reduce the area of undeveloped character to less than the 5,000-acre minimum eligibility. This amount does not include the areas subject to indirect or cumulative effects as seen from above Emery Reservoir.

Indirect visual effects to roadless characteristics in this area from other adjacent lands planned for ground-based yarding would not be apparent, except from the western margin above Emery Reservoir because of topography.

Alternative 2 could preclude future consideration of the Heliotrope inventoried roadless area for Wilderness designation.

**Alternative 3**

Alternative 3 includes four units (E1, E2, E3, E4) and road maintenance in the northwestern portion of this roadless area. All 755-965 acres would be helicopter yared, potentially affecting 15-19 percent of its total roadless area directly. One helicopter yarding area would be utilized in an open area adjacent to a coral to yard E3.

Due to the small size of this entire roadless area (5,196 acres), this impact could possibly result in dropping the entire area’s roadless designation because its undeveloped acreage could fall below the 5,000-acre minimum. This amount does not include the acres subject to indirect or cumulative effects as seen from above Emery Reservoir.

Road maintenance to Forest Development Roads #50070 and #50285 could also contribute towards a developed effect. However, road reclamation in the area should offset any negative effect associated with the upgradie of these haul roads.

As in Alternative 2, one would sense indirect visual and audible effects to apparent naturalness and remoteness while in this area, relatively few helicopter harvested steep slopes would be apparent due to topography. The exception may be treatment units A1 and A3 as seen from the far western margin of the roadless area above Emery Reservoir.

**Muddy Creek-Nelson Mountain Inventory Roadless Area**

There would be no unique effects between the action alternatives to the Muddy Creek-Nelson Mountain inventoried roadless area.

**Twelvemile Inventory Roadless Area**

Alternatives 2 and 3 would harvest 15-26 acres within the southeast portion of the Twelvemile inventoried roadless area (Unit B4). Harvest of Unit B4 would directly affect less than 1 percent of the inventoried roadless area. Given the size of this roadless area (10,600 acres) and the negligible direct impact effects would be small. Potential impact from the small-scale of proposed harvest would not measurably affect the special feature of the existing large landslide or manageability of the area as a whole.

Alternative 2 would yard Unit B4 with ground-based equipment, whereas Alternative 3 would helicopter yard it. A difference in visual effects would be expected between the two types of yarding, with helicopter yarding leaving less visible evidence of activity.

**White Mountain Inventoried Roadless Area**

Both Alternatives 2 and 3 would harvest one unit (D4/5), totaling 255-332 acres, within the northeast part of the White Mountain inventoried roadless area. Harvest of Unit D4/5 would directly affect 1 percent of this inventoried roadless area. Given the size of this roadless area (27,700 acres) and the small direct impact of the proposed harvest, manageability of the remaining area should not be adversely affected.

Unit D4/5 would be located within the viewed area of an outstanding lookout point, which is a special feature of this inventoried roadless area located near Three Lakes. The visibility of this unit from this special feature, would potentially affect apparent naturalness, sense of remoteness, and opportunity for solitude.

**Alternative 4**

Alternative 4 would have no direct effect, as treatments and associated activities do not enter inventoried roadless areas. Indirectly, the apparent naturalness and sense of remoteness could be affected by treatments adjacent to inventoried roadless areas.

**Cumulative Effects**

Past and present non-motorized recreation activities in roadless areas are relatively non-impaive, such as hunting on foot or by horse, and backpacking. Since the late 1980’s and through the 1990’s, use of “4-wheelers” increased throughout the Wasatch Plateau, including the South Manti project area (Bill Dye, 2000). Correspondingly, there were increases in the use of forest system roads and motorized trails and reduction in a sense of remoteness and naturalness within inventoried roadless areas.

Existing development associated with past harvest, mining, and user-developed roads located in or near roadless areas contribute to reducing roadless character.

The 1992 Timber Canyon Timber Sale (330 acres) was located within the Twelvemile roadless area, consequently there were direct effects to 3 percent of it. There may also be indirect effects to remoteness and solitude of the roadless area. Those traveling to destinations nearby may view the harvested area. Others may simply know that it is there.

The 1993 Twelvemile Timber Sale (205 acres) was located approximately 7 miles west of the Heliotrope roadless area, therefore there were no direct impacts. Its indirect effects of the timber harvest are negligible because they are not visible because of topographic and vegetative screening.

From the 1996 South Manti Timber Salvage Sale decision, approximately 2,000 acres of timber have been or will be harvested within the next 3 to 5 years within the project area. This harvest may indirectly affect the area’s roadless character in terms of apparent naturalness and remoteness due to noise and the presence of management activities in distant views.

Alternative 4 would have the least amount of cumulative effects to roadless character as it does not enter any of the inventoried roadless areas. Alternative 2 would have the greatest effect, and alternative 3 would be in between 2 and 4. However, all action alternatives would reclaim approximately 10-33 miles of non-system road and trails that would improve the areas overall character through time. Alternative 1 would have no additional impacts to roadless character.
Inventoried Roadless & Unroaded Areas

Alternative 1

Alternative 2

LEGEND:
- Project Boundary
- Past Timber Harvest
- Inventoried Roadless Areas
- Contiguous Unroaded Areas

LEGEND:
- Helicopter Landing Areas
- Project Boundary
- Harvest Units
- Inventoried Roadless Areas
- Contiguous Unroaded Areas
Inventoried Roadless & Unroaded Areas
Alternative 3

LEGEND:
- Helicopter Landing Areas
- Project Boundary
- Harvest Units
- Inventoried Roadless Areas
- Contiguous Unroaded Areas

Inventoried Roadless & Unroaded Areas
Alternative 4

LEGEND:
- Helicopter Landing Areas
- Project Boundary
- Harvest Units
- Inventoried Roadless Areas
- Contiguous Unroaded Areas
Possible conflicts with plans and policies of other jurisdictions, such as the State of Utah or local Counties, have been considered and are summarized in the following.

Prescribed burning can affect local air quality. All burning must comply with the procedures and requirements in the State Smoke Management Plan and the Multi-Lake Sail Smoke Management Guidelines for Prescribed Fogs (USDA Forest Service, 1992a). The State Program Coordinator must approve burning permits and may reschedule a proposed prescribed fire to manage local, area, or State-wide emissions from both prescribed and wildland fires.

There would be no conflicts with plans and policies of other jurisdictions since roads would be located, designed, and constructed to minimize the potential for inducing landslides.

Section 313 of the Clean Water Act requires Federal Agencies to comply with all Federal, State, interstate and local requirements, administrative authority, and process and sanctions with respect to the control and abatement of water pollution. Executive Order 12088 also requires the Forest Service to meet the requirements of the Act. All alternatives would comply with the Clean Water Act and the intent and specifics of the State's High Quality - Category 1 designation. State water quality standards should be met. Based on SEDROUTE results, the sediment and associated TDS load from National Forest System lands in Twelvemile Creek (a 303(d) listed stream) would not change and might decrease slightly. All action alternatives incorporate reasonable Best Management Practices, avoid channel degradation, and comply with the Forest Plan.

Degradation of aquatic habitats would be in conflict with the plans and policies of the Utah Division of Wildlife Resources. Potential water related impacts are negligible relative to the existing hydrologic impacts from the beetle infestation. None of the alternatives would degrade aquatic habitats. Therefore, there would be no conflicts with plans and policies of other jurisdictions.

Current policies of Utah Division of Wildlife Resources direct that fishing opportunities be maintained or improved. New and improved road access to some areas could increase angler harvest success and fishing opportunities, complementing this other agency’s policy.

There would be no conflicts with plans and policies of other jurisdictions. Currently there are cooperating documents with Sanpete County for weed control.

Conflicts may arise if a planned fire or wildfire goes onto lands not administered by the Forest Service.

The Forest Service and the Utah Division of Wildlife Resources work together to manage wildlife, but the missions of the two agencies are different. The Forest Service manages the land and affects wildlife through the habitat provided - including access impacts. The State of Utah manages wildlife populations by adjusting hunting seasons and bag limits. There would be no conflicts with plans and policies of other jurisdictions.

There would be no conflicts with plans and policies of other jurisdictions. The final decision resulting from this planning effort would be in compliance with Agency road policy in effect at the time of the decision.

There would be no conflicts with plans and policies of other jurisdictions.

There would be no conflicts with plans and policies of other jurisdictions.

There would be no conflicts with plans and policies of other jurisdictions.

Cultural resource protection on Federal Lands are coordinated in consultation with the State Historic Preservation Office (SHPO), who serve in an advisory capacity. The policies of the Forest Service and SHPO are consistent.

There would be no conflicts with plans and policies of other jurisdictions.

There would be no conflicts with plans and policies of other jurisdictions.

There would be no conflicts with plans and policies of other jurisdictions.

Implementation of any alternative would inevitably result in some environmental effects that cannot be avoided. The severity of the probable effects is minimized by adhering to the design features of the alternatives. Probable environmental effects that cannot be avoided have been considered and are summarized below. The earlier sections of this chapter address potential effects in detail.

Temporary impacts to air quality are unavoidable from prescribed burning and associated smoke. Prescribed burning is an integral part of fuel treatment and site preparation for reforestation. Such activity would be scheduled when air dispersion is good. If a wildfire were to occur, there would be unavoidable effects to air quality from smoke. Such a wildfire could occur when air dispersion is poor.

Increased potential for landslides caused by beetle-induced tree mortality cannot be avoided.

There would likely be some localized areas of soil damage from soil disturbance, erosion, or fire. The extent of damage would be negligible through the application of Best Management Practice. If an intense wildfire occurred, the soil resource would be unavoidably damaged.

Aquatic habitat is in close proximity to proposed harvest activities. Although design features and BMP’s would be used to minimize impacts to the soil and water resources, small amounts of sediment could reach the stream channel. These amounts would not be expected to adversely affect existing water uses or aquatic habitat. Riparian buffer zones and transpiration design should minimize, and in most cases avoid, such effects.
VEGETATION RESOURCES
Existing spruce mortality and subsequent beetle-induced spruce mortality as spruce beetle populations continue to expand cannot be avoided. Spruce mortality is expected to continue, unless a natural environmental event (e.g. extreme cold, wet summer or heavy freeze affecting susceptible stages of the spruce beetle life cycle) causes a population collapse stopping the current epidemic.

FUELS/FIRE
Wildland fires cannot be avoided due to the degree that spruce stands within and adjacent to the project area have been killed creating anordinate amount of fuel loading.

WILDLIFE
The probable environmental effects that cannot be avoided for each species are discussed in Section 4.7 of this chapter. All of the action alternatives would have an effect on the cover/consumption relationships in the project area.

TRANSPORTATION
Roads constructed and maintained for long-term use essentially become part of the landscape, affecting users and use of the area. Road construction, reconstruction, and obiteration directly affects various resources through ground disturbance. Road construction, reconstruction, and obiteration indirectly affect other resources through the change in use patterns.

RANGE
Temporary effects to the availability and use of rangelands would be expected. Impacts would be the greatest for areas needing protection to ensure regeneration success. Range improvements would be protected.

VISUAL LANDSCAPE
Roads associated with the project which are maintained for long-term use would visually alter the landscape by the introduction of a linear feature - the road. Visual effects resulting from harvest activities would be relatively short-lived and blend in over time with the natural setting at the landscape scale. The introduction of timber harvest units would add a variety of line, form, color, and texture to the landscape. Recreation visitors would see a modified forest in the near foreground, middle-ground, and background where harvest and road construction is implemented.

UNDEVELOPED CHARACTER
Implementation of any action alternative cannot avoid affecting the undeveloped character to some degree.

CULTURAL RESOURCES
Some ground disturbing activity may affect an undiscovered historic or prehistoric site. Plans to address these effects would be coordinated with SHPO and ACHP.

ECONOMICS
Although not an environmental effect, if funds are generated from the sale of timber, a percentage of the gained revenue would be apportioned to the affected Counties.

ENERGY
All action alternatives would consume fuels proportional to the number of engines (vehicles and other machinery) operating to implement the project.

ROADLESS CHARACTER
Implementation of any action alternative cannot avoid affecting the roadless character of the inventoried roadless and unroaded areas to some degree. Inventoried roadless and unroaded area acreage affected by this project could be dropped, in part or whole, for future consideration as an inventoried roadless area. In addition, they may be less suitable for wilderness.

4.17 RELATIONSHIP BETWEEN SHORT-TERM USE AND LONG-TERM PRODUCTIVITY

AIR QUALITY
The temporary impacts of smoke from prescribed burning and road dust from vehicles associated with activities would have minor, short-term effects on visual quality and recreation use. The short-term impacts are offset by a reduction in the risks from wildland fire and long-term, increased site productivity.

LAND STABILITY
Effects on land stability would be long-term. They would last until the beetle killed stands have been reestablished. Existing roads, including those portions of roads that are reconstructed for the project, would remain indefinite. New roads used in the action alternatives would exist for the life of the Timber Sale and follow-up reforestation efforts (estimated at 5 years). After serving these purposes, they would be rehabilitated. Rehabilitation could decrease the landslide potential. In the treated units, reforestation of understory vegetation would take approximately 5 years. Re-establishment of mature trees would take at least 150 years.

SOILS
Soils would be taken out of production where use is dedicated to roads, landings, and service areas. Upon rehabilitation, the soils would again be productive. Adequate amounts of organic materials would be left for nutrient cycling and surface protection. The 10 to 15 tons per acre of coarse woody debris to be retained is consistent with requirements found in research, (USDA Forest Service, Graham et al. 1994a). Soil compaction from ground-based logging that is not treated would return to its near natural density in a few years (estimated within 5 years). If an intense wildfire were to occur, long-term productivity could be reduced.

WATER RESOURCES
Erosion and sedimentation from road development and other ground disturbing activities may occur even after vegetative recovery, although at a lesser degree than initially. The impacts to aquatic habitat will be short-term (less than five years). Recovery will be dependent upon re-establishment of vegetation on disturbed areas and frequency, timing, and intensity of precipitation events.

VEGETATION RESOURCES
Managed stands produce a higher volume through time than un-managed stands. Regeneration of desired faster growing species, planting of trees, stocking control to reduce competition and improve growth of individual trees, and intermediate treatments to maintain the health and vigor of stands are silvicultural means of maintaining the long-term yield of forest stands. Timely reforestation puts the land back into a productive timber growing condition. There would be no effect to Federally listed plant species negligible effects on sensitive plant populations.

FUELS/FIRE
Initially, an increase in dead and down fuels, mixed with the fuel moisture characteristics described previously, would contribute to an increase in fire risk. However, reducing the buildup of activity created fuels, by implementing slash disposal requirements described previously, and breaking up continuous fuels within designated treatment areas would reduce the overall wildland fire risk to manageable levels. This practice would contribute to the long-term reduction in risk of a large, intense wildland fire.

WILDLIFE RESOURCES
For all action Alternatives, relationship between short-term use and long-term productivity concerning each species are discussed in Section 4.7.
LAND STABILITY
Increases in landslide potential caused by human activity would be irretrievable but probably not irreversible because actions could be taken to increase landslide and road stability. The occurrence of a naturally occurring landslide could be irreversible. The occurrence of a project induced landslide could be reversible if limited in scale. Decreases in land productivity and soil health and quality due to landslides would be irreversible but not irreversible because actions could be taken to replace productivity. The loss of vegetation and soil due to a project induced landslide would be irretrievable. Landslide area, sed sediment increases in streams, ponds, and reservoirs would also be irretrievable. The loss of topsoil could be considered irreversible because replacement of soils by natural processes is very slow.

SOILS
Best Management Practices would be used to avoid soil and potential productivity losses from timber harvest and associated access needs. Soil lost by erosion would be considered irretrievable. In general, the soil lost by this project would not cause an irreversible impact because the amount lost would be less than the amount of natural soil formation required to maintain long-term productivity. Soil productivity is irretrievably lost on roadways that are not rehabilitated.

WATER RESOURCES
Sediment will move downstream throughout the stream system. There are no irreversible or irretrievable commitments anticipated to aquatic habitat or species.

VEGETATION RESOURCES
Mortality of spruce beetle affected by spruce beetle is an irreversible effect that cannot be avoided. A minimum of 100 to 200 years would be required to bring stand structures back to conditions similar to those which existed prior to the spruce beetle epidemic. Timber harvest would change plant succession, stand development, and species composition. No effects are anticipated to cause irreversible commitments of rangeland resources. If project requirements fail, some irreversible commitments may include loss of vegetation for livestock and wildlife if noxious weeds become established. Also some diversity in vegetative composition of the plant community could be lost to noxious weeds. Road construction would irretrievably remove land from production. The impact to sensitive plant populations is expected to be minimal.

FUELS/FIRE RESOURCES
Resources could be irretrievably lost if a large, intense wildfire fire were to occur.

WILDLIFE RESOURCES
The loss or modification of habitat for certain wildlife species is an irreversible commitment of resources. As vegetation recovers, this habitat would recover. No irreversible commitment of resources would occur from implementation of any alternative. Irretrievable commitments would occur when the annual productivity of the various species is reduced.

TRANSPORTATION
The area needed for road construction and gravel sources takes that land out of production and is an irretrievable commitment. Removal of the gravel is an irreversible commitment. The time spent by travelers because of delay or extended travel time is irreversible and irretrievable.

RANGE
No irreversible commitments of resources are expected. Irretrievable commitments include a temporary damage to range improvements until they are repaired and temporary loss of forage production during initial reforestation of the harvested areas.

VISUAL
No action would cause no irreversible or irretrievable effects to visual quality in the long term.
LANDSCAPE: Changes in the existing appearance of the landscape would occur from the action alternatives. These changes are reversible because they would become progressively less noticeable as vegetation recovered in harvested areas and along roads. Additionally, until full visual recovery, reductions of visual quality from timber harvest itself may be offset by an improvement to the landscape color and texture associated with the removal of the dead trees.

UNDEVELOPED CHARACTER: There would be no irreversible or irretrievable commitment of resources with implementation of Alternative 1. Unloaded is essentially a non-renewable resource. Most development is an irreversible and irreversible commitment of the resource to a less natural condition for the long-term because the processes of ecological recovery and succession move slowly compared to a human life span. In a broader time frame, the developed condition may be reversible after about 30 to 40 years.

CULTURAL RESOURCES: Any activity that would disturb a cultural resource is an irreversible commitment. While the recovered data could be used for educational purposes, the removed portion of the site would be irretrievably lost.

ECONOMICS: Implementation of Alternative 1 could have the irreversible economic effect of forgone employment opportunities and revenue generation once the dead trees become unmarketable.

ENERGY: The use of fossil fuels to implement any of the action alternatives would represent irreversible and irretrievable commitments of resources.

ROADLESS CHARACTER: There would be no irreversible or irretrievable commitment of resources with implementation of Alternatives 1 or 4. Roadless is essentially a non-renewable resource. Most development is an irreversible and irreversible commitment of the resource to a less natural condition for the long-term because the processes of ecological recovery and succession move slowly compared to a human life span. In a broader time frame, the developed condition may be reversible after about 30 to 40 years.

4.20 FOREST PLAN CONSISTENCY: This project tiers to direction in the Forest Plan and its Record of Decision, and incorporates by reference the analysis disclosed in its environmental analysis. This planning effort documents the analysis in the second level of planning. In the Forest Plan, the National Forest System lands within the Manti-La Sal National Forest has been divided into management units which differ from each other in resource emphasis. The management units that fall within the project area were discussed and mapped in Chapter 3 of this document. Changes in land use designation which have been established in the Forest Plan are not part of this project and were not evaluated in this analysis.

Forest Plan Forestwide direction is presented in Appendix C - Forest Plan Direction. Forestwide direction applies to all areas across the Forest. Additional Forest Plan direction applicable to the pertinent management units is also presented in Appendix C - Forest Plan Direction. Management unit direction is supplemental to and supersedes the general Forestwide direction.

Disclosures within this document and Project File support that all action alternatives considered in detail would be consistent with Forest Plan direction. A detailed assessment of consistency for each resource area can be found in the Project File.

The following disclosures summarize specific project consistency with the Forest Plan. This summary is intended to be fairly inclusive of applicable key direction by resource/issue topic. However limiting the following examples may be, consistency was assessed on the entirety of the Forest Plan direction.

AIR QUALITY: All alternatives would be consistent with Forest Plan direction to meet State and Federal air quality objectives (Air Quality 01). Consistency is based upon compliance with the State Smoke Management Plan and use of the Manti-La Sal Smoke Management Guidelines for Prescribed Fire (USDA Forest Service, 1992a).

LAND STABILITY: All alternatives would be consistent with Forest Plan direction. They would comply with Forestwide direction to conduct appropriate geologic surveys and include appropriate geological data into the project (Geologic Resource Management 01, 02). Examples of consistency include the land stability analysis completed for this project and project requirements to: reforest harvested areas; operate under dry or frozen condition; avoid locating log decks in existing landslide areas; and avoid, where practicable, unburned areas, moderately unstable areas, slopes greater than 40 percent, and active landslides. There is no Range or Wood-fiber Management Unit direction regarding land stability.

SOILS: All alternatives would be consistent with Forest Plan direction. They would comply with Forestwide direction to conduct appropriate soil inventories, maintain and improve soil productivity, minimize project impacts to the soil resource and rehabilitate disturbed areas (Soil and Water Inventories 01, Soil and Water Resource Management 01, 02; Soil and Water Resource Improvements 01). Examples of consistency include the soil resource analysis completed for this project and project requirements to: helicopter or cable yard steep slopes, reforest harvested areas; operate under dry or frozen condition; maintain 10 to 15 tons per acre of woody debris; apply Best Management Practices; severely compacted areas, use erosion control measures for road construction, prescribe burn in a manner to not adversely impact the soil resource, and reclaim specified roads. There is no Range or Wood-fiber Management Unit direction regarding soils.

WATER RESOURCES: All alternatives would be consistent with Forest Plan direction.

Water Quantity: All alternatives would comply with Forestwide direction to analyze the implementation of projects on water yield (Water Yield Improvement 02). Current and future water yields are predominantly associated with the beetle killed tree mortality. Examples of consistency are the same as those listed in the preceding soils section. There is no Range or Wood-fiber Management Unit direction regarding water quantity.

Water Quality: All alternatives would comply with Forestwide direction to improve or maintain water quality, implement Best Management Practices, and manage waters capable of supporting self-sustaining fisheries (Water Quality Management 01, 02; Wildlife and Fish Resource Management 08). Water quality has analyzed for this project. The only water quality parameter that would be affected by the action alternatives is total sediment. It was found that projected changes in sediment yield would be small and that beneficial uses would not be adversely affected. Examples of consistency include those listed in the preceding soils section. Additionally, consistency is exhibited by project requirements to place logging slash and large woody debris on skid trails; conduct field review to refine appropriate Best Management Practices, stabilize and reseed helicopter landings; and include contractual provisions to minimize the risk of petroleum products entering the water. There is no Range or Wood-fiber Management Unit direction regarding water quality.
Riparian, Wetlands, And Floodplains: All alternatives would comply with Forestwide direction to identify and evaluate effects to riparian, wetlands, and floodplains (Riparian, Floodplain and Wetlands 01, 03). Identification and analysis of potential impacts to these water dependent features has occurred for this project. Other examples of consistency include project requirements to exclude harvest and ground-based harvest equipment within 100 feet of perennial waters and 50 feet of intermittent waters, unless otherwise approved for specific crossing; avoid road and landing construction within riparian areas; cross Riparian Units perpendicular; obtain specific approval for landings within Riparian Units; avoid wetlands; restore skidding induced changes to the drainage; avoid road crossing in wetlands; field identify floodplains and assess appropriateness of facility location; and apply Best Management Practices. There is no Range or Wood-fiber Management Unit direction regarding it-use water dependent features.

Aquatic Habitat: All alternatives would comply with Forestwide direction to provide habitat needs, as appropriate, for management indicator species (Wildlife and Fish Resource Management 01). The above water resource discussions demonstrate consistency with this requirement. Additionally, consistency is demonstrated by the project requirements to: maintain the macroinvertebrate diversity index at or above 11, and the Biotic condition index at or above 75; conduct field review of all perennial streams to assess and determine appropriate fish passage structures (e.g. culverts) and manage stream habitat to at least 50 percent of its potential. There is no Range or Wood-fiber Management Unit direction regarding aquatic habitat.

Threatened, Endangered, and Sensitive Aquatic Species: All alternatives would comply with Forestwide direction to manage habitat for recovery of threatened and endangered species, and manage habitat of sensitive species to keep them from becoming listed (Wildlife and Fish Resource Management 02, 04). Although no such species occur within the project area, the above water resource discussions demonstrate consistency with this requirement. There is no Range or Wood-fiber Management Unit direction regarding threatened, endangered, and sensitive aquatic species.

All of the action alternatives would be consistent with Forest Plan direction. It could be debated as to whether inaction. Alternative 1, would be consistent with specific vegetation management direction.

Forest Health, Diversity, and Productivity: All action alternatives would comply with Forestwide direction to: manage suitable timberlands for harvest; provide for timber stand improvement, reforestation and wildlife habitat improvement; manage unsuitable timberlands for commercial harvest to maintain forest cover species, with emphasis on other forest resources and use, use clear-cuts as appropriate on any forest species with potential for impact, or impacted by insects or disease; manage timber product removal and utilization to meet multiple use requirements; establish satisfactory reforestation after harvest (Timber Resource Management 01, 02, 03, 04, 05, Silvicultural Prescriptions 03, Reforestation 01). The need to respond to forest health concerns, timber stand improvement, wildlife habitat improvement, and emphasis on multiple uses. All action alternatives include measures to ensure adequate reforestation. While all of the action alternatives are directly responsive to the aforementioned direction, it could be debated as to whether inaction. Alternative 1, would be consistent. There is also Range Management Unit Direction to maintain forests to provide a high level of forage production, wildlife habitat, and diversity (Range, Timber Resource Management 01). As stated above, all action alternatives would be consistent with this, whereas it could be debated as to whether inaction, Alternative 1, would be. There is no Wood-fiber Management Unit direction regarding forest health, composition, and productivity.

Noxious Weeds: All alternatives would comply with Forestwide direction to control and reduce noxious weeds (Range Improvement and Maintenance 03). Examples of consistency include project require. ItS to control continuous of noxious weeds and require weed-free equipment to moving onto the site. There is also Range Management Unit Direction to improve or maintain range condition to fair or better (Range, Range Resource Management 01). Continued weed management and preventative measures such as weed-free equipment would help maintain the range condition. There is no Wood-fiber Management Unit direction regarding noxious weeds.

Threatened, Endangered, and Sensitive Terrestrial Plant Species: All alternatives would comply with Forestwide direction to manage recovery for threatened and endangered species, and manage habitat of sensitive species to keep them from becoming Federally listed (Wildlife and Fish Resource Management 02, 04). There are no proposed Federally listed plants, or their habitat, within the project area. Heliotrope milk-vetch, the only threatened plant within the project area, is outside of the areas of activity and would not be affected. There would be no impact to the endangered species Carrington daisy or Arizona willow because they outside of the areas of activity and would not be affected. There may be cumulative impacts to Musnea groundsel and Maguire campion associated with use of the South Camel gravel pit. However, project requirements are included to minimize potential impacts and the crushed rock surface afterwards may provide habitat conducive to plant establishment. Additionally, consistency is demonstrated by project requirements to minimize or avoid potential effects: do not harvest within riparian zones, survey habitats and known populations sites prior to harvest; and identify and protect plants and habitat. There is no Range or Wood-fiber Management Unit direction regarding threatened, endangered, and sensitive terrestrial plant species.

All of the action alternatives would be consistent with Forest Plan direction. It could be debated as to whether inaction. Alternative 1, would be consistent with specific vegetation management direction. All action alternatives would comply with Forestwide direction to: provide a level of protection from wildfire that cost efficient that should meet objectives of the management unit, maintain fuel conditions which permit fire suppression forces to meet protection objectives of management unit, use preplanned prescribed fire to accomplish resource management objectives (Fire Planning and Presuppression 01; Fuel Treatment 01; Vegetation Treated by Burning 01). The need to treat the extensive amount dead and drying spruce is the foundation of this project, and its action alternatives. All action alternatives propose to selectively harvest dead and drying spruce trees followed by fuel treatments (prescribed burning, logging and vegetation) to reduce fuels and wildfire potential. The proposed method of treatment may be the most cost-effective means to achieve the desired reduced fuels and wildfire risks. All action alternatives should result in conditions within the capabilities of fire suppression efforts. While all of the action alternatives are directly responsive to the aforementioned direction, it could be debated as to whether inaction. Alternative 1, would be consistent.

All alternatives would be consistent with Forest Plan direction.
Management Indicator Species: All alternatives would comply with Forestwide direction to provide habitat needs, as appropriate, for management and collector species, and manage down timber to provide habitat for wildlife; maintain or improve habitat capability; and use commercial and non-commercial practices to accomplish wildlife habitat objectives (Wildlife and Fish Resource Management 01, 02, 06, 07: Habitat Improvement and Maintenance 01, 04). Several project requirements demonstrate consistency: maintaining adequate cover in calving areas; promoting aspen clones where they exist in treated areas; precluding harvest during calving; and restricting harvest activities during the hunting season; closing temporary project roads to the public; maintaining appropriate forage to cover ratios; maintaining at least 50 percent of current habitat; meeting specified legacy, slash, and woody debris requirements; protecting trees with raptor nest sites or snags; retaining specified number of snags; and restricting winter hauling if necessary. The action alternatives further contribute to achieving the Forest Plan direction by not harvesting live non-spruce trees or dead Douglas-fir to improve cavity habitat, road closures and reclamation to improve habitat effectiveness, and reforestation to accelerate return of cover and security. There is no Range or Wood-fiber Management Unit direction regarding management indicator species.

Tree Cavity Dependant Species: All alternatives would comply with Forestwide direction to provide habitat needs of tree cavity nesting birds, raptors, and small animals (Wildlife and Fish Resource Management 06). Project requirements that demonstrate consistency include requirements for leave trees, snags and raptor nest trees, and woody debris. There is no Range or Wood-fiber Management Unit direction regarding cavity dependent species.

Proposed, Threatened, and Endangered Species: All alternatives would comply with Forestwide direction to manage habitat for recovery of threatened and endangered species, and maintain and/or improve habitat and habitat diversity for minimum viable populations (Wildlife and Fish Resource Management 02, 04). There would be no impact to endangered peregrine falcon and southwest willow flycatcher. Action alternatives may impact individuals or habitat, but would not likely contribute to a loss of population viability of the listed species. Some impacts to lynx would be from possible indirect increased human activities in winter habitat. Impacts to bald eagle would be from possible disturbance from helicopter activity during migration through the area, although helicopter flight restrictions exist for roosting periods. There is no Range or Wood-fiber Management Unit direction regarding proposed, threatened, and endangered species.

Sensitive Species: All alternatives would comply with Forestwide direction to manage habitat of sensitive species to keep them from becoming Federally listed, and maintain and/or improve habitat and habitat diversity for minimum viable populations (Wildlife and Fish Resource Management 02, 04). The numerous above wildlife resource discussions demonstrate consistency with this requirement. Additionally sensitive species would be protected by: following Conservation Strategy, and Agreement for the Management of Northern Goshawk, retaining large snags and small packets of dense vegetation along ridge tops and mid-slope on south or east aspects; retaining snags, including ones with broken tops. Action alternatives may impact individuals or habitat, but would not likely contribute to a loss of population viability of sensitive wildlife species. There is no Range or Wood-fiber Management Unit direction regarding sensitive species.

Neotropical Migratory Birds: There is no Forestwide, Range, or Wood-fiber Management Unit direction specific to Neotropical migratory birds. However, the preceding discussions about wildlife indicate that the needs of such birds would be met by all alternatives.

Transportation: All alternatives would be consistent with Forest Plan direction. All action alternatives would comply with Forestwide direction to: close newly constructed roads to public use after project use; allow permitted use of Forest Development Roads under specific requirements; close Forest Development Roads when unacceptable damage is occurring; construct and reconstruct roads specific uses (e.g. timber sales). Maintain roads to minimum requirements (Transportation Management 01, 02, 06; Collector Road Construction and Reconstruction 01, Local Road Construction and Reconstruction 01, 02, 06; Road Maintenance). All action alternatives include road management as outlined above. Final Action, Alternative 1, would be consistent with the direction to close roads causing unacceptable damage. There is no Range Management Unit direction regarding transportation. Wood-fiber Management Unit direction is to plan roads to meet short- and long-term timber management needs, with emphasis to design for future timber activities (Wood-fiber, Transportation System 01, 02).

All alternatives would be consistent with Forest Plan direction. All alternatives would comply with Forestwide direction to manage the resource range in harmony with other resources and activities (Range Resource Management 01). This project attempts to accomplish several needs in harmony for all resources involved. Additionally, the project includes coordination with the livestock permittee. The Range Management Unit direction is to plan roads to meet short- and long-term timber management needs, with emphasis to design for future timber activities (Wood-fiber, Range Improvement and Maintenance 01). All action alternatives include provisions for regeneration protection from livestock damage.

All alternatives would be consistent with Forest Plan direction. All alternatives would comply with Forestwide direction to manage the resource range in harmony with other resources and activities (Range Resource Management 01). This project attempts to accomplish several needs in harmony for all resources involved. Additionally, the project includes coordination with the livestock permittee. The Range Management Unit direction is to plan roads to meet short- and long-term timber management needs, with emphasis to design for future timber activities (Wood-fiber, Range Improvement and Maintenance 01). All action alternatives include provisions for regeneration protection from livestock damage.

There is no Forestwide, Range, or Wood-fiber Management Unit direction specific to undeveloped character. However, the following Forestwide direction to provide opportunities for roaded, natural appearing, semipermissive motorized, and semipermissive nonmotorized recreation uses would apply (Rangeland Recreation Management 01, 02, 03, 04). The most pertinent areas would be consistent with the Forestwide direction to manage the resource range in harmony with other resources and activities (Range Resource Management 01). This project attempts to accomplish several needs in harmony for all resources involved. Additionally, further field review would be made to identify visually sensitive areas to be included in the contract for special measures. There is no Range or Wood-fiber Management Unit direction regarding visual landscape.

There is no Forestwide, Range, or Wood-fiber Management Unit direction specific to undeveloped character. However, the following Forestwide direction to provide opportunities for roaded, natural appearing, semipermissive motorized, and semipermissive nonmotorized recreation uses would apply (Rangeland Recreation Management 01, 02, 03, 04). Additionally, Range and Wood-fiber Management Unit direction to provide semipermissive nonmotorized, semipermissive motorized, roaded natural, and rural recreation opportunities (Range, Dispersed Recreation Management 01, Wood-fiber, Dispersed Recreation Management 01) The project area provides semipermissive motorized, roaded natural, and rural Recreation Opportunity Spectrum classes. Additionally, there are areas where nonmotorized recreation could occur. The above discussion about visual landscape could also apply to the discussion of undeveloped character.
complain inventories; evaluate and protect National Register eligible sites. On protection in place is not possible, avoid, minimize, or mitigate impacts; when modification cannot protect sites, develop data recovery plans, halt activities; upon discovery of new sites, and consult with Native American entities. Additionally, no eff ect determination has been made for all alternatives. There is no Range or Wood-fiber Management Unit direction regarding cultural resources.

**ECONOMICS**

There is no Forestwide, Range, or Wood-fiber Management Unit direction specific to economics. However, all action alternatives would meet Forest Plan Timber Goals to: provide commercial timber sales of sufficient quantity and quality to maintain local timber industry and accomplish desired vegetation treatment goals, meet as much of the demand for wood fiber and Forest products as possible, consistent with multiple-use objectives; and use timber management to meet other management or resource needs.

**ENERGY**

There is no Forestwide, Range, or Wood-fiber Management Unit direction specific to energy.

**ROADLESS CHARACTER**

There is no Forestwide, Range, or Wood-fiber Management Unit direction specific to roadless. However, the following Forestwide direction to provide opportunities for roaded, natural xeroxing, semiprimitive motorized, and nonmotorized recreation uses would apply (Dispersed Recreation Management 02). Additionally, Range and Wood-fiber Management Unit Direction to provide semiprimitive nonmotorized, semiprimitive motorized, roaded natural, and rural recreation opportunities (Range, Dispersed Recreation Management 01: Wood-fiber, Dispersed Recreation Management 01). The project area provides semiprimitive motorized, roaded natural, and rural Recreation Opportunity Spectrum classes. Additionally, there are areas where nonmotorized recreation could occur. The above discussion about visual landscape could also apply.

**4.21 SPECIFICALLY REQUIRED DISCLOSURES**

**Environmental Justice**

The alternatives were assessed to determine whether they would disproportionately impact minority or low income populations, in accordance with Executive Order 12898. No local minority or low income populations were identified during scoping of the analysis of effects. No minority or low income populations are expected to be impacted by implementation of any of the alternatives.

**Effects of Alternatives on Social Groups**

There would be no overall differences between alternatives in effects on minorities, Native American Indians, women, or the civil liberties of any American citizen.

**Effects on Floodplains and Wetlands**

There are bogs, ponds, and lakes within the project area. These wetlands should not experience any significant adverse effects from management activities. The floodplains within the project area would not receive measurable impact by upstream influences. Management activities designed to protect these resources conform to the federal regulations for floodplains (Executive Order 11990) and wetlands (Executive Order 11990).

**Energy Requirements and Conservation Potential of Alternatives**

Energy consumption and output is presented in Section 4.14 of this Chapter. The energy required to implement the alternatives in terms of petroleum products would be insignificant when viewed in light of the production costs and effects of the national and worldwide petroleum reserves.

**Effects of Alternatives on Prime Rangeland, Forest Land, and Farm Land**

The alternatives presented are in compliance with Federal Regulations for prime lands. The project area does not contain any prime rangeland or farm lands. The definition of prime forest land does not apply to lands within the National Forests. In all alternatives, Federal lands would be managed with the appropriate consideration to the effects on adjacent lands.
APPENDIX A
LIST OF PREPARERS
## APPENDIX A - LIST OF PREPARERS

<table>
<thead>
<tr>
<th>Name</th>
<th>Area of Expertise</th>
<th>Education</th>
<th>Experience (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stan Andersen</td>
<td>Wildlife, Vegetation, Threatened and Endangered Species, Sensitive Species, Range</td>
<td>B.S. Wildlife/Range Management M.S. Wildlife/Range Management</td>
<td>15</td>
</tr>
<tr>
<td>Judy Beacco</td>
<td>Writer/Editor/Documentation</td>
<td>B.S. Forest Management B.S. Secondary Education</td>
<td>9</td>
</tr>
<tr>
<td>Diane Cote</td>
<td>Forest Health, Vegetation, Silviculture</td>
<td>B.S. Forest Management</td>
<td>23</td>
</tr>
<tr>
<td>Steve Cote</td>
<td>Logging Systems</td>
<td>A.S. Forestry</td>
<td>25</td>
</tr>
<tr>
<td>Rob Davies</td>
<td>Aquatic Habitat</td>
<td>B.S. Geology</td>
<td>10</td>
</tr>
<tr>
<td>Martha DeFreest</td>
<td>Transportation Planning, Energy</td>
<td>B.S. Civil Engineering</td>
<td>12</td>
</tr>
<tr>
<td>Kruvin Draper</td>
<td>Visuals, Recreation, Roadless Character, Undeveloped Character</td>
<td>B.S. Wildlife and Range B.S. Landscape Architect</td>
<td>9</td>
</tr>
<tr>
<td>Ivan Erskine</td>
<td>Fuels, Fire</td>
<td>B.S. Forestry</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B.S. Elementary Education</td>
<td></td>
</tr>
<tr>
<td>Katherine Foster</td>
<td>Air Quality, Hydrology, Soils</td>
<td>B.S. Forestry</td>
<td>24</td>
</tr>
<tr>
<td>David Hatfield</td>
<td>NEPA/Consultant</td>
<td>B.A. Natural Science M.S. Geology</td>
<td>16</td>
</tr>
<tr>
<td>Glen Jackson</td>
<td>Economics, Logging Systems</td>
<td>B.S. Forestry</td>
<td>31</td>
</tr>
<tr>
<td>Doug Jones</td>
<td>Team Leader</td>
<td>B.S. Forestry</td>
<td>20</td>
</tr>
<tr>
<td>Fred Kaminski</td>
<td>Fire/Fuel</td>
<td>B.S. Forestry</td>
<td>10</td>
</tr>
<tr>
<td>Pete Kilbourne</td>
<td>Geographic Information Systems</td>
<td>B.A. Geology</td>
<td>20</td>
</tr>
<tr>
<td>Ann King</td>
<td>Public Involvement</td>
<td>B.S. Elementary Education M.S. Outdoor Recreation</td>
<td>9</td>
</tr>
<tr>
<td>Stan MacDonald</td>
<td>Cultural Resources</td>
<td>B.S. Anthropology M.A. Anthropology</td>
<td>22</td>
</tr>
<tr>
<td>Greg Montgomery</td>
<td>Forest Health, Vegetation, Silviculture</td>
<td>B.S. Forestry</td>
<td>22</td>
</tr>
<tr>
<td>Steve Munson</td>
<td>Insects and Forest Health</td>
<td>B.S. Forest Pest Management M.S. Forest Entomology</td>
<td>26</td>
</tr>
<tr>
<td>Rod Player</td>
<td>Wildlife Biology/Range Management</td>
<td>B.S. Range Science M.S. Range-Wildlife Relations</td>
<td>21</td>
</tr>
<tr>
<td>Carter Reed</td>
<td>Geology, Land Stability</td>
<td>B.S. Geology</td>
<td>22</td>
</tr>
</tbody>
</table>
SCOPING

The solicitation of comments is referred to as scoping. Comments were sought on the Proposed Action as indicated below.

<table>
<thead>
<tr>
<th>Date of Scoping</th>
<th>Type of Scoping</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 14, 1998</td>
<td>Manti-La Sal &quot;Schedule of Proposed Actions&quot; Forest mailed to an approximate 250-person mailing list, on a quarterly basis.</td>
</tr>
<tr>
<td>February 17, 1998</td>
<td>Individual Scoping Letters Individual scoping letters were mailed to approximately 300 individuals.</td>
</tr>
<tr>
<td>April 8, 1998</td>
<td>Manti-La Sal &quot;Schedule of Proposed Actions&quot; Forest mailed to an approximate 250-person mailing list. Project has been on quarterly schedule continuously.</td>
</tr>
<tr>
<td>October 5, 1998</td>
<td>Public Field Trip Field trip to explain proposed action to interested publics.</td>
</tr>
<tr>
<td>May 7, 1999</td>
<td>Federal Register Notice of Intent of DEIS Forest mailed over 200 copies of DEIS.</td>
</tr>
<tr>
<td>July 13, 1999</td>
<td>Public Field Trip Explained and answered questions pertaining to DEIS.</td>
</tr>
</tbody>
</table>

CONTENT ANALYSIS

The process of analyzing scoping comments is called content analysis. Content analysis helps to clarify the project, set the limits for the analysis, and identify follow-up actions.

97 letters were received in response to the Draft Environmental Impact Statement. Received letters were assigned a unique number based on the date of the letter (see below).

<table>
<thead>
<tr>
<th>Letter Date</th>
<th>Letter Number</th>
<th>Affiliation, Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>05/03/99</td>
<td>1</td>
<td>Utah Environmental Congress, Denise Boggs</td>
</tr>
<tr>
<td>05/17/99</td>
<td>2</td>
<td>Friends of Nipomo Parks, William L. Denneen</td>
</tr>
<tr>
<td>06/17/99</td>
<td>3</td>
<td>Eric, D. Faatz</td>
</tr>
<tr>
<td>06/22/99</td>
<td>4</td>
<td>Rocky Mountain Loi Homes, Patrick O. Connell</td>
</tr>
<tr>
<td>06/22/99</td>
<td>5</td>
<td>Sierra Club California, Kathy Bailey</td>
</tr>
<tr>
<td>06/24/99</td>
<td>6</td>
<td>Nathan Wyeth</td>
</tr>
<tr>
<td>06/25/99</td>
<td>7</td>
<td>Stephanie Cobb</td>
</tr>
<tr>
<td>06/25/99</td>
<td>8</td>
<td>Dan Steinberg</td>
</tr>
<tr>
<td>06/25/99</td>
<td>9</td>
<td>Tom Ribe</td>
</tr>
<tr>
<td>06/25/99</td>
<td>10</td>
<td>Debra Davison</td>
</tr>
<tr>
<td>06/28/99</td>
<td>11</td>
<td>Name not readable</td>
</tr>
<tr>
<td>06/28/99</td>
<td>12</td>
<td>Arizona Humane Society, Mr. and Mrs. Bob Burns</td>
</tr>
<tr>
<td>06/28/99</td>
<td>13</td>
<td>Office of Environmental Policy and Compliance, Robert F. Stewart</td>
</tr>
<tr>
<td>06/28/99</td>
<td>14</td>
<td>Mark Noethen</td>
</tr>
<tr>
<td>06/30/99</td>
<td>15</td>
<td>Allison Jones</td>
</tr>
</tbody>
</table>
Commenter: Utah Environmental Congress

1-a Comment: Per the NOI, how many of the proposed 6,600 acres are currently in Timber Management Emphasis units identified in the Forest Plan?

Response: Approximately 2,100 acres of the area proposed for treatment under Alternative 2 of the DEIS are identified for management under a prescription of TBD (Forest Plan emphasis is on wood-fiber production and harvest). Appendix E of the DEIS provides a display of Forest Plan Prescription and associated acres by unit and by alternative.

1-b Comment: How will the South Manti timber sale reduce the potential for large and intense wildfires? We have references that state that after logging the wildfire risk is the greatest.

Response: By reducing the fuel loading and breaking up the continuity of the fuels. Harvesting removes the larger materials and consequently, this will reduce the burn intensity of the fire. See the fuel/fire section in Chapter 4 for additional comments and analysis. We believe your references address green sales. This project deals with dead trees. Consequently, additional fuel is not being created.

1-c Comment: All of the past sales need to be included in a comprehensive cumulative effects analysis for past, present, and reasonably foreseeable environmental impacts to all resources.

Response: All past sales have been included in the analysis to be considered in the cumulative effects.

1-d Comment: How will the additional 40 MMCF of Engelmann spruce proposed for logging affect the viability of the goshawk and its habitat? Considering Utah is developing a management direction for goshawk, it would be prudent to delay this project until the management direction is released.

Response: All alternatives will be consistent with management direction, including the Utah Northern Goshawk Forest Plan Amendment signed on April 14, 2000. The Biological Evaluation and associated impact determination can be found in Appendix J of the FEIS. A discussion of forest fragmentation and habitat connectivity, especially as it relates to the goshawk can be found in comment #1.

1-e Comment: How does logging of approximately 55 MMCF (combined sales in analysis area) of Engelmann spruce meet the standards and guidelines, goals and objectives of the Manti-La Sal Forest Plan?

Response: Consistency with Forest Plan goals is discussed in Chapter 2, the purpose and need. Consistency with forest plan standards and guidelines is addressed in Chapter 4 for each resource topic. This project contributes to the objectives listed for the Forest Plan. It is but one project out of many that were implemented over the past ten years.
The relationship between the forest, bark beetles, and wildlife has been considered in the DEIS, sections 3.8 (p. 3-29 to 3-35) and 4.7 (p. 4-44 to 4-58) address the current situation and effects of implementation of each alternative (including No Action) on wildlife species and their habitat. Appendix J: Biological Assessment provides additional information and analysis relative to federally listed threatened, endangered, or sensitive species. This information has been carried into the FEIS as well.


1-d Comment: The problem related to the loss of dead wood and the importance of snags and downed wood in a healthy forest should be thoroughly analyzed in the DEIS.

Response: The project design features include a requirement to maintain 10-15 tons/acre of woody debris greater than 3 inches in diameter evenly distributed in the proposed harvest units. Of this total, at least 25% is to be greater than 10 inches in diameter. The requirement is included to maintain soil productivity. It will also provide microsite protection for both planted and naturally regenerated seedlings. Project design features also include snag guidelines.

1-e Comment: UEC is opposed to any new or temporary construction on Forest Service lands, particularly in roadless areas. The full cost of all associated road building costs must be included in the Economic Analysis.

Response: The Interim Rule of March 1, 1999 temporarily suspends decision making on road construction and reconstruction in many unroaded areas. The Draft EIS has been re-evaluated, and no road construction is taking place in these areas for all alternatives. Road construction is proposed under alternative 2 for access into timber unit E-3, see FEIS map. Only Alternative 2 proposes any new road construction. That proposed construction is 1.1 miles in the Heliotrope area. Alternatives 3 and 4 propose only reconstruction of existing Forest system roads. A description of proposed road construction and reconstruction is in Chapter 2, Figure 2-13 Comparison of Alternatives by Issue without Final Interim Rule, Issues 12: Transportation and Chapter 4, Section 4.8 Transportation. The economic analysis uses a reasonable estimate for the cost of road construction and reconstruction. Experienced costs from other road construction and reconstruction, which is similar to the work proposed in this project, are used to develop the estimates. Cost estimates are documented in the project record.

1-f Comment: The cost of helicopter logging must be fully documented in the Economic Analysis.

Response: The estimated cost of helicopter logging is documented in Chapter 4, Section 4.12 Economics.

1-m Comment: UEC requests that the EIS demonstrate how the additional roads will contribute to the health of the forest and benefit people.

Response: Alternative 2 is the only alternative to propose 1.1 miles of new construction. The proposed road provides access to stands impacted by the Engelmann spruce bark beetle epidemic so silvicultural treatments may be performed. Forest health is discussed in Chapter 3, Section 3.6 Vegetation Resource and Chapter 4, Section 4.5 Vegetation Resources. Benefits to the public in terms of projected increase in the number of jobs and income are discussed in Chapter 3, Section 3.13 Economics, and Chapter 4, Section 4.12 Economics.

1-n Comment: The current open road density in the analysis area must be displayed as well as the foresurable road density if these roads are built.

Response: Road densities are displayed by alternative in the EIS. No additional roads are anticipated in the foreseeable future (see appendix G).

1-o Comment: All indicator and TES species (plants, animals, fish) as well as songbirds must be thoroughly analyzed for potential impacts to their populations and habitat.

Response: The spruce bark beetle epidemic with its resulting dead trees has changed the habitat for species that used to utilize these areas. A list of the wildlife species observed in the area of interest can be found in the project folder. While not all species can be examined and a determination as to the effect of the range of alternatives made, a determination has been made and documented for the Threatened, Endangered, and Sensitive wildlife species that are known to exist or have habitat in the area of interest. An analysis for Forest Management Indicator Species has also been made relative to the range of alternatives considered.

1-p Comment: We request that the Biological Evaluation be included in the DEIS for public review.

Response: The Biological Evaluation was included in the DEIS is the actual document text instead of as an Appendix such as the Biological Assessment. The BE can be found on pages Chapter 3.31 to 3.34, which details the habitat requirements of these sensitive species and Chapter 4.52 to 4.56 details the potential impacts for these sensitive species and makes a determination of the impacts for each species. The determination for each TES species is also documented in the Executive Summary (5-13) in the DEIS. For reading clarity, the Biological Evaluation has been separated and included in an appendix in the FEIS.

1-q Comment: We request population data from monitoring reports to be included in the DEIS for all indicator and TES species.

Response: The area of interest was surveyed to determine the wildlife species present, there is also some long term monitoring on going throughout the area specific for goshawks. This information was used to help in determining the potential impacts to wildlife species as they relate to the range of alternatives, the data is found in the project file.

1-r Comment: The DEIS must analyze how the proposed project will further contribute to forest fragmentation and how this additional fragmentation will affect wildlife habitat for all species.

Response: Fragmentation of the project area has occurred naturally from the spruce bark beetle epidemic. 90% of the trees >11 inches are dead. The selection of an action alternative (salvage logging) won't add to the forest fragmentation. Selection of an action alternative will allow for replanting of the logged areas with spruce seedling which will decrease forest fragmentation. Alternative 2 proposes 1.1 miles of road construction, and all other roads that would be temporarily used (approximately 24 miles of other FDR, nonsystem roads and trails would be reclaimed). Alternative 3, the 1.1 miles of road construction won't be constructed, but the temporary roads and other roads would be reclaimed as in Alternative 2. Alternative 4 provides for the road reclamation as do the other action alternatives. Any forest fragmentation due to roads would be short term in duration and impact, in the long term the habitat effectiveness would improve with road closures.

Goshawk habitat is connected (the opposite of fragmented) if it is accessible from existing population centers. Connectivity has positive implications for population viability because it allows individuals to emigrate to new areas when their current habitat declines in value.
such as a beetle epidemic killing 90% of mature spruce trees. Available information on goshawks (The Northern Goshawk in Utah: Habitat Assessment and Management Recommendations) indicates that goshawk movements of 20-50 miles is typical. This definition of connectivity ensures that any resident goshawks in the project area will be able to disperse throughout the Wasatch Plateau to find areas of high-quality habitat.

Comment: A substantive cumulative effects analysis must display past, present and reasonably foreseeable impacts from project activities. A mere listing is not sufficient.

Response: The section on cumulative impacts and wildlife species has been rewritten in the FEIS.

Comment: All riparian areas must be clearly displayed on a map.

Response: Riparian areas in the project area are generally narrow and associated with stream courses and other water bodies. We have no specific inventory of riparian area for the project area; however, using available GIS layers, we have displayed the area adjacent to stream channels and water bodies that will be protected via the design features and best management practices. Riparian areas are most likely contained within that buffer zone. A map has been added to Chapter 3.

Comment: How will the South Manti timber sale incorporate pollinator health into ecosystem planning and account for pollinator decline?

Response: Pollinator health is not addressed in this analysis. Since the treer are already dead, plus they are wind pollinated, there will be no adverse effect on pollinators.

Comment: A detailed monitoring program that guarantees BMP’s and mitigation measures will be implemented must be documented in the DEIS. It should include the responsible officials, implementation dates/seasons, exact mitigation protocol, etc.

Response: Best Management Practices and mitigation measures can be found in Appendix D - Project Design Features. (D-1, D-2).

Monitoring and Best Management Practices are discussed in Appendix D of the EIS. Each monitoring item (Appendix D-3) lists the monitoring objective, items to monitor, type of monitoring, monitoring parameters, frequency/duration of monitoring, reporting procedures, projected costs, and responsible officials. Each BMP (Appendix D-2) lists the soil and water objective, considerations for BMP’s, responsible persons, and the provision to include into the timber sale contract.

A monitoring item specifically to track the implementation and the effectiveness of Best Management Practices is in Appendix D-3. The monitoring and Best Management Practices listed in Appendix D will be implemented as part of the selected alternative.

Comment: It would be helpful if the DEIS could cite the mitigation measures that were implemented for the original 25 MMBP projects in the analysis area, and if they are effective.

Response: The EIS contains in Appendix D, Project Design Features and Best Management Practices, that are incorporated into all of the alternative alternatives. These features were carried forward from the original S. Manti EA and revise, to, meet current practices. Effectiveness monitoring is on-going and not completed.

1-x Comment: The EIS must demonstrate that funding is currently available to implement any proposed mitigation measures and show that funding is not contingent on KV funds or timber sale revenue from the proposed sale.

Response: It is not possible to demonstrate availability of funding for multiple year projects when Congress appropriates funding on an annual basis. However, required monitoring is reasonable given current and expected levels of funding.

COMMENTER: FRIENDS OF NIMPOPU PARKS

2 Comment: The sale would impact the imperiled northern goshawk, Utah's largest elk herd, several populations of the threatened Hellotrip Mite-Vetch. The use of helicopters without building roads is a cynical attempt to exploit loopholes in the chief's roadless policy. This goes against the chief's moratorium. There are not enough roadless areas. Keep them intact. Helicopter logging is not cost effective. No logging in roadless areas, no salvage logging, no logging period on the South Manti.

Response: The impacts to the Northern goshawk, the elk herd, and Hellotrip Celtis-mosaic have been disclosed in the analysis and BA/BE and chapter 4. The use of helicopter yarding is specifically addressed in the chief's roadless policy. Economics of helicopter logging is included in the analysis. The Washington Office was consulted to ensure that this proposal does not violate the roadless policy. Roadless character was deemed to be a significant issue and was used to develop alternatives. Consequently, effects to roadless character is included in the analysis.

COMMENTER: ERIC D. FAATZ

3-a Comment: I wonder if controlled burning of areas has really been given proper consideration.

Response: Controlled burning was considered in section 2.3 - Alternatives considered but not given detailed study.

3-b Comment: At least reconsider improving the Baseball Flats/White Mountain road and the Muddy/Mill Fork drainage roads if the "no action" alternative is not a possibility. I greatly fear that improving the above mentioned roads will cause overuse and abuse of open meadowland areas near access roads.

Response: Alternatives 2.3, 4. and 4 no longer call for improving the road across Baseball Flats for White Mountain access. This is because the Forest is managing roads under the Interm Rule (March 1, 1999) which temporarily suspends decision making on road construction and reconstruction in many unroaded areas. The FEIS lists road reconstruction on FDR #52333 (up Black Fork and towards Mill Fork) for alternatives 2, 3, and 4. Some segments are in poor condition and are contributing water quality degradation at unprotected crossings. Abuse of Forest lands is causing place each season as users make or lengthen roads and trails. The FSRs has an opportunity to close the north hali of this loop road, reducing the opportunity to make or lengthen roads and trails out the north half. The Forest intends to maintain the south segment of the 52333 road to accommodate high clearance vehicles, with expected rough and irregular driving surface (Maintenance Level 2, Traffic Surface Level D). Use of Forest Service lands for recreational purposes is not assigning whether the Forest keeps roads maintained (or improved) or not. Increase in use is likely to increase resource degradation. Direction from the Forest Plan is to provide safe and adequate transportation with a minimum of surface disturbance and to use Best Management Practices to maintain or improve water quality.
3-c  Comment: A related concern is whether the USFS will be able to enforce the closure of the timber access roads created while harvesting the timber.

Response: The concern with ATV abuse is shared by the Forest Service. While the Forest will continue to monitor areas and warn visitors or write tickets, Forest visitors can become active in promoting the "Tread Lightly" program in their communities and schools. Forest visitors can inform Forest Law Enforcement when resource damage is occurring, and can talk with others while recreating in the Forest about resource damage. Concerned citizens are encouraged to write to congress through their representative for additional funding for Forest Law Enforcement to assist in reducing off-road abuse. As for building roads off of Baseball Flat, the Forest does not plan to build roads there under any of the alternatives, as noted in the above response. The Baseball Flat road, outside of this project, is recommended for reconditioning, and obliteration of the parallel system. See the above response paragraph for discussion of the Muddy/Mill Fork drainage.

COMMENTER: ROCKY MOUNTAIN LOG HOMES

4-a  Comment: The executive summary reads as though Land stability, Soils, Water Resources, Vegetation Resources along with the majority of the remaining issues will be "impaired" by alternative 2-4, and not impacted if you do nothing under alternative one. This is clearly wrong. There has been ample empirical study of 1988 and 1994 fire seasons as resource managers, the effects of fire can be clearly enumerated on all the issues.

Response: We agree. Additional effects that were missed have now been included to the no action alternative.

4-b  Comment: The Washington office’s interim 1 march 1999 roadless interim directive should absolutely not apply for this EIS’ analyzed area. Consider: 1) your EIS is a state of the art document with a critical focus on this specific area. 2) there is full opportunity for public participation. 3) the quantifiable details in the document are referenced by the most current applicable research. 4) the environmental conditions present today on site comprise a socially unacceptable fire risk. 5) the affect of ...

Response: The interim directive does apply.

4-c  Comment: pg S-10, a spread from between 200 lbs to 4000 lbs of soil erosion per acre every year over the ground based logged areas. The suspect nature of that statement is thoroughly evidenced in the numbers. This statement is talking about the average for the entire area. Where did this number come from? There is a huge difference in displaced soil, and soil that is eroding. The details of water quality environmental consequences section certainly doesn’t draw the conclusion that erosion is going to occur.

Response: We agree. That section has been changed to better reflect the analysis in Chapter 4.

4-d  Comment: To say that the several different creatures listed as either threatened or endangered with habitat in the project area face "no effect" is simply in error. Under the "no action" alternative, a conscious management decision to do nothing would prevail, and as a consequence set the stage for a wildfire in the area. The resultant wildfire would, under the legal definitions of ESA threaten or harm creatures themselves or their habitat by the radical change fire would bring to the existing mixed conifer ...

Response: The section on fire has been reworked showing the likelihood of a potentially large, intense wildland fire. Harvesting (an action alternative) reduces the probability of a wildland fire which may impact Threatened and Endangered species or their habitat. The BA/BE discusses their associated habitat requirements and use of the area.

4-e  Comment: The intensity of any wildfire that develops is guaranteed to convert the green members of the "mixed conifer stand" into fuel, as well. The 70 tons per acre of fuel would equate to low plus 5 axle log trucks loads of spruce. Reviewing the project area, the 70 ton figure missed the additional 25-50 tons per acre of large woody material that is currently green.

Response: The tons per acre of fuel relate to dead and down woody material. It is true that in a wildland fire scenario that green trees will be burned.

4-f  Comment: In chapter four, Environmental Consequences, there is no acknowledgment of risk for sterilization due to fire, short or long term deterioration of water quality, or the degree of air particulate generated from a per acre wildfire burn. These risks are real, as they are consequences to project level wildfire. I believe that the conclusion within the EIS would have further dramatically led the public, local government agencies to understand the true magnitude of the cost of no, or little action.

Response: Several sections of Chapter 4 address your comments. The Fire, Soils, and Water sections have been revised. Based on fire behavior modeling, the extreme intensities which sterilize soil would not occur in treated areas and are unlikely in untreated areas. Burned area emergency rehabilitation needs are evaluated for wildfires larger than 300 acres; emergency watershed rehabilitation is not dependent on other funding sources or activities.

4-g  Comment: I must object to the discussion within the EIS for the need of logging restrictions due to big game hunting. There is no data or reference produced in the EIS to substantiate the inference that logging impairs hunting experience. Perhaps weekend log hauling, but not complete suspension of the project. Such an effort would cost thousands of dollars to a timber sale purchaser to remove and return logging equipment for the temptation to the 1% want that masquerades as a hunter.

Response: This part of the document has been changed. Logging operations could occur during the hunting season with the exception that hauling will not be permitted on the day before and opening weekends for the general rifle elk hunt and general rifle deer hunt. This change was done with input from the Utah Division of Wildlife Resources.

COMMENTER: SIERRA CLUB CALIFORNIA

5  Comment: Same as #2

COMMENTER: NATHAN WYETH

6  Comment: Same as #2
Hygnstrom et al. (1994) determined that the most effective and the least likely method to cause damage to wildlife is underground baiting. Using strychnine in an underground treatment presents minimal hazard to nontarget wildlife either by direct consumption of bait or by eating poisoned gophers.
22 Comment: Hundreds of jobs depend on the removal and utilization of dead trees from the South Manti area.

22-d Comment: It is morally wrong to waste a resource that has a limited economical and/or useful life. Alternative #1 would be nothing short of a callous disregard for the forest and our people.

22-e Comment: At least 40% of each dead tree off the South Manti must go into lower value products that do not justify the extremely high cost of helicopter yarding. We can afford some helicopter costs, but ground based yarding must be done on a majority of acreage to be economically feasible.

Response: The response to the above 5 comments are addressed into one response. An economic analysis and logging plans were developed for each alternative (see the economic analysis in Chapter 4 and the logging plans in Appendix E). Effects to the local economy and associated jobs were included in the analysis. Additional alternatives were considered that would better meet your objectives, but were dropped due to other resource considerations and/or economics. Tractor yarding was considered and utilized when access and terrain were not overriding factors.

COMMENTS: HUMANE SOCIETY OF UTAH

23-a Comment: I am concerned that the proposed strychnine gopher poisoning in reforestation areas would result in secondary poisoning to other target species, i.e. those that may utilize existing gopher borrows for housing or hunting. The only other species mentioned with respect to possible secondary impacts was the Golden eagle (p. 4-49).

Response: Same as 13-b. Also, refer to BA/BE in appendix J.

23-b Comment: What, if any, studies have been conducted with respect to the effects of frequent, low-level helicopter flights on forest wildlife?

Response: No formal studies on impacts of low-level helicopter flights on wildlife have been made in any of the recent timber sales in or near the project area. In the fall of 1999, observations by timber sales administrators of the helicopter logging was done in the Six-Mile Canyon area (adjacent to the project area), and deer were seen within the proximity of the operation (1/4 mile).

Prior to the helicopter hovering and lifting logs from the sale area, followers with chainsaws cut the trees down, then a ground crew is used to hook up the cut logs with choker chains. These activities would temporarily move most of the large mammal and bird species out of the area being cut. For economic reasons the helicopter logging is done in a small area, most generally the helicopter won’t haul logs more than 1 mile, so a small area is being impacted from the helicopter not the whole drainage. The helicopter operation is usually done in the fall due to the elevation (mostly above 3000 ft.) and the cooler temperatures that are needed for the helicopter to have adequate lift capabilities. This period of time is after breeding and parturition of wildlife species which would result in less impact to wildlife.

23-c Comment: I encourage you to select Alternative 4, as it has less impacts than the other associated action alternatives.

Response: Your support for Alternative 4 is noted.
<table>
<thead>
<tr>
<th>Commenter</th>
<th>Page</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>KELLY HUNT</td>
<td>35</td>
<td>Same as #22</td>
</tr>
<tr>
<td>SATTERWHITE LOG HOMES</td>
<td>36</td>
<td>Same as #22</td>
</tr>
<tr>
<td>WILLIAM D. JARVIS</td>
<td>37</td>
<td>Same as #22</td>
</tr>
<tr>
<td>JANE MASSEY</td>
<td>38</td>
<td>Same as #22</td>
</tr>
<tr>
<td>LAVOY MEADORUS</td>
<td>39</td>
<td>Same as #22</td>
</tr>
<tr>
<td>GENE COOPER</td>
<td>40</td>
<td>Same as #22</td>
</tr>
<tr>
<td>DBRYAN SAMPSON</td>
<td>41</td>
<td>Same as #22</td>
</tr>
<tr>
<td>DARREN HARKINS</td>
<td>42</td>
<td>Same as #22</td>
</tr>
<tr>
<td>SATTERWHITE LOG HOMES</td>
<td>43</td>
<td>Same as #22</td>
</tr>
<tr>
<td>SATTERWHITE LOG HOMES</td>
<td>44</td>
<td>Repeat of #43</td>
</tr>
<tr>
<td>SHON SPENCER</td>
<td>45</td>
<td>Same as #22</td>
</tr>
<tr>
<td>DAN MULLEN</td>
<td>46</td>
<td>Same as #22</td>
</tr>
<tr>
<td>JASON MECHAM</td>
<td>47</td>
<td>Same as #22</td>
</tr>
<tr>
<td>JOHN BRADY</td>
<td>48</td>
<td>Same as #22</td>
</tr>
<tr>
<td>JACK RUSSELL</td>
<td>49</td>
<td>Same as #22</td>
</tr>
<tr>
<td>KEITH STAM</td>
<td>50</td>
<td>Same as #22</td>
</tr>
<tr>
<td>KENT L. MYLROE</td>
<td>51</td>
<td>Same as #22</td>
</tr>
<tr>
<td>ARTHUR WESTON</td>
<td>52</td>
<td>Same as #22</td>
</tr>
<tr>
<td>DAVID M. LAMBERTSON</td>
<td>53</td>
<td>Same as #22</td>
</tr>
<tr>
<td>RAY CHRISCO</td>
<td>54</td>
<td>Same as #22</td>
</tr>
<tr>
<td>TERRY RUSSELL</td>
<td>55</td>
<td>Same as #22</td>
</tr>
<tr>
<td>WANNA-BEE LOGGING</td>
<td>56</td>
<td>Same as #22</td>
</tr>
</tbody>
</table>
COMMENTER: HARRISON GRATHWOHL

57 Comment: Same as #2

COMMENTER: SATTERWHITE LOG HOMES

58 Comment: Same as #22

COMMENTER: NORMAN J. HILL

59 Comment: Same as #22

COMMENTER: WASATCH TECHNOLOGIES CORPORATION

60 Comment: Same as #22

COMMENTER: LOUISIANA-PACIFIC CORPORATION

61 Comment: I support Alternative 2 for achieving management goals and because it represents the intent of the original proposal from February 1998. I concur that the proposed action meets the four emphasis areas objectives of 1) watershed health and restoration; 2) sustainable forest ecosystem management; 3) travel management objectives; and 4) improved recreation opportunities and experiences.

Response: Your support of Alternative 2 is noted.

COMMENTER: NANCY FAKRIEH

62 Comment: Same as #2

COMMENTER: DON ESTES

63 Comment: Same as #22

COMMENTER: ROBERT CHILDs

64 Comment: Same as #22

COMMENTER: A. J. FRANDSEN

65 - a Comment: One concern that is lacking in all this documentation that needs to be explained in the Final, is the legal basis of all this roadless issue and the "Interim Final Rule or the Final Interim Rule" and how it all relates to law. Does the administrative Forest Service policy take precedent over the laws of Congress. It seems the Chief's new direction on limiting road construction in roadless areas that were released, takes precedence over the direction of NFMA (existing Forest Plans) and the Utah Wilderness Act.

Response: The interim rule is temporary and will be in effect for 18 months or less.

65 - b Comment: While the stated Purpose and Need for this project is to address the ecological and economic values affected by spruce beetle activity on the South Manti (pg. a-3), this analysis does not recognize, the loss of revenue for the two year hiatus. Trees that were predicted to die in the earlier analysis did die.

Response: The Decision Notice for the South Manti Timber Salvage Sales Environmental Assessment was appealed and remanded back to the Forest for preparation of an Environmental Impact Statement. You are correct that induced jobs and income were not available from 1998 to the present time. An evaluation of whether a loss of product value occurred as trees died would be difficult to determine given the rising demand for house log specialty products during the same time period. Use of a lost-value figure for the purpose of illustrating the cost of an appeal procedural decision does not provide helpful information for assessing the current situation. Loss of product value is a moot point. Also, you are correct that the Engelmann Spruce bark beetle epidemic continued and caused increased tree mortality. That event is discussed in Chapter 3, Section 3.6 Vegetation Resource.

COMMENTER: GUNNISON IMPLEMENT CO.

66 Comment: Same as # 22

COMMENTER: EMERY COUNTY PUBLIC LANDS COUNCIL

67 - a Comment: What process was used to identify non project road and trails obliteration, and what funding will be used to restore to natural habitat.

Response: A Global Positioning System was used to survey nonsystem roads and trails in and around the project. This information was used to generate a Geographical Information System map which was combined with a system road and trail map and the project boundary. Nonsystem roads and trails outside the project boundary were identified for reclamation. The South Manti Salvage project will not have funds to accomplish this, because these nonsystem roads and trails are outside the scope of the project. Funds will have to come from annual appropriations as managers prioritize and establish funding for the task. The document acknowledges the existence of these nonsystem roads and trails, and identifies the need to reclaim them, as they are not needed for future management of Forest resources.

67 - b Comment: Provided typographic edits to document.

Response: Your edits have been incorporated.
COMMENTER: US ENVIRONMENTAL PROTECTION AGENCY REGION VIII

69 - a Comment: EPA is, however, concerned with any potential for impacts to those streams on the State of Utah's 303(d) list of waterways suffering from impaired use(s). EPA strongly recommends that the Forest Service identify and commit to mitigation that would reduce sediment yield to the 303(d) listed streams equal to or greater than the predicted sediment yield from project activities.

Response: The State of Utah's 303(d) list changed; the 2000 update includes Twelvemile Creek, but not the other stream segments or watersheds affected by the proposed activities. Total dissolved solids is the pollutant of concern; the priority for preparation of a TMDL is low and will be scheduled for some time after 2002. The projected sediment yield from project activities has been revised. The action alternatives still include road reclamation. The appropriate sections of Chapters 3 and 4 have been changed.

68 - b Comment: Road and trail reclamation may mitigate many of the environmental impacts of this project. Because of the potential benefits of reclamation to ecosystems in the project area, EPA would like to see budgetary condition taken off this portion (see attached "Specific Comments" for details).

Response: If the budget trends of the recent past can be used to predict a portion of the future, there should be funds available for decommissioning and for soil and water improvements. Rehabilitation of road segments not needed for the proposed harvest operations can proceed as soon as a NEPA decision document is approved and funding is available. This analysis

COMMENTER: STATE OF IDAHO DIVISION OF ENVIRONMENTAL QUALITY

69 - a Comment: In Section 3.2, it would be helpful to have a summary of the contents of the two cited documents: 1998 Memorandum of Understanding between the State Utah Air Conservation Committee and the Forest Service and the Manti- La Sal National Forest Smoke Management Guidelines for Prescribed Fires. ...It is difficult to understand how air quality impacts from the planned burns will be avoided or mitigated.

Response: The ways in which the State and Forest Service interact to manage prescribed fires have changed. The State's Smoke Management Plan is being final-ized by the participating agencies. Its provisions and permitting processes require the State Program Coordinator to consider project size and projected emissions, proximity to Class I and non-attainment areas, and weather conditions when issuing a burn permit and scheduling ignitions (including final go/no go decisions). The Program Coordinator would also be responsible for interstate coordination. The Smoke Management Plan is available on the internet at www.utahmip.net. The Regulatory Framework section of Chapter 3.2 has been revised and updated.

69 - b Comment: In Section 4.1 under Effects Common to All Alternatives, there should be a citation for the statement that "...air quality degradation has been modeled to be considerably greater than that of prescribed fire - up to six time as much."

Response: We agree. We could locate no reference for this statement and have deleted it from the document.
Commenter: Marilyn Danger
72 Comment: Same as #2

Commenter: Satterwhite Log Homes
73 Comment: Same as #22

Commenter: Kevin Sheehan
74 Comment: Same as #22

Commenter: Gunnison City Corporation
75 Comment: Same as #22

Commenter: Center for Biological Diversity
76-a Comment: Why is the Forest Service willing to potentially sacrifice wilderness eligibility to the altar of industrial logging?
Response: Evaluating this area for Wilderness eligibility is beyond the scope of this analysis. However, the potential consequences are disclosed in Chapter 4.
76-b Comment: The proposed action unnecessarily tests the boundaries of the agency's March 1, 1999 final rule which temporarily forbids road construction and reconstruction within most National Forest roadless areas. While the South Manti salvage sale arguably adheres to the letter of the roadless policy, it is obviously also a cynical attempt to exploit any possible loopholes and clearly run contrary to the purpose and spirit of the moratorium.
Response: The intention of the proposed action is to meet the purpose and need, and to stay within the limits of the interim rule. Alternatives have been developed that do not construct any roads within inventoried roadless areas. This will give the decision maker a full range of alternatives to consider. Also refer to 70-b.
76-c Comment: The proposed helicopter logging in roadless areas will be economically infeasible for all but the largest timber operators. Even LP expressed concerns in their scoping letter (Appendix B, p. B-12). Ecologically and economically, the South Manti salvage sale, especially the roadless area component, is infeasible.
Response: Economics have been evaluated in the DEIS (section 2.2, p. 2-5; section 3.14, p. 3-43 to 3-44; and section 4.13, p. 4-73 to 4-78) and have been reevaluated in the FEIS. The effects of implementation of each alternative have been analyzed and are available for review in the DEIS and the FEIS. Section 3.14 of the FEIS also discusses markets and where past sales have been sold or processed.

Comment: This type of analysis, or lack thereof, is insufficient for a series of proposed timber sales that may cut up to 460 million board feet of timber and construct or reconstruct over 15 miles of road, with much of this activity taking place on steep slopes with existing unstable soils. The FEIS should rectify this failure by including quantitative estimations of the amounts of soil which will be displaced by the various alternatives, the effects such displacement will have on the riparian areas and species within the project area and watersheds, and the cumulative effects of such actions.
Response: Much of the logging proposed in the action alternatives is helicopter-based; the associated ground disturbance and expected erosion is minimal. Tractor-based logging is limited to gentle slopes and stable terrain. The expected changes in ground cover are disclosed in Chapter 4. There is no road construction in Alternatives 3 and 4. Alternative 2 proposes 1.1 miles of new construction. In addition to improving trafficability, road reconstruction will resolve existing drainage and erosion problems in some areas. Chapter 4, Water Resources was revised to better display the results of sediment modeling and to better describe cumulative effects.

Comment: The dearth of information provided is similar to the water quality and aquatic habitats with respect to soils.
Response: Chapter 4, Water Resources was revised.

Comment: The DEIS focuses solely on the predicted decrease in stand replacing fire risk resulting from proposed logging activities. Scientific references for this prediction are not provided.
Response: Your comment has been addressed in Chapter 4 in the fuels/fire section.

Comment: No analysis is provided for the increased fire risk associated with the enormous quantities of slash that will be created by the proposed action.
Response: Your comment has been addressed in Chapter 4 in the fuels/fire section.

Comment: The FEIS must include quantified estimations and projections of the effect of this action on deer and elk herds (i.e. number of individuals lost over the short and long term).
Response: The timber salvage project that would occur if an action alternative is selected would occur in the summer range for deer and elk, no winter range is in the analysis area. Summer range is not the limiting factor for these species. An action alternative would allow logging on up to 4200 acres. Fragmentation of the project area has occurred naturally from the spruce bark beetle epidemic. 90% of the trees >11 inches are dead. Selection of an action alternative will allow for replanting of the logged areas with spruce seedling which will decrease forest fragmentation. The action alternatives calls for approximately 24 miles of roads, nonsystem roads and trails would be reclaimed. Any removal of dead spruce in recent adjacent salvage timber sales has been replanted with Engelmann spruce seedlings (approximately 350,000 in the past 3 years). Replanting will provide for hiding cover and foraging habitat for deer and elk. An action alternative will have a negative impact in the short term, while the logging is happening and until the new seedlings get established and are approximately 3-4 tall (approximately 15-20 years). In the long term an action alternative will be the most beneficial to deer and elk.

In the short term, a no action alternative will be least detrimental to big game, the dead trees will provide some hiding cover. However, in the long term when the dead spruce start...
to fall down (approximately 20-100) these areas will provide almost no hiding, thermal or foraging opportunities for big game, and up to 6,349 acres will be impacted. This area would be useless by most wildlife species until a destructive wildfire removes the down timber, which may cause soil sterilization and might also have a negative impact on wildlife.

A quantified estimate of the number of deer or elk mortality is difficult to make, however it can be surmised that the number would probably be very few for Alternatives 2 and 3, and less than that for Alternative 4. The positive effects of an action alternative far outweigh any possible mortality to these big game species.

76 - Comment:
No cumulative effects analysis for deer and elk is provided.

Response:
A cumulative effects analysis for wildlife has been completed and can be found in the FEIS.

76 - I Comment:
When were the surveys for goshawk conducted on the project area? Was all the suitable and potentially suitable habitat on the area surveys? Why does the FS assume that the action will have no discernible impact on the goshawk, as species well known to be adversely affected by logging and habitat fragmentation?

Response:
Goshawk surveys have been done on our forest regularly for the past 5-8 years. Some of the nests have been known since 1984. Information is collected on most of these nests each year such as is the territory active, a description of the area, photos, and reproductive success for the goshawk pair. Recent data about the goshawk nests and suitable habitat surveys for the area of interest can be found in the project file.

All suitable goshawk habitat in the area of interest was identified, mapped, and surveyed. Continued goshawk monitoring will be done in the future. The rational and determination about the impacts associated to the goshawk for various alternatives can be found in the Biological Evaluation found as part of the text of the FEIS and Executive summary.

A discussion of forest fragmentation and habitat connectivity especially as it relates to the goshawk can be found in comment #1.

76 - Comment:
The cumulative effects analysis is insufficient. While much of the DEIS purport to address cumulative effects, the discussion is limited to a mere listing of projects rather than a substantive analysis of the project’s effects on the various resources.

Response:
We generally agree with your statement. We have addressed this concern by revising the cumulative effects in the FEIS.

76 - I Comment:
With the exception of the no action alternative, all alternatives contemplate extensive timber harvesting, the little difference between acreage logged and board feet extracted. Such a pure emphasis on timber production fails to meet NEPA’s mandate to consider a reasonable range of alternatives.

Response:
In alternatives considered by not given detailed study in the DEIS, we considered 8 other alternatives that were identified, considered, and eliminated from detailed study for various reasons. We believe that having greater than a 12 MMBF difference in volume is significant.

76 - m Comment:
Many of the issues raised in our scoping letter were not adequately responded to, including roadless area concerns, ASQ issues, ecology of bark beetle, and scientific basis used to determine “dead and dying” trees.

Response:
We believe these concerns are adequately addressed. In particular, Alternative 4 was developed to address roadless and undeveloped character. Also page S-1, Overview of the Area, 3rd paragraph describes a dead and dying tree. The ecology of the bark beetle has been added to section 3.5.

COMMENTER: WESLEY H. ODELL

77 Comment:
I can’t believe you would act in direct contradiction to the expressed direction of Mike Dombek...

Response:
We are consistent with management direction, as we are responsive to the interim roads rule and the natural resources agenda.

COMMENTER: UTAH ENVIRONMENTAL CONGRESS

78 - a Comment:
The project fails to meet the stated Purpose and Need and violates both Forest Service direction and the Manti-La Sal National Forest Plan directives.

Response:
See responses to comments 2 and 76b.

78 - b Comment:
Logging should not occur in any roadless areas, as well as with steep slopes, erodable soils, and areas known to be susceptible to landslides. Land management activities should not be occurring in these areas which are more suitable for wildlife habitat and wilderness designation.

Response:
These effects are addressed in Chapter 4 of the FEIS. Wilderness designation is beyond the scope of this analysis.

78 - c Comment:
The project will denude high quality watersheds and possibly impact the Colorado River cutthroat introduction into Little Horse Creek. The Forest failed to conduct an appropriate sediment study, which is needed, if the Forest proceeds with this project.

Response:
Based on analyses in Chapter 4, the forested and formerly forested areas have 100% ground cover; helicopter logging reduces ground cover by 3-5%; ground-based logging by 15-20%; BMPs and design features will minimize surface erosion and sedimentation. SEDROUTE was used to assess sedimentation on a watershed scale; the projected increase for Little Horse Creek is 3.6%. Because Little Horse Creek is an important watershed, a site-specific plan will be developed for road realignment and reconstruction (depending on the alternative chosen).

78 - d Comment:
The project is estimated to lose approximately $4 million that will burden the American tax payer once again. The Manti-La Sal NF administers a below-cost timber program and should seriously consider eliminating the program in favor of a forest and road restoration program.

Response:
The DEIS does state a range of costs between $3 million and $5 million depending upon which alternative is reviewed. The economic modeling used in the FEIS will use a reasonable selling value rather than an appraised value. Use of a selling value would more accurately display what benefits may be received. Results of the revised economic analysis are found in Chapter 4, Section 4.13 Economics. Omission of the Forest’s timber
South Mantí Timber Salvage Final Environmental Impact Statement
Appendix B - Public Involvement

program is not an action considered in this analysis. Each of the action alternatives propose both Forest system roads and non-system roads to be reclaimed. In addition some Forest system roads will not be open to public travel. The number of road miles proposed for reclamation or restricted use are summarized in Chapter 2, Figure 2-13 Comparison of Alternatives by Issue without Final Interim Rule, Issue 4b, Transportation and Chapter 4, Section 4.8 Transportation.

78 - e Comment: The project failed to analyze the impacts and serious implications of helicopter logging on large mammals. Deer populations in the area are not being met, one of the largest elk herds in the state resides in the area, and black bears are denning within the project area. This issue needs to be fully addressed in the FEIS if the project proceeds.

Response: Same as 23-b.

COMMENTER: SOUTHERN UTAH WILDERNESS ALLIANCE

79 Comment: Repeat of letter # 71

COMMENTER: WILD UTAH FOREST CAMPAIGN

80 - a Comment: WUFC views the use of helicopters to log roadless areas without building roads as an attempt to exploit loopholes in the Chief’s final interim rule.

Response: The use of helicopter yarding is specifically addressed in the Chief’s final interim rule.

80 - b Comment: WUFC feels that the proposal to log 5 roadless areas, is in violation of the Chief’s current direction. The DEIS admits the physical and biological aspects of the roadless areas will directly change as a result of this project and this is not acceptable. We ask that you remove the roadless areas from the project and provide an alternative, besides the no action alternative, that does not log roadless areas.

Response: Alternative 4 addresses this, as it does not enter any of the inventoried roadless areas in the DEIS or FEIS.

80 - c Comment: The roadless areas within the project area boundary are source drinking water areas. For this reason, these roadless areas are in need of protection from extractive commercilly activity that is proposed.

Response: Entire watersheds, not just the roadless areas, are source areas for drinking water. This use was considered in the development of design features and BMPs.

80 - d Comment: By logging these roadless areas, they will no longer possess roadless character and they will be excluded from the revised roadless area evaluation and inventory for the Mantí-La Sal NF.

Response: Impacts to inventoried roadless areas were considered and disclosed in the FEIS, section 3.15 and sections 4.15 through 4.20. The potential effect you refer to was considered and disclosed.

Appendix B, Page 8-25

80 - e Comment: WUFC is concerned with the stability of the soils in the project area. Much of the project area is steeply sloped with shallow soils. The landslide potential of the treatment area is high.

Response: As discussed in Chapter 4, Land Stability, the cutting of dead and dying trees would not add to the already existing and natural land instability condition. The decreased evapotranspiration rate due to tree mortality is the greatest factor, other than geologic conditions, currently contributing to the instability issue. The only proposed activities that would decrease land stability are new road construction and reconstruction of existing roads in unstable areas. Table 4-2 shows the lengths of road construction and reconstruction in the "moderately unstable" and "unstable" zones for each alternative. Considering that the roads would be designed and constructed to minimize their effect on land stability, and the short distances of road involved, the risk is generally considered to be within acceptable limits for each of the action alternatives.

80 - f Comment: In our opinion, the amount of wood that has been taken from the forest annually, coupled with the amount to be taken in the next five years from past approved timber sales, and the amount of wood to be harvested in the South Mantí sale is in violation of LRMP and of NFMA. WUFC feels that the Mantí-La Sal should cut back on green tree sales to make up for this blatant disregard for the Forest Plan should require an EPS for a Forest Plan Amendment...

Response: Same as 1-g.

80 - g Comment: The cumulative environmental impacts of all of these sales must be addressed in the final EIS. The Mantí-La Sal NF is already fragmented from past forest management practices. How could this sale, in combination with others, not contribute to further forest fragmentation?

Response: The cumulative impacts of all sales are addressed in Chapter 4. We are not aware of how salvage operations will fragment forest. Fragmentation is also addressed in response 1-r.

80 - h Comment: On page 8 of the Mantí-La Sal LRMP Record of Decision (ROD) regarding timber production, the following statement is made:... We feel that by offering this below cost sale, the Mantí-La Sal is in violation of the direction in the LRMP. ... We ask that you provide an action alternative in the final DEIS that is more cost effective.

Response: Based upon current constraints, it is not practical to develop more cost effective alternatives that address the purpose and need. Also, see 1-r.

80 - i Comment: The DEIS fails to ensure the viability of TES species, and their habitat, as required by law. ...WUFC feels that none of these requirements are adequately addressed by the biological assessment (BA) for any of the TES identified in the DEIS.

Response: The viability of the Threatened and Endangered species found in the area of interest will not be compromised by the selection of an action alternative. The rational and determination of the effects have been made for each of the listed or proposed species and can be found in the Biological Assessment (Appendix J) in the FEIS. Note: American Peregrine Falcon has been delisted and is now considered a Sensitive species by the Forest Service.
Comment: We ask that you also address these requirements for your four management indicator species (MIS): mule deer; blue grouse; and golden eagle.

Response: The viability of the Management Indicator Species found in the area of interest will not be compromised by the selection of an action alternative. Most of these species are wide ranging over a variety of habitats, and only a small portion of the actual area is proposed for disturbance if an action alternative is selected. The effects on these species by the range of alternatives have been outlined in the FEIS.

Habitat and wildlife effectiveness will improve with the selection of an action alternative due to reforestation and road closure activities. These species are specifically addressed in Chapter 4.

Comment: How will the approximately 30 MMBF of Engelmann spruce proposed for logging affect the viability of the goshawk and its habitat? How will this be impacted by the millions of board feet of Engelmann spruce that have already been removed from the project area and the millions that are soon to be removed in sales that have already been approved? WUFSC feels that any decision on this project should be delayed until the management direction for northern goshawk is released.

Response: Same as 1d and 1r.

Comment: Threatened hellrotrope milk-vetch plant exists within the project area. WUFSC feels that the DEIS statement that there will be no effects on these plants is misleading. ... The cumulative impacts to the surrounding areas will disrupt this plant’s population.

Response: The Biological Assessment documents the reasons why a No Effect determination was made (see page J-10 of the DEIS).

Comment: WUFSC questions your mortality statistics for Engelmann spruce trees in the project area. We believe that the actual mortality percentages are much less than the DEIS claims. ... We would like to know how you came up with these statistics and we challenge their validity.

Response: Data used to develop Figure 3-9 (DEIS p. 3-18) was provided by Forest Health Protection (FHP) staff from information obtained during aerial surveys that have been conducted annually since 1981. Information displayed and referenced in Figure 3-12 (DEIS p. 3-20) was obtained using ground surveys conducted by Forest Health Protection staff. The survey used a systematic grid to locate temporary plots within sites affected by spruce beetle. Data collected from the plots determined the number of live and dead trees, tree species, tree diameter (> 5 inches), and cause of death for each sampled tree. This information has been summarized in the DEIS and FEIS. Field inventory data is available at the Forest Health Protection office in Ogden, Utah. The results of this spruce beetle impact assessment have been summarized in “Spruce Beetle, Dendroctonus rufipennis, Outbreak in Engelmann Spruce. Picea Engelmannii, in Central Utah, 1986-1998” by Alan D. Dykman, John Anhold, and Allan S. Munson. The Great Basin Naturalist has accepted this document for publication. The Journal article is scheduled for publication by the fall of 2000. This document is available in our project records.

Additionally, Marti-La Sai National Forest personnel have completed random post-treatment monitoring of harvested stands. Stands recently harvested under authority of the original decision now show similar mortality levels and provide information useful in validating projections used in the analysis regarding what project area stands would look like following the outbreak or stand treatments. This information is also available in the project records.

Comment: WUFSC is opposed to the proposal to construct approximately 2 miles of road in a Forest Plan inventoried roadless area (Hellrotope) and to leaving these 2 miles open as Forest Development Roads once the project is complete. This goes against the spirit and purpose of the final interim rule.

Response: For Clarification, it is 1.1 mile of constructed road, and the new construction will be closed to public access if selected. See response to 70-b for additional information.

Comment: We would like to see an alternative provided in the FEIS that will meet the purpose and need of the project without a commercial timber component.

Response: In Alternatives Considered but not given Detailed Study, alternatives without commercial timber were considered. They were determined to either be impractical or they did not meet the purpose and need. We were unable to develop such an alternative, and would have considered yours if you had submitted one that met the purpose and need of the project.

Comment: We disagree that this project could be a rapid solution to the degradation that has been occurring for at least a century. We question the ability of the project to rapidly reestablish an Engelmann spruce stands to a historical stratification pattern. We believe the Forest to be heading toward a climax successional stage within the historic range of variability and again question why a commercial timber sale is needed to meet the project’s objectives.

Response: We do not know where you got your information, as you have added statements to our purpose and need. The EIS does not relate to "historical stratification pattern". However, management objectives and goals for these forested areas are discussed in section 1.2 (DEIS, p. 1.5 to 1.8). As described, this proposal and analysis is consistent with the identified Purpose and Need that was developed through consideration of the goals and objectives defined by the current Forest Plan. The analysis displays how the alternatives meet these goals and objectives through identified evaluation criteria that have been addressed for each resource area or issue.

Rapidity of recovery is relative to the life expectancy of the vegetation of concern, the extent to which the area in question is deforested, and the availability of a dead source to reestablish the stand or area in question given specific management objectives. We consider reestablishing spruce within 10 years, as an integral component of stands destroyed by mortality to move them towards a more diverse and stable condition, as compared to 70 years or longer, to be a relatively rapid recovery when compared to a stand life expectancy of 200-300 years. This is of value for other resources and management objectives as well as those stands that have been identified for management under a Forest Plan Management Prescription of TBR. The relative benefits and/or consequences for each resource area or issue are displayed in Chapter 4 of the DEIS. Current conditions and rate of recovery are further addressed in the FEIS.

Comment: It is impossible to recover some of the economic value of the dead and dying trees. We feel that most of the timber companies able to do so will not bid on this sale. The wood is of poor quality and methods that must be used to achieve the wood are prohibitive... If the sale does receive bids, these bids will not be high enough to recover the costs of sales overhead. We question the ability of any of the actions alternatives to meet the purpose and need.

Response: The economic analysis modeling used in the FEIS will use a reasonable selling value rather than an appraised value to display benefits. The selling value was reached by...
reviewing the actual selling values of timber sales with a dead spruce component, tractor and helicopter yarding, and similar sale characteristics. Dead Engelmann spruce trees are experiencing an increasing demand for use as a house log specialty product. Some dead spruce from previously awarded timber sales on the Forest is being delivered to house log manufacturers in Saguache, Colorado and Stevensville, Montana. Yarding methods included both tractor and helicopter in those sales. Any proposed timber sales would be designed to make them economically viable for a prospective timber purchaser.

**COMMENTER: FOREST GUARDIANS**

81 - a Comment: The South Manti Timber Salvage project should be cancelled and replaced with a project that immediately addresses the need for watershed restoration without further damaging forest ecosystems through commercial logging. ...

Response: The effects analysis in Chapter 4 discloses environmental impacts of the alternatives.

81 - b Comment: The South Manti Timber Salvage project creates more social and economical harm than good, and has not been planned in a manner that maximizes net public benefits.

Response: Since no specific description is stated concerning what kind of harm may occur, or what improper planning is proposed, it is difficult to respond to the comment. Chapter 3, Section 3.1.4 Economics, references socioeconomic analysis of effects of timber harvest as being included in the Forest Plan Final Environmental Impact Statement as a source of analysis.

81 - c Comment: The South Manti Timber Salvage will jeopardize the viability of species that find optimum habitat in interior forests, natural disturbed areas, snags and old growth.

Response: Wildlife species that utilize interior forest and old growth already have lost this habitat due to the bark beetle outbreak resulting in thousands of acres of dead trees.

81 - d Comment: The South Manti Timber Salvage Project DEIS fails to quantify or meaningfully analyze in any manner the effects of habitat fragmentation. ...

Response: See 1 - f.

81 - e Comment: The DEIS does not address the effect of the South Manti Timber Salvage project on old growth spruce-fir. ...

Response: Old growth was not raised as a significant issue during the scoping and issue analysis. This proposal deals only with removal of dead and dying trees, not harvest of live, old growth trees or stands.

81 - f Comment: The DEIS provides virtually no analysis of the direct, cumulative effects of South Manti Salvage on water quality in the Muddy, Ferron, Sixmile, and Twedwemile watersheds. ...

Response: SEDROUTE, a locally developed sediment routing model was used to assess water quality on a watershed scale. The Water Quality section of Chapter 4 has been revised to better display the SEDROUTE results.

81 - g Comment: The removal of large amounts of biomass from the South Manti Timber Salvage area will deprive future stand recruitment of vital nutrients, minerals, and organic matter.

Response: The design features and BMPs require the leaving of 10-15 tons per acre of woody material in harvest units. This requirement is intended to maintain soil fertility, provide protected microsites for planted and natural tree regeneration, and to meet wildlife habitat requirements for several species.

**COMMENTER: T. ALEXANDER DENMARSH**

82 Comment: Same as #2 and comments to #80

**COMMENTER: STEVE BAUHS**

83 Comment: Same as #2

Response:

**COMMENTER: CATHY O'LEARY & JOHN CAREY**

84 Comment: Same as #2

**COMMENTER: RUTH HISWANDER**

85 Comment: Same as #2

**COMMENTER: SHIRLEY KUHN**

86 Comment: Same as #22

**COMMENTER: ROGER KUHN**

87 Comment: Same as #22

**COMMENTER: JAN CONLEY**

88 Comment: We would like to ask that you reconsider the South Manti timber sale and stay out of roadless areas.

Response: Impacts to roadless character was deemed to be a significant issue and was a basis for development of the alternatives. Alternative #4 stays out of all inventoried roadless areas and has been fully analyzed and considered.

**COMMENTER: WALLACE T. SHIVERDEEKER**

89 - a Comment: As brief as it is, 3.10 fails to discuss the impacts of grazing on the forest composition, the impacts to aspen regeneration, and how grazing has contributed to the predominance of conifer that is now resulting in insect problems the EIS is written for. The ecological context of grazing is totally avoided.

Response: This comment is outside the identified purpose and need of the document.
89 - b Comment: Secondly, the section on fire (3.7) fails to address the ecological role of fire and the dependence of these ecosystems on fire. This section should be re-written to reflect the fire ecology that has been disrupted by human activity over the last 150 years.

Response: Our analysis of fire has been adjusted in the FEIS in order to better display the relationship between the spruce-fir ecosystem, fire, and the alternatives that have been analyzed in response to the identified purpose and need.

89 - c Comment: Thirdly, there is no mention of the inter-regional conservation agreement for Arizona willow and the possibility that Arizona willow or its habitat is present within the project area.

Response: Page 4-37 of the DEIS states, "Arizona willow and its habitat are not found within the proposed treatment area. However, it does occur in riparian habitat adjacent to a Forest Development Road along the potential haul route. Project design features prohibit timber harvest within riparian zones. The project would have No Impact on this species or its habitat."

89 - d Comment: Neotropical migratory birds are mentioned, there is no species list for the area and no indication that the area has ever been surveyed to develop such a list. Since these birds are not all the same with the same habitat requirements, there should be more analysis to ensure that the terms and conditions of the Migratory Bird Treaty Act are not violated.

Response: A list of the wildlife species observed in the area of interest can be found in the project folder. While not all species can be examined and a determination as to the effect of the range of alternatives made, a determination has been made and documented for the Threatened, Endangered, and Sensitive wildlife species that are known to exist or have habitat in the area of interest.

89 - e Comment: It appears that the Forest should wait to complete this analysis until the final Roads Policy for the Forest Service comes out this fall. Failure to do so only adds to confusion.

Response: A roads analysis has been completed (project record) and the interim road rule has been applied.

COMMENTER: SOUTHEAST ASSOCIATION OF GOVERNMENTS

90 Comment: Good resource management and economic benefits center around revegetation rather than allowing the trees to rot or burn. Common sense tells us that good management continues with Alternative 2.

Response: Your support of Alternative 2 has been noted.

COMMENTER: WELEY H. ODELL

91 Comment: I am enclosing a copy of a Letter to the Editor which appeared in the July 27, 1999 issue of the Wall Street Journal. Although the subject of the letter is in a proposed National Park, it not in your National Forest. It is significant that this issue appears in the WSJ.

Response: Your comment has been noted.

COMMENTER: SANPETE COUNTY COURTHOUSE

92 Comment: We reaffirmed our support for the salvage of the beetle infested timber on the South Mant. The timber is a valuable resource for both the USDA, and the local timber companies.

Response: Your support has been noted.

COMMENTER: STATE OF UTAH DEPARTMENT OF NATURAL RESOURCES

93 - a Comment: I fully endorse these actions and recommend implementation as quickly as possible.

Response: Your support has been noted.

93 - b Comment: The accumulation of dead timber which follows a serious outbreak of spruce beetle is a substantial fire risk. That risk is unacceptable to the state of Utah. May I encourage you to take the proposed action to reduce this risk?

Response: Your support has been noted.

COMMENTER: UTAH DIVISION OF WILDLIFE RESOURCES

94 - a Comment: The development or regeneration of aspen stands on suitable sites within the project area.

Response: Aspen development and regeneration has been included in the DEIS. Section 3-6 (p. 3-16 to 3-25) provides information relative to the current response of aspen to the spruce beetle-induced tree mortality. Aspen has been included in stand modeling used to project stand growth and development over time, and salvage and post harvest treatments (slash disposal, site preparation for natural regeneration, and tree planting) are designed to emphasize the growth and development of aspen within those areas where it is present and will be encouraged (preferred) over spruce or subalpine fir. Appendix B of the DEIS, p. B-4 (response to comment 7-2), p. B-5 (response to comment 9-4), p. B-8 (response to comment 9-5), and p. B-9 (response to comment 9-22) provides additional information relative to aspen management in proposed treatment areas.

94 - b Comment: Minimize negative impacts, and possibly provide long-term benefits to wildlife through proper planning and design of specific timber harvests.

Response: When the impacts of different alternatives were analyzed, if there was a negative impact to wildlife identified, a design feature was developed to minimize or mitigate the impact. As this comment relates specifically to the South Mantle Timber Salvage analysis a number of design features have been put into the document which would provide long-term benefits to a variety of wildlife species. If an action alternative is selected, a number of design features will be put into the timber sale contract which will minimize impacts to wildlife from the logging operation.

94 - c Comment: Address specific species concerns, requirements, and safety issues.

Response: While not all species can be examined and a determination as to the effect of the range of alternatives can be made, a determination has been made and documented for the Threatened, Endangered, and Sensitive wildlife species that are known to exist or have habitat in the area of interest. This type of analysis was also done for Forest Management Indicator species. A number of design features have been put into the document which would provide long-term benefits to a variety of wildlife species. If an action alternative is
selected a number of design feature will be put into the harvesting contract which will minimize impacts to wildlife and address safety issues associated with the logging operation.

COMMENTS: CLAWSON CITY

95 -a Comment: The pine beetle is having a devastating effect on our forest. We are concerned not only for the loss of the trees and the beauty they provide, but also for the potential fire hazard and soil erosion that can occur.
Response: The effects of the potential fire hazard and soil erosion have been analyzed in the fire and soil sections of chapter 4. These effects will influence the selected alternative.

95 -b Comment: We don’t want to see restricted access to the forest.
Response: Your comment has been noted. A transportation analysis was completed which identifies access needs to manage National Forest resources. Existing nonsystem roads/trails will be restored to restore producton.

95 -c Comment: We strongly support the proper management of the forest. This includes relying on those trained and experienced in forest management and not on extreme ideas that have no scientific basis.
Response: Your support has been noted.

COMMENTS: FERRON CANAL AND RESERVOIR COMPANY

96 -a Comment: Same as 95 -a

96 -b Comment: Same as 95 -b

96 -c Comment: Same as 95 - c

COMMENTS: FERRON CITY MAYOR

97 -a Comment: Same as 95 - a

97 -b Comment: Same as 95 - b

97 -c Comment: Same as 95 - c

LIST OF AGENCIES, ORGANIZATIONS, AND INDIVIDUALS RECEIVING THIS DOCUMENT

The following parties, at a minimum, have been sent a copy of this Final Environmental Impact Statement.

AGENCIES

Policy & Planning Division, Office of Civil Rights
USDA, Dixie National Forest
Utah State Department of Natural Resources
USDA, Uinta National Forest
Utah State Division of Water Rights
USDA, Fishlake National Forest
Utah State Division of Water Quality
USDA, Bureau of Reclamation, Upper Colorado
Utah State Division of Wildlife Resources
USDA, Forest Service, Intermountain Regional Office
US Environmental Protection Agency
USDA, Fish and Wildlife Service
USDA, Ashley National Forest
USDI, Office of Environmental Affairs
USDA, Wasatch-Cache National Forest
USDA, National Ag. Library
US Environmental Protection Agency Region VIII

ORGANIZATIONS AND LOCAL GOVERNMENTS

Arizona Humane Society
Gunnsison Implement Co.
Center for Biological Diversity
Humane Society of Utah
Clawson City
Independent Forest Products Association
Emery County Public Lands Council
Louisiana-Pacific Corporation
Ferron City Mayor
Rocky Mountain Log Homes
Ferron City Mayor
Sanpete County Courthouse
Forest Guardians
Satterwhite Log Homes (5)
Forest Service Employees For Environmental Ethics
Schwabe, Williamson & Wyatt
Friends of Nipomo
Sierra Club California

AGENCIES

A.J. Frandsen
Allison Jones
Arthur Weston
Bob Pfister
Bruce Barton
Bryan Sampson
Carol Pinsky Bumathal
Cathy O’Leary & John Carey
Charles Lund
Cone Darel
Dan Mullen
Dan Steenber
Darren Harkins
David Cobb/Antz
David M. Lambertz
Debbie Anderson
Debra Davison
Dennis J. Moon
Don Estes
Douglas Wilkerson
Erik D. Faatz
Gay Colbert
Gene Cooper
Gina Bengtsc
H.R. Myers
Harrison Graithwohl
Holly Lin
Jack Russell
Jan Conley
Jane Massey
Janice Britton
Jason Mechem
Jeanne Dussex
John Brady
Keith Starn
Kelly Hunt
Ken Christiansen
Kent L. Myllase
Kevin Sheahan
LaNita Bowden
Lavory Meadonus
Marilyn Danger
Mark Noethen
Michael P. Berman
Nancy Fakrhe
Nathan Wyeth

INDIVIDUALS

Norman J. Hill
Paul Frischknecht
Ray Chisico
Ray Warrum
Robert Childs
Roger & Shirley Kuhn
Roger Barton
Ron Anderson
Ron Hamilton
Ruth Niewander
Sheldon Larson
Shon Spencer
Stephanie Cobb
Steve Bubs
T. Alexander Denmarsh
Terry Russell
Tim Cooper
Tom Rine
Wallace T. Shiwerdecker
Wesley George
Wesley H. Odeill
William D. Jarvis
APPENDIX C - FOREST PLAN DIRECTION

This appendix of Forest Plan direction is intended to provide the reader with the minimum parameters of Forest Plan direction (also referred to as standards and guidelines) under which any alternative selected for implementation would normally have to follow, if applicable. However, if Forestwide direction differs from direction for the Management Unit direction, the Management Unit direction takes precedence.

Forestwide direction and Management Unit direction may be amended if it is specifically addressed for a project and subsequently approved. No amendment are currently identified for implementation of any action alternative.

The following listing of Forest Plan Direction is divided into two main sections: I. Forestwide Management Direction and II. Management Unit Direction.

I. FORESTWIDE MANAGEMENT DIRECTION

The following are excerpts of the Forestwide general direction from the Manti-La Sal National Forest's Forest Plan. This list reflects an itemization of all the Forestwide direction, as indicated by resource topic and numbering. Direction not pertinent to the nature of this project are identified as "Not Applicable" and are not itemized in this listing. To reduce the length of this appendix, additional explanations included in the Forest Plan are omitted here.

Cultural Resource Management
01 Protect, find an adaptive use for, and or interpret cultural and paleontologic resources on National Forest System lands which are listed on the National Register of Historical Places or the National Register of Historical Landmarks, or may be determined to be eligible for the national register (p. III-16).
02 Nominate or recommend cultural or paleontological sites to the National Register of Historic Places or National Natural Landmarks (p. III-16).
03 Protect and foster public use and enjoyment of cultural and paleontological resources (p. III-16).
04 Use a predictive model to determine areas of high and low potential for cultural resources. Design site-specific survey requirements in various areas on the basis of the predictive model, after appropriate review and approval (p. III-16).

Visual Resource Management
01 Forest resource uses or activities should meet the adopted Visual Quality Objective (VQO) as displayed on the Planned VQO Map (p. III-17).
02 Design and implement management activities to blend with the natural landscape (p. III-17).
03 Rehabilitate existing projects and areas which do not meet the adopted Visual Quality Objectives specified for each management unit (p. III-17).
04 Achieve landscape enhancement through addition, deletion or alteration of landscape elements (p. III-17).

Management of Developed Recreation Sites
01 Manage sites identified for developed recreation under the Developed Recreation Site (DRS) Management Unit (p. III-17).

Dispersed Recreation Management
01 Describe, as appropriate, high interest or unique geological, paleontological, biological, archeological, or historical features for public information and, as appropriate, develop interpretive information for these sites (p. III-17).
02 Provide opportunities for roaded natural appearing, semiprimitive motorized, and semiprimitive nonmotorized recreation uses (p. III-18).
03 Classify areas as to whether vehicular travel use is restricted (p. III-18).
04 Restrict use and/or rehabilitate dispersed sites where unacceptable environmental damage is occurring (p. II-18).

05 Limit camping near lakes and streams or in watersheds as necessary to protect riparian and aquatic ecosystems and to maintain the quality of the recreation experience (p. II-18).

06 Preclude camping in undeveloped sites within one quarter mile of developed fee sites, where it is inappropriate (p. II-18).

07 Manage dispersed recreation activities and use of trails in dispersed areas to not exceed the established PAOT/acres or site or trail capacity (p. II-18).

Recreation Management (Private and Public Sector)

Not Applicable (p. III-19).

Wilderness Area Management

Not Applicable (p. III-19).

Wildlife and Fish Resource Management

01 Provide habitat needs, as appropriate, for management indicator species (p. III-19).

02 Manage habitat for recovery of endangered and threatened species (p. III-21).

03 Implement activities to meet the Forest's share of approved recovery plans (p. III-21).

04 Manage habitat of sensitive species to keep them from becoming threatened or endangered (p. III-21).

05 Maintain and/or improve habitat and habitat diversity for minimum viable populations of existing vertebrate wildlife species (p. III-22).

06 Provide for habitat needs of cavity nesting birds, raptors, and small animals (p. III-22).

07 Manage down timber to provide habitat for wildlife (p. III-22).

08 Manage waters capable of supporting self-sustaining fish populations to provide for populations (p. III-22).

Wildlife Habitat Improvement and Maintenance

01 Maintain or improve habitat capability through direct treatment of vegetation, soil, and/or water (p. III-23).

02 Manage non-commercial aspen stands in mixed age groups to provide a source of forage (p. III-23).

03 Give wildlife funding priority to habitat improvement projects which are jointly or cooperatively funded with the states (p. III-23).

04 Use both commercial and non-commercial silvicultural practices to accomplish habitat objectives (p. III-23).

05 Maintain a medium to high edge contrast between tree stands created by even-aged management (p. III-23).

06 Provide for conservation pools, and as appropriate, recreation facilities to meet resource protection needs in projects for new reservoir construction or reconstruction of existing reservoirs (p. III-23).

Wildlife and Fish Cooperation with Other Agencies

Not Applicable (p. III-23 to p. III-24).

Range Resource Management

01 Within the rangeland capability, provide forage to sustain the dependent livestock industry (p. III-24).

02 Manage the range resource within its productive capabilities for grazing and browsing animals in harmony with other resources and activities to provide sustained yield and improvement of the forage resource. Encourage and coordinate other resource activities so as to maintain or enhance forage production (p. III-24).

03 Manage livestock and wild herbivores forage use by implementing proper use criteria as established in the Allotment Management Plan (p. III-24).

Range Improvement and Maintenance

01 Provide structural and non-structural range improvements needed to maintain or improve range conditions as specified in allotment management plans (p. III-24).

02 Perpetuate non-commercial aspen communities as a forage source (p. III-24).

03 Control and reduce noxious weeds and poisonous plants (p. III-25).

Timber Resource Management

01 Manage timberlands suitable for commercial harvest for timber or wood fiber production (p. III-25).

02 Provide for timber stand improvement, reforestation in sale area improvement plans, and wildlife habitat improvement (p. III-25).

03 Manage timberlands not suitable for commercial harvest to maintain forest cover species, but emphasis should be on production of other forest resources and uses (p. III-25).

04 Require those authorized to conduct activities to replace losses through appropriate mitigations where a site-specific development adversely affects long-term production or management (p. III-25).

05 Use clearcuts as appropriate on any forest cover type with potential for impact, or impacted by insects or disease (p. III-25).

06 Coordinate timber and fuelwood programs to take advantage of roads constructed for other resource development or use (p. III-25).

07 Assure that even-aged conifer stands scheduled to be harvested during the planning period will generally have reached the culmination of mean annual increment of growth (p. III-26).

08 Make Christmas trees available in areas where Christmas tree culture or other resource objectives can be accomplished through commercial or personal use Christmas tree sales (p. III-26).

Silvicultural Prescriptions

01 Combine appropriate management activities for the timber type to provide the acceptable range of management intensity for timber production (p. III-26).

02 Silvicultural treatments will normally begin after the stand density index reaches the lower management level and will be completed prior to reaching the upper management level (p. III-27).

03 Manage timber product removal and utilization to meet Forest multiple use requirements (p. III-28).

04 [There is no number 04 for Silvicultural Prescriptions.]

05 Perpetuate aspen communities through silvicultural treatments (p. III-29).

Reforestation

01 Establish a satisfactory stand on cut over areas, emphasizing natural regeneration within five years after final harvest (p. III-29).

02 Do not apply final shelterwood removal cut until the desired number (as specified in minimum stocking standards) of well-established seedling/acres are expected to remain following overwood removal (p. III-30).
In the best genetic quality available which are adapted to the planting site (p. III-30).

**Water Quality Management**
01 Improve or maintain water quality (p. III-30).
02 Implement best management practices relative to water quality in all resource activities (p. III-30).

**Municipal Watershed Management**
01 Manage municipal watersheds for multiple-use with mitigation measures to protect the water supply for intended purposes. Allow projects when the proposed mitigation measures provide adequate protection (p. III-31).

**Riparian, Floodplain and Wetlands Management**
01 Prior to implementation of project activities, delineate and evaluate riparian areas and or wetlands that may be impacted (p. III-31).
02 Give preferential consideration to riparian area dependent resources in cases of unresolved resource conflicts (p. III-31).
03 Floodplains should be identified and, as appropriate, a risk/hazard analysis performed for project sites where long-term occupancy is proposed (p. III-31).
04 Protect present and necessary future facilities that cannot be located out of the 100-year floodplain by structural mitigation (p. III-31).

**Soil and Water Resource Inventories**
01 Complete appropriate order of soil and water resource inventories to provide data for Forest activities and uses (p. III-31).
02 Protect snow courses from site modification (p. III-31).

**Soil and Water Resource Management**
01 Maintain or improve soil productivity and watershed qualities within the ecological site capabilities (p. III-31).
02 Minimize adverse, man-caused impacts to the soil resource including accelerated erosion, compaction, contamination, and displacement (p. III-32).

**Soil and Water Resource Improvements**
01 Rehabilitate disturbed areas, where feasible, that are eroding excessively and/or contributing significant sediment to perennial streams (p. III-32).
02 Maintain completed watershed improvement projects until project objectives have been obtained (p. III-32).
03 Identify, prescribe, and implement appropriate action before, during, and after landslide and/or flood events (p. III-32).

**Water Yield Improvements**
01 Pursue water yield augmentation when and where research has shown that it is economically and environmentally sound. During the interim, water yield increases will be incidental to other management projects (p. III-32).
02 Analyze the manipulation of forest types, when significant projects are proposed by other activities, for water yield benefits and impacts (p. III-33).

**Water Uses Management**
01 Secure favorable flows of water (p. III-33).

**Soil and Water Resource Improvement Maintenance**
01 Provide for maintenance of soil and water resource improvement projects to meet objectives (p. III-34).

**Geologic Resources Management**
01 Complete appropriate order of geologic inventory and as appropriate geotechnical investigation (p. III-34).
02 Monitor identified geologic hazards for effects on management activities (p. III-34).
03 Describe, as appropriate, high interest or unique geological, paleontological, biological, archeological, or historical features for public information and, as appropriate, develop interpretive information for these sites (p. III-34).
04 Assure that appropriate geotechnical and/or geologic data are included in design and construction of facilities, or other developments so as to minimize the potential of induced failure (p. III-34).

**Minerals Management, General**
Not Applicable (p. III-34 to p. III-35).

**Mining Law Compliance and Administration**
Not Applicable (p. III-35).

**Minerals Management, Leasables**
Not Applicable (p. III-35 to p. III-36).

**Minerals Management, Salesables**
Not Applicable (p. III-36).

**Special Use Management (Non-Recreation)**
Not Applicable (p. III-37).

**Right-of-Way and Land Adjustments**
Not Applicable (p. III-37 to p. III-38).

**Withdrawals, Modifications and Revocations**
Not Applicable (III-39).

**Property Boundary Location**
Not Applicable (III-39).

**Transportation System Management**
01 Close newly constructed intermittent local roads to the public after initial intended use is completed when:
A. The establishment of public use is undesirable,
B. The road is unsafe for public travel,
C. Management direction has previously been established to close the road (p. III-39).
02 Allow commercial or permitted use on Forest Development Roads under the following conditions:
A. Use is compatible with existing road standards, designs and public safety and user provides commensurate share of road maintenance.
B. User reconstructs the road to incorporate both existing uses and proposed traffic and provides commensurate share of road maintenance.
C. If the road meets design standards but the combined use does not fulfill public safety requirements due to volume of traffic, the road may be administratively managed to control conflicting traffic, unsafe conditions or traffic flows (p. III-39 to p. III-40).

03 Encourage the development of Forest Development Roads, when constructed or reconstructed for special purposes to meet existing and potential all purpose needs (p. III-40).

04 Put roads under special-use permit or easement that are needed for the benefit of private uses, and are not needed for public travel or the administration of Forest resource (p. III-40).

05 Consider turning existing Forest Development Roads over to county or State jurisdiction in specific circumstances (p. III-40).

06 Close Forest Development Roads when unacceptable environmental or road damage is occurring as a result of road use (p. III-40).

07 Where possible, establish cost and commensurate share agreements for access roads constructed for other resource uses (p. III-40).

08 Coordinate transportation planning for Forest Development Roads with Forest Trails to provide continuity and fulfill Forest transportation needs (p. III-40).

Arterial and Collector Road Construction and Reconstruction
01 Construct and reconstruct arterial and collector roads to meet multiple resource needs and specified standards (p. III-41).

Local Road Construction and Reconstruction
01 Construct and reconstruct local roads to provide access for specific resource activities such as campgrounds, trailsheads, timber sales, range allotments, leases, etc., with the minimum amount surface disturbance and fitting the road to the topography (p. III-41).

02 Construct temporary roads for specific resource activities such as timber sales, emergencies, (e.g., fire suppression), or mineral exploration (p. III-41).

Road Maintenance
01 Maintain roads to minimum requirements (p. III-42).

02 Maintain structures, bridges, culverts, etc., to be structurally sound and safe for use (p. III-42).

Trail System Management
01 Maintain trails for designated uses and close trails to inappropriate uses (p. III-42).

02 Provide a full range of trail opportunities (p. III-42).

Trail construction and Reconstruction
01 Construct or reconstruct trails when needed as part of the transportation system (p. III-42).

Facility Construction, Reconstruction and Maintenance
Not Applicable (III-42).

II. MANAGEMENT UNIT DIRECTION

Management Unit direction is supplemental direction specific to specified areas. Management Unit direction supersedes Forestwide general direction for the applicable area.

There are six Management Units within the project area: Range Forage Production, Wood Fiber Production and Utilization, Riparian Management Unit, Undeveloped Motorized Recreation Sites, Developed Recreation Sites, and Watershed Protection and Improvement.

Since the majority of the project area (98%) is in the Range and Forage Production Management Unit (77%) and the Wood Fiber Production and Utilization Management Unit (21%), the following excerpts are the Management Unit direction for these areas. This list reflects an itemization of all the direction for these management units, as indicated by resource topic and numbering. To reduce the length of this appendix, additional explanations included in the Forest Plan are omitted here.

RANGE FORAGE PRODUCTION MANAGEMENT UNIT DIRECTION

Dispersed Recreation Management
01 Semi-primitive nonmotorized, semi-primitive motorized, roaded natural and rural recreation opportunities may be provided (p. III-65).

02 Temporarily closed dispersed area camping sites to recreation use where resource damage is occurring or management of livestock is seriously impaired (p. III-65).

Wildlife and Fish Resource Management
01 Balance wildlife use with grazing capacities and habitat (p. III-65).
Range Resource Management
01 Improve or maintain range condition to fair or better (p. III-65).
02 Balance livestock obligations and use with grazing capacities (p. III-65).

Timber Resource Management
01 Maintain and manage non-commercial forested inclusions to provide a high level of forage production, wildlife habitat, and diversity (p. III-65).
02 Use mechanical, chemical, or prescribed fire to alter timber stands and increase herbaceous yield or cover in areas where harvest methods are impractical or demand does not exist (p. III-65).
03 Manage aspen stands or mixed fir and fbalanced stands to the appropriate ecological stage that provides high herbaceous yield and cover (p. III-65).

Mineral Management General
01 Provide appropriate mitigation measures to assure continued livestock access and use (p. III-66).
02 Those authorized to conduct developments will be required to replace losses through appropriate mitigations, where a site-specific development adversely affects long-term production or management (p. III-66).

WOOD FIBER PRODUCTION AND UTILIZATION MANAGEMENT UNIT DIRECTION

Dispersed Recreation Management
01 Semiprimitive nonmotorized, semiprimitive motorized, roaded natural and rural recreation opportunities may be provided (p. III-68).
02 Prohibit recreation use (including snowmobiles, vehicular travel, cross-country skiing etc.) where needed to protect forest plantations (p. III-68).

Range Improvement and Maintenance
01 Protect regeneration from unacceptable livestock damage (p. III-68).
02 Utilize transitory forage that is available where demand exists, and where investments in regeneration can be protected (p. III-68).

Transportation System Management
01 Locate, design and construct the minimum Forest Development Road necessary to provide a stable road base to serve short- and long-term timber needs, under the timber sale program (p. III-68).
02 To the extent possible, give emphasis to and coordinate road locations for timber sales that will benefit future fuelwood sales and other timber activities (p. III-68).

Initial Attack and Fire Suppression
01 Control wildfires in Engelmann spruce types and in young ponderosa pine stands (p. III-68).
APPENDIX D - PROJECT DESIGN FEATURES

This appendix has three parts: D-1 (Project Design Features by Issue); D-2 (Best Management Practices); and D-3 (Monitoring).

D-1 PROJECT DESIGN FEATURES BY ISSUE

All action alternatives include design features that would better implement the project. All applicable Forestwide and Management Unit direction identified in the Forest Plan are hereby incorporated by reference unless otherwise stated. The following project design features are listed by issue topic.

Features Responsive to Issue #1 - Air Quality
- Follow the procedures and requirements in the State of Utah Smoke Management Plan.
- Use techniques to minimize smoke production and impacts from prescribed burning:
  - Follow the procedures and requirements in the State Smoke Management Plan.
  - Follow guidance in Manti-La Sal National Forest Smoke Management Guideline for Prescribed Fire.
  - Burn when conditions are good for rapid dispersion.
  - Burn under favorable moisture conditions.
  - Keep soil out of burn piles.
- Notify area residents and users of activity.

Features Responsive to Issue #2 - Land Stability
- Complete appropriate geologic inventory and geotechnical investigations. (FP, III-34)
- Appropriate geotechnical and/or geologic data are included in project design. (FP, III-34)
- Confine operations to dry conditions or wintertime; typically the dry field season is July 1st to October 1st.
- Do not locate log decks at the heads of existing landslide areas.
- Avoid, where practical, road construction/reconstruction and staging areas on lands classified unstable or moderately unstable, slopes greater than 40 percent, and existing slides. Where avoidance is not practicable, locate and design facilities to minimize landslide risk (changes to topographic and drainage conditions).

Features Responsive to Issue #3 - Soil Erosion and Productivity
- Take measures to revegetate disturbed sites within one season after termination of the activity. Add mulch, fertilizer, and other soil amendments as necessary (FP, III-32).
- Confine operations to dry or frozen conditions. The usual dry field operating season is July 1st through October 1st, however, summer storms can temporarily change soil moisture conditions. Generally, soils are too wet when equipment creates six inch ruts. Roads are too wet when ruts are 2 inches deep on aggregate surfaced roads and 3 inches deep for native surfaced roads.
• Maintain 10 to 15 tons per acre of woody debris in harvest units to maintain soil productivity. Use C(T)6.7a - Slash Disposal to assure retention of large woody material (material greater than 3 inches in diameter). Materials should be evenly distributed over the area. At least 25 percent of the material should be greater than ten inches in diameter. It is desirable to have the materials in varying degrees of decomposition.

• Apply Best Management Practices (identified in Part D-2) to all road construction and timber sale activities.

• Rip areas having severe compaction after use to a depth of 8-12 inches, scarify other compacted areas to a depth of 2-4 inches to prepare a seed bed.

• Prescribed burning would be conducted so as to not adversely impact the soil resource (i.e. manage fire intensity to obtain desired results).

Features Responsive to Issue #4 - Water Resources

Quality

• Apply Best Management Practices, as identified in Part D-2, to assure compliance with applicable water quality protection regulations.

• Place logging slash and large woody debris on skid trails following harvest.

• Prior to preparation of the timber sale contract, a Hydrologist and Presale Forestier will visit the sale and prescribe site specific Soil and Water Conservation Practices that will be included in each sale contract.

• Stabilize and reseed helicopter landing areas when management activities have finished.

Riparian/Wetlands/Floodplains

• No harvesting or mechanical entry (e.g. skidding, landings) will be permitted within 100 feet of each perennial stream bank, seep, lake, reservoir, or wetland, unless otherwise agreed to by the hydrologist or fisheries biologist. Rehabilitation of any damage is required.

• Except where crossing are agreed to, protect intermittent streams with no harvest within 35 feet, and no mechanical entry (e.g. skidding) within 50 feet. Landings will not be located in this buffer area.

• Where roads must cross the perennial or intermittent streams, they will cross as nearly perpendicular to the riparian area as practicable. No more than 200 feet of road side ditch will lead into perennial or intermittent stream channels.

• Maintenance of existing roads in wetlands will be accomplished in accordance with Best Management Practices. Construction or reconstruction of roads through wetlands will use the guidelines in Managing Roads for Wet Meadow Ecosystem Recovery (USDA-FS, 1996) or other best available technologies.

• Petroleum products and other hazardous materials will be stored in upland locations and no closer than 200 feet from a perennial or intermittent stream channel, wetland, or riparian area.

Aquatic Habitat

• Macroinvertebrates: The diversity index DAT (DAT combines measurements of the number of taxa and biomass as an indication of diversity) will be maintained at or above 11, the standing crop at or above 1.6, and the biotic condition index at or above 75 (F/P, Ill-20). One station for sampling is at the mouth of Duck Fork Creek (established in 1995). Monitoring of this station is part of Forest-level monitoring. If DAT and Standing C, p and biotic conditions fall below set levels then evaluation of cause of sediment source would be done and corrective measures taken as soon as possible.

Features Responsive to Issue #5 - Vegetation Resource

Forest Health, Diversity, and Productivity

• Live Engelmann spruce and subalpine fir trees plus dead Douglas-fir and Subalpine Fir trees: would not be harvested.

• Timber Sale Contracts will be developed using the Intermountain Region's approved C(T) provisions for 2400-6(T) contracts and Special Provisions for 2400-3(T) contracts. Other contracts or permits that may be used are the Forest Product Contract (2400-4), Forest Product Permit (2400-14), fuelwood permit (2400-8), and administrative use permit.

• Locations for temporary roads, log landings, and skid trails would be approved as specified in the Timber Sale Contract provisions. Generally, log landings for ground-based operations would be located along harvest access roads every 1/8th to 1/4th mile. Log landing and decking areas would likely be less than 1/2 acre in size for ground-based yarding areas and less than 2 acres in size for helicopter yarding units.

• Special Provisions C(T)6.41 - Felling And Bucking, C(T)6.41a - Felling and Bucking (Special Objectives), and C(T)6.42 - Skidding and Yarding (Special Objectives) would be included in the Timber Sale Contract to provide protection measures for live residual tree stands.

• Special operation instructions to close and stabilize temporary work roads, skid trails, and landings will be listed in the following C(T) provisions.

C(T)5.444 - Obliteration of Temporary Roads. This provision would require the timber purchaser to restore the temporary road to original contour. This work includes ripping the surface for seeding, pulling material from the fill slope and brow of the cut slope on the running surface of the road, removal of drainage structures, and placing slash, stumps, or cul logs on the road surface.

C(T)5.458 - Closure of Permanent Roads. This provision would be used when there is a need for some type of closure beyond what is called for in BT 6.62 - Temporary Roads.

C(T)6.5a - Erosion Prevention and Control. The provision provides direction for temporary road location and width, skid trail location, maintenance of culverts and drainage structures, and requires erosion control work to be current with operations and in any case no later than 15 days after completion of skidding on each payment unit.

C(T)6.601# - Erosion Control Seeding. This provision provides for seeding and fertilizing all exposed areas of raw soil as designated by the Forest Service on skid trails, landings, firebreaks, slides, stumps, temporary roads and traveled ways of specified roads.

C(T)6.602# Protection of Disturbed Areas from Establishment of Noxious Weeds. This provision would be used when there is an identified need to establish a vegetative cover to minimize the establishment and growth of noxious weeds.
C(TI6.7#: Slash Disposal
1. This provision requires a timber purchaser to machine pile landings, log limbs and tops (to a 3 inch Dia (Diameter Inside Bark)), and top and scatter logging slash through all cutting units so slash depths are no more than 24 inches high.
2. Other C(TI6.7# slash disposal requirements will be implemented as required to meet individual stand or road construction conditions or needs, and will be prescribed by a Silviculturist or Engineer (i.e. hand or machine fireline construction, fuelbreak construction, hand pile slash, dozer piling, felling damaged residual trees, yarding tops, limb and top removal, yarding un-utilized material, slash throwback, purchaser pile and burn, scattering slash away from leave trees that are 8 inches DBH (Diameter Breast Height) and large. Tractor yarded units shall be whole tree harvest with cut material to be left in order to meet soil, water, and wildlife requirements.

C(TI6.72#: Temporary Road Construction Slash Disposal. This provision describes slash treatment methods for slash created from temporary road development.

• No firewood gathering in harvest areas during contract operations.
• Include C(TI6.25# Protection of Habitat of Endangered Species.
• C(TI6.24#: Protect Cultural Resources.
• Silvicultural release and weed activities will be implemented after harvest in units to improve stand health, promote diameter and crown growth and development, improve species diversity and distribution, reduce encroachment of less desirable species on desirable species (aspen, Engelmann spruce, Douglas-fir, and limber pine), and meet short and long-term resource objectives.
• Reforestation activities will be prescribed and monitored by a Silviculturist
• Reforestation of harvest areas will be accomplished by natural regeneration, or by hand planting bareroot seedlings or containerized seedlings grown from seed collected from appropriate seed sources. Site preparation tools for reforestation activities may include machine scarification, hand scarification, and prescribed fire.
• Where aspen occurs within the harvest areas, reforestation measures would favor aspen regeneration through sprouting. Spruce seedlings would not be planted within the fringe area around existing aspen clones. The width of the fringe area should not exceed the height of the dominant aspen trees in the clone or 2/3 the height of the surrounding conifer trees. If aspen sprouting does not naturally occur where expected after harvest, mechanical preparation or prescribed fire may be used as part of post-harvest treatment of slash to further stimulate sprouting.
• 10 to 15 tons per acre of large (>3") woody debris will be maintained on site to protect soil productivity and to provide microsite protection for seedling establishment and protection.
• Where site conditions allow, reforestation stocking objectives will meet or exceed Forest Plan stocking standards (FP, III-27).
• Reforestation (plantation) investments will be protected. FSH 2409.26b (C(TI6.04-Responsibility) states that "A decision to regenerate any vegetation manipulation project is also a decision to protect the investment." In accordance with this, potential plantations will be reviewed by a Silviculturist. After coordination with appropriate range or wildlife management personnel, prescriptions will be implemented which provide appropriate protection of investments. Plantation protection and/or monitoring activities will continue until stated silvicultural objectives are met (FSH 2409.26b, C(TI6.31 - Protection).

- Appropriate protection activities may include exclusion of livestock from plantations through fencing or allotment administration (rest rotation, closure, herding practices, or salt placement), and underground strychnine baiting of burrows in and around planted areas to reduce pocket gopher populations.
- Treatment of gophers will occur only where needed using underground treatment methods. Control measures may be applied when 25 to 35 percent of a 2-year old plantation contains active gopher mounds or when 40 to 50 percent of a 3 to 5 year old plantation contains active gopher mounds (The Northern Pocket Gopher, Ronald E. Bonar, Wallowa-Whitman National Forest, August 1995). During the first, third, and fifth year stocking survey the plantations will be visually assessed for gopher activity. If this survey identifies sufficient amounts of gopher activities or damage to seedings then a formal gopher survey will be performed and appropriate action will be taken.
- Plan post-harvest projects in the Sale Area Improvement Plan (KV (Knudson-Vandenberg). If KV funds are not available, projects will be programmed and appropriated funds requested. Annual maintenance and removal of protection structures (i.e. fences) will be included in the funding process.
- Native plant species and species which discourage pocket gopher activity are preferred for revegetating landings, skid roads, temporary roads, or other disturbed areas. Species composition, including tree species in the Range management units, will be reviewed by silviculturists, vegetation management specialists, and wildlife biologists to determine appropriate species mixes.

Noxious Weeds
- Continue control of noxious weeds with existing decisions and agreements.
- Special Provision C(TI6.27#: Noxious Weed Control will be used to prevent the potential spread of noxious weeds into harvest units. Timber purchasers would be required to furnish proof of weed-free equipment. If available, KV funds would be collected to treat any noxious weeds that may invade disturbed areas following operations.

Threatened Endangered and Sensitive Plant Species:
- Where activities or uses may impact sensitive plant species or their habitats, initiate the following procedures:
  - No harvesting within riparian zones.
  - Habitats and known population sites will be surveyed prior to harvest activities to determine distribution of plants.
  - Plants and habitat identified will be marked, fenced out, and flagged to identify the areas where no project activity will occur.
  - Where appropriate, barriers may be placed to prevent project equipment and personnel from disturbing sensitive plants and their habitat.
  - No gravel will be taken from the steep slopes where sensitive plants exists within the gravel source area.
  - Advancement of the South Camel gravel pit to the north would be prohibited.

Features Responsive to issue #6 - Fuel Loading and Fire Risk
- Slash, substandard, and cut material left at landings would be piled or scattered by the timber purchaser. Areas of heavy slash concentrations throughout the units would be either machine and piled by the timber purchaser and burned by Forest Service personnel, or jackpot burned by Forest Service personnel. Fuelbreaks may be constructed within and/or around treatment units. Deposits needed to complete this work would be collected through the brush disposal plan.
Implement strategies will be followed per the Conservation Strategy and Agreement for the Management of Northern Goshawk Habitat in Utah. This is consistent and complies with the Utah Northern Goshawk Forest Plan Amendment signed on April 14, 2000. In addition to this, surveys for new nesting territories will be conducted in areas of suitable habitat the year prior to offering each sale and appropriate changes made if new nesting territories are found.

- Flammulated Owl - Along ridge tops and at mid-slope on south or east aspects in areas containing Douglas-fir mixed with spruce and/or aspen manage for the retention of all large snags containing cavities. In these same areas retain small pockets of dense vegetation where they exist.

- Three Toed Woodpecker - A minimum of 1 snag per acre within the harvest units will be retained.

- If possible retain and leave snags with broken tops.

- Spotted Bat - Manage for vegetative diversity across the landscape. Inventory limestone cliffs, mines, or caves where impacts may occur. No rock material will be disturbed from cliff faces. Pit blasting will not occur prior to surveys, with the Forest Service being notified of blasting 30 days in advance. If surveys identify roosting utilization, impacts will be reassessed and appropriate measures taken.

- Townends Big-Eared Bat - Manage for vegetative diversity across the landscape. Inventory limestone cliffs, mines, caves, or old buildings where impacts may occur. No rock material will be disturbed from cliff faces. Pit blasting will not occur prior to surveys, with the Forest Service being notified of blasting 30 days in advance. If surveys identify roosting utilization, impacts will be reassessed and appropriate measures taken.

Features Responsive to Issue #9 - Transportation

- Temporary work roads shall be returned to resource production and use compatible with the management unit emphasis. Appropriate timber sale closures for erosion prevention and control and for reclamation of temporary roads would be incorporated into each contract.

- Allow commercial or permitted use on Forest Development Roads. If the road meets design standards but the combined use does not fulfill public safety requirements due to volume of traffic, the road may be administratively managed to control conflicting traffic, unsafe conditions or traffic flows (FP, III-40). Road use restrictions are listed in appendix F (Roads with hauling prohibited or restrictive limitations).

- Warning signs will be installed at the entrance to road construction or reconstruction projects, on Forest Development Roads used for timber haul, at the junction of Forest Development Roads and work roads, and near dispersed camp areas 1/4 mile from logging operations. If necessary, traffic controllers (flaggers) will be used.

- Vehicle Access Restrictions and Operating Season Restrictions: Vehicle access restrictions will remain in effect as shown on the 1990 Forest Visitor/Travel Map, as amended.

- Hauling logs on weekends, holidays, during the first two days of the general rifle deer and elk seasons will be prohibited. The dates of hunts will be established by the State Division of Wildlife Resources. These restrictions would be identified in timber sale contract.

- Winter hauling will be negotiated and approved annually based on safety, road damage, and resource protection (see wildlife design features).

- Where possible locate construct work roads to facilitate closure which will minimize unauthorized use.

- Preclude public use of newly constructed project roads by closure order and signing.

- System roads will be located, designed, and constructed for short and long term timber needs (FP, III-68).
South Manti Timber Salvage Final Environmental Impact Statement
Appendix D - Project Design Features

- Hauling will be suspended whenever conditions compromise the road investment or public safety.
- Close newly constructed project roads to the public after initial intended use is complete when the establishment of public use is undesirable or management direction has previously been established to close the road (FP. III-39).
- Reclaim non-system roads in and adjacent to the project that will not be used for logging activities and are not needed for future resource management. These roads would be reclaimed over a period of 10 to 15 years as funding becomes available. They number approximately 19 miles and are dispersed throughout and adjacent to the project area.
- Dust abates haul roads as needed.

Features Responsive to Issue #9 - Range Allotments and Improvements
- Coordinate grazing and timber activities. The timber sale contract Forest Service Representative (FSR) will send a copy of the general operating plans to range specialists to help facilitate this coordination.
- Maintain and protect all range improvements. The timber sale operator will be responsible to repair any damages they cause, in a timely manner.
- Livestock grazing would be discouraged within reclaimed roads for two to three seasons to allow vegetation (for erosion control) to become established. Grazing could be discouraged by restocking an entire unit, herding 'techniques, animal husbandry, salting, and seed mixes not attractive to livestock.
- In the harvest units, grazing may be prohibited until spruce and fir regeneration reaches a minimum average height of 4 feet. This height should be attained within 15 to 20 years. This may require fencing in some situations that will be maintained by appropriated funds. If long-term restrictions are necessary, they will need to be coordinated with the permittees at least two years in advance in order for the permittee(s) to make arrangements for the excess livestock.

Features Responsive to Issue #10 - Visual Landscape
- Employ techniques such as feathering, leave trees, shaping cuts to duplicate naturally occurring open pockets, or aspen clones in the area, which alleviate unnaturally appearing geometric lines and forms.
- When practical, avoid skyline salvage related disturbance. Objects or unnaturally appearing forms become greatly exaggerated when in silhouette on the horizon, particularly when contrasted against a blue-sky or moon-lit background.
- Where practical, angle skidding and logging road corridors away from Forest Development Roads and major trails and align them as close to the natural contour as possible to prevent direct views down these corridors.
- Where necessary to meet Forest Plan visual quality standard, remove or visually screen from view, salvage-created slash which may be readily recognized within the immediate foreground view.
- Where practical, directional fell trees away from roads and trails and cut trees at a slant (low to the ground); positioning the exposed cut to face away from the trail or road.
- Landscape/Recreation Specialist and Presale Forester will visit the project area and identify visually sensitive areas to be included in the contract and apply the appropriate contract provisions (see B/T/6.412, G/T/6.7).

Features Responsive to Issue #11 - Undeveloped Character
- No system roads, temporary work roads, or constructed skid roads shall be constructed in Inventoried Roadless areas or in adjacent 1000+ acre areas per the interim road rule. Do not construct in the following units: A-9, B-4, C-3, C-8, D-1, D-2, D-3, D4/5, E-1, E-3, E-4, F-1, F-3, G-1, and G-2.

Features Responsive to Issue #12 - Cultural Resources
- Implement the Memorandum of Understanding with Utah State Historic Preservation Office (SHPO) and Advisory Counsel. Implementation of the operating plan (Project File) in-part includes:
  - Conduct inventories of all harvest units, roadways, road construction and reconstruction, and other associated activities prior to timber sale and road contracts.
  - Evaluate and protect in-place all National Register eligible sites.
  - When in-place protection is not possible, modify proposed activities to avoid, mitigate, or minimize impacts in consultation with the SHPO and Advisory Counsel.
  - Where project activities cannot be modified to protect sites in-place, develop plans to recover scientific data in accordance with the National Resources Protection Act, Archaeological Resources Protection Act, and the Native American Graves Repatriation Act.
  - Discovery of previously unknown sites, either on the surface or subsurface, may occur during project implementation. The Timber Sale Contract includes a provision for Protection of Cultural Resources (either C6.244 or CT 8.244). These provisions state that the discovery of any cultural resource sites during project implementation would require mitigation or avoidance.
  - Consult with appropriate Native American entities.

Features Responsive to Issue #13 - Economics
- Timber sales will be developed and offered for sale based on many factors including volume locations, economics, harvest methods, road construction requirements etc.

Features Responsive to Issue #14 - Energy
- None

Features Responsive to Issue #15 - Roadless Character
- See Issue #11 - Undeveloped Character
D-2 BEST MANAGEMENT PRACTICES

Description of the soil and water conservation practices from the Forest Service Soil and Water Conservation Handbook (REF 22) will be applied in all alternatives. Refer to the Soil and Water Conservation Handbook for more information regarding any specific Best Management Practice (BMP).

Abbreviations used in this table:
- SPS = Special Project Specification
- PSF = Pre-sale Forester
- ER = Engineering Representative
- IDT = Interdisciplinary Team
- CO = Contracting Officer
- COR = Contracting Officer's Representative
- MC = Marking Crew
- TSC = Timber Sale Contract
- SMZ = Streamside Management
- TSA = Timber Sale Administrator
- SAM = Sale Area Map
- PSAM = Sale Area Map
- PSF = Pre-sale Forester
- IDT = Interdisciplinary Team
- CO = Contracting Officer
- COR = Contracting Officer's Representative
- MC = Marking Crew
- TR = Timber Sale Administrator

SWCP SWCP OBJECTIVE CONSIDERATIONS FOR BEST MANAGEMENT PRACTICES PERSONS RESPONSIBLE CONTRACTOR

11.07 OIL AND HAZARDOUS SUBSTANCES SPILL CONTINGENCY PLANNING To prevent contamination of water from accidental spills by poor planning and development of Spill Prevention Control and Countermeasures Plans

A SPCC Plan is required if the total above-ground storage of oil, petroleum products, or other hazardous materials exceeds 1320 gallons, or any single container exceeds a capacity of 600 gallons

COR

CTB.34

CTB.341

11.14 MAPPING OF SNOW SURVEY SITES To protect snow courses and related data used to affect changes from land management activities

Sites located in Section 19, T19S, R4E, 34 Baby Dairy Station, Section 23, T19S, R4E, Buck Flat Site, and Section 27, T20S, R4E (Cle Camp)

PSF, MC

TSA

BT8.22

11.02 SLOPE LIMITATIONS FOR TRACTOR OPERATION To reduce gulley and sheet erosion and associated sediment production

Application of the SWCP as mandatory for all vegetation manipulation projects, exceptions must be specifically addressed in the EIS. The project supervisor and/or Contracting Officer are responsible for identifying wetlands and meadows not previously recognized in the NEPA process and for following management controls and contract provisions pertaining to wetland and meadows. Protection of wetlands (mapped and unmapped) should be included in pre-work briefings

PSF

CTB.429

11.34 REVEGETATION OF DISTURBED AREAS To protect soil productivity and water quality by reducing erosion

Helicopter landings and rehabilitated roads will be seeded per the Emission and Sediment Control Plan. Tractor-based landings may be reserved for natural regeneration or seeded

TSA

CTB.681

CTB.682

11.35 REVERSE (REVERSING AND FOLLOWING SLASH WINDROWING) To prevent removal or severe disruption of the productive surface soil and to minimize losses from erosion

Material should be windrowed on contour. Little to no soil should be incorporated in the piles

TSA

CTB.79

11.36 TREE LEAVERS (STANDING AND FOLLOWING SLASH WINDROWING) To prevent removal or severe disruption of the productive surface soil and to minimize losses from erosion

Follow all Soil Quality Standards and Guidelines for detrimental outplanting and compaction. Use rutting restrictions in the design features

TSA

CTB.66

11.31 TIMBER SALES PLANNING To minimize soil and water resource considerations into Timber Sale Planning

DT specialists will evaluate watershed characteristics and estimate response to proposed activities. EIS identifies design criteria intended to protect soil and water resources. Timber sale contract will include provisions to meet water quality standards, and other provisions as directed by the Record of Decision

DT

PSF

N/A

14.02 TIMBER HARVEST UNIT DESIGN To insure timber harvest unit design will assure favorable conditions of water flow, maintain water quality and soil productivity, and reduce soil erosion and sedimentation

Prescriptions will be designed to assure an acceptable level of protection for soil and water resources. IDT specialists will work with PSF during unit layout to avoid sensitive areas, adjust unit boundaries, add specific BMPs to meet specific SWCPs and implement the Martin-L Sal Riparian Area Guidelines

IDT, PSF

N/A

14.03 USE OF SALE AREA MAPS (SAM) FOR DESIGNING SOLID AND WATER PROTECTION NEEDS To delineate the location of protected areas and available water sources and insure their recognition, proper consideration, and protection on the ground

All perennial and intermittent streams will be designated for stream course protection and/or included in a Streamside Management Zone. Other water features with buffer zones (see the design features) will also be included in the SAM. Note that SWCP 13.03 is mandatory and applies to mapped and unmapped wetlands. Ground verification and preparation of SAMs to be included in TSC will be done by Pre-sale Forester. TSA reviews areas of concern with purchaser before operations

IDT specialists, PSF, TSA

BTB 11

BTB 5

BTB 5.90.3

14.04 LIMITING THE OPERATING PERIOD OF TIMBER SALE ACTIVITIES To minimize soil erosion and sedimentation and loss in soil productivity by insuring the purchaser conducts his/her operations in a timely manner

See also 13.06. Pre-sale forester will prepare a TSC that includes the appropriate provisions to prevent loss of soil/water resources, including seasonal restrictions. TSA and ER will limit operations on-the-ground conditions warrant

ER, PSF

BTB 12

BTB 31

BTB 6.3

BTB 6.8

BTB 9.1

14.05 PROTECTION OF UNSTABLE AREAS To protect unstable areas and avoid triggering mass movements of the soil mantle and resultant erosion and sedimentation

IDT specialists have identified unstable areas and mitigation measures in NEPA process. Mitigation measures will be incorporated into TSC

IDT specialists

PSF, TSA

BTB 6.8

14.06 RIPARIAN AREA DESIGNATION To minimize the adverse effects on riparian areas with prescriptions that manage nearby logging and related land disturbance activities

See 14.03. The minimum Streamside/Riparian Management Zone will be 100 feet along streams and springs. 100 feet from land or reservoir high water lines, 100 feet from each perennial stream bank, 100 feet from the outer perimeter of a wetland and 10 feet from the top of each intermittent stream bank. This information will be included in the TSC. Widger/larger zones may be required through consultation among the PSF and IDT specialists

IDT specialists

PSF, MI, MC

BTB 6.5

BTB 6.1

14.07 DETERMINING TRACTOR LOGGABLE GROUND To protect wetland quality from degradation caused by tractor logging ground disturbance

IDT and PSF have identified general areas of loggable ground during transportation and timber sale plan process. PSF and IDT will verify field visibility in selected units. PSF will prepare a TSC that includes provisions stating areas and identification by which tractors can operate

IDT, PSF

BTB 4.2

BTB 4.29

BTB 6.8

BTB 6.8

14.08 TRACTOR SKIDDOING DESIGN To minimize erosion and sedimentation and loss in soil productivity by designing skidding patterns to best fit the terrain

IDT specifies the same sensitive areas during logging. The TSC will locate the skid trails with the timber purchaser or approve the purchaser’s proposed locations prior to operation

IDT

PSF

BTB 4.2

BTB 4.2

BTB 6.8

BTB 6.8

14.09 LOGGING LOCATION AND DESIGN To locate in such a way as to avoid soil erosion and water quality degradation

TSC must approve landing locations proposed by the purchaser. Approved landing locations will meet the criteria of minimum size, least accumulation needed, minimal cutline of stream channels, minimum skid roads necessary, no side cast material into sensitive areas, and proper drainage. Landings will not be located in Streamside/Riparian Management Zones

TSC

BTB 4.2

BTB 4.29

BTB 6.8

BTB 6.8

14.11 LOGGING EROSION PREVENTION AND CONTROL To reduce erosion and subsequent sedimentation from log landing through the use of mitigating measures

PSF and TSA assesses what is necessary to prevent erosion from landing and to ensure reclamation. This TSC will be prepared in consultation with IDT specialists. Inadequate erosion control procedures and additional water including preventing water and roads from reaching the landing, shaping cuts and fills, decommissioning spreading basins

PSF, TSA

BTB 7.5

BTB 8.6

BTB 8.6

BTB 8.6

BTB 4.29

BTB 6.4

BTB 6.5

BTB 6.8

BTB 6.9

BTB 6.9

BTB 6.9

BTB 6.9

BTB 6.9

BTB 6.9

BTB 6.9

BTB 6.9

BTB 6.9

BTB 6.9

BTB 6.9

BTB 6.9

BTB 6.9

BTB 6.9
<table>
<thead>
<tr>
<th>SWCP</th>
<th>SWCP OBJECTIVE</th>
<th>CONSIDERATIONS FOR BEST MANAGEMENT PRACTICES</th>
<th>PERSON(S) RESPONSIBLE</th>
<th>CONTRACT PROVISION</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.12</td>
<td>EROSION PREVENTION AND CONTROL MEASURES DURING THE TIMBER SALE OPERATION</td>
<td>PSF sets purchaser’s responsibility to prevent soil/water resource damage in TSC. TSA ensures that erosion control is kept current and prevents operation when excessive impacts are possible. The kinds and intensity of work done shall be adjusted to ground and weather conditions, including seasonal periods of precipitation and the need for controlling runoff.</td>
<td>PSF, TSA</td>
<td>BT6.6 BT6.62 BT6.63 BT6.64 BT6.65 BT6.66 CT6.42# CT6.61#</td>
</tr>
<tr>
<td>14.14</td>
<td>REVEGETATION OF AREAS DISTURBED BY HARVEST ACTIVITIES</td>
<td>TSA is responsible to see that revegetation work required by purchaser is done correctly and in a timely manner. For this project, the purchaser will be responsible for revegetation for one year after the completion of harvest.</td>
<td>IDT, TSA</td>
<td>CT6.601# CT6.602#</td>
</tr>
<tr>
<td>14.15</td>
<td>EROSION CONTROL ON SKID TRAILS</td>
<td>See the Erosion and Sediment Control Plan. IDT specialists will identify areas of special concern. TSA will ensure erosion control measures are applied prior to expected hydrologic events (spring runoff, high-intensity storms, etc.). Purchaser must complete and maintain erosion control work as specified in TSC.</td>
<td>TSA</td>
<td>BT6.6 BT6.64 BT6.65 BT6.66 CT6.42# CT6.6#</td>
</tr>
<tr>
<td>14.16</td>
<td>MEADOW PROTECTION DURING TIMBER HARVESTING</td>
<td>Unauthorized operation of vehicular or skidding equipment on meadows designated as SAMS and/or marked on the ground is prohibited. Vehicular or skidding equipment shall not be used on meadows except where roads, landings, or tractor road are approved. PSF will verify the areas needing protection and prepare the contract to prevent damage to meadows. The TSA will be responsible for on-the-ground protection of meadows. If meadows are found by the TSA during operations, it is their responsibility to either afford them the proper protection or pursue a contract modification. Note that SWCP 13.03 requires the protection of both mapped and unmapped wet meadows and other wetlands.</td>
<td>IDT specialists; PSF, TSA</td>
<td>BT6.61#</td>
</tr>
<tr>
<td>14.17</td>
<td>STREAM CHANNEL PROTECTION (IMPLEMENTATION AND ENFORCEMENT)</td>
<td>All perennial and intermittent streams will be designated for stream course protection and/or included in a Streamside Management Zone. PSF will prepare a SAM locating the channels needing protection. Other water features with buffer zones (see the design features) will also be included in the SAM. TSA will see that TSC items are carried out on the ground. IDT specialists will be consulted as needed.</td>
<td>IDT specialists; PSF, TSA</td>
<td>BT6.5 CT6.50# CT6.9#</td>
</tr>
<tr>
<td>14.18</td>
<td>EROSION CONTROL STRUCTURE MAINTENANCE</td>
<td>During the period of the TSC, the purchaser shall provide maintenance of soil erosion control structures constructed by the purchaser until they become stabilized, but not for more than one year after their construction. If work is needed beyond this time, the District will pursue other sources of funding.</td>
<td>TSA</td>
<td>BT6.6 BT6.66</td>
</tr>
<tr>
<td>14.19</td>
<td>ACCEPTANCE OF TIMBER SALE EROSION CONTROL MEASURES BEFORE SALE CLOSURE</td>
<td>A careful review of erosion prevention work will be made by the TSA before each harvest unit is considered complete. The inspection will determine if the work is acceptable and will meet the objective of the erosion control feature. A feature is considered not acceptable if it does not meet standards or is not expected to protect soil/water values. Technical assistance will be used as necessary. See SWCP 14.18 erosion prevention work done in previous year should be periodically inspected during the life of the timber sale to determine maintenance need within the first year following construction and to evaluate adequacy of the work and any necessary modifications.</td>
<td>ER, TSA</td>
<td>BT6.35 BT6.62 BT6.64 BT6.65 BT6.66 CT6.6#</td>
</tr>
<tr>
<td>14.20</td>
<td>SLASH TREATMENT IN SENSITIVE AREAS</td>
<td>All activities will comply with the MLS Riparian Area Guidelines in Forest Plan. SWCP 13.03 and 14.16 restrict equipment operation in Streamside Management Zones, buffer zones around lakes and wetlands, and stream designated for stream course protection.</td>
<td>Fuco 3 Specialist</td>
<td>BT6.5 BT6.7 CT6.50# CT6.61# CT6.7#</td>
</tr>
<tr>
<td>14.22</td>
<td>MODIFICATION OF THE TSC</td>
<td>If TSC is not adequate to protect soil/water resources, the TSA and Contracting Officer are responsible for recommending a modification of the TSC.</td>
<td>TSA, CO</td>
<td>BT8.3 CT8.3 CT8.32</td>
</tr>
</tbody>
</table>
15.01 GENERAL GUIDELINES FOR TRANSPORTATION PLANNING: To introduce soil and water resource considerations into transportation planning.

15.02 GUIDELINES FOR THE LOCATIONS AND DESIGN OF ROADS AND TRAILS: To locate and design roads and trails with minimal soil and water impact while considering all design criteria.

15.03 ROAD AND TRAIL, EROSION CONTROL PLAN: To prevent, limit, and mitigate erosion, sedimentation, and resulting water quality degradation prior to the initiation of construction, by implementing the guidelines for erosion control practices.

15.04 TIMING OF CONSTRUCTION ACTIVITIES: To minimize erosion by conducting operations during optimal runoff periods.

15.05 SLOPE STABILIZATION AND PREVENTION OF MASS FAILURES: To reduce sedimentation by minimizing the chances for rodent-killed mass failures, including landslides and embankment slumps.

15.06 MITIGATION OF SURFACE EROSION AND STABILIZATION OF SLOPES: To minimize soil erosion from both upslope, hill slopes, and travel ways.

15.07 CONTROL OF PERMANENT ROAD DRAINAGE: To minimize the erosive effects of concentrated water and the degradation of water quality by proper design and construction of road drainage systems and control structures.

15.08 PORER ROAD CONSTRUCTION: To prevent road construction-related mass wasting associated with pioneer road construction.

15.09 TIMELY EROSION CONTROL MEASURES ON INCOMPLETE ROADS: To prevent road construction-related erosion. This will be prevented only at locations designated by the ER or TSA with input from the IDT specialists. In-channel erosion should be planned for low time periods and be accomplished in as short a time period as possible. Materials stockpiled or disposed of should be placed and contained in areas above the probable high water lines. Stream channels impacted by construction activity will be restored to their original plan and profile. Stream bed armor should be replaced to the extent possible.

15.10 CONTROL OF ROAD CONSTRUCTION, EXCAVATION, AND SIDECAST MATERIAL: To reduce sedimentation from uncompacted excavated and side-cast material caused by road construction, reconstruction, or maintenance.

15.11 SERVICING AND REFUELING EQUIPMENT: To prevent contamination of waters from accidental spills of fuels, lubricants, bitumens, and other harmful substances.

15.12 CONTROL OF CONSTRUCTION IN RIPARIAN AREAS: To minimize the adverse effects on riparian areas from construction.

15.13 CONTROLLING IN-CHANNEL EXCAVATION: To minimize stream channel disturbances and related sediment production.

15.14 TIMELY EROSION CONTROL MEASURES ON INCOMPLETE ROADS: To prevent road construction-related erosion. This will be prevented only at locations designated by the ER or TSA with input from the IDT specialists. In-channel erosion should be planned for low time periods and be accomplished in as short a time period as possible. Materials stockpiled or disposed of should be placed and contained in areas above the probable high water lines. Stream channels impacted by construction activity will be restored to their original plan and profile. Stream bed armor should be replaced to the extent possible.

15.15 STREAM CROSSINGS ON TEMORARY ROADS: To keep temporary crossings from unduly disturbing stream channels, disturbing riparian areas, or obstructing fish passage.

15.16 BRIDGE AND CULVERT INSTALLATION: To minimize sedimentation and turbidity resulting from excavation for in-channel structures.

15.17 REGULATION OF BORROW PITS, GRAVEL SOURCES, AND QUARRIES: To minimize sediment production from borrow pits, gravel sources, and quarries, and limit channel disturbance in those gravel sources suitable for development in floodplains.

15.18 DISPOSAL OF RIGHT-OF-WAY AND ROADSIDE GRIPPS: To ensure that debris generated during road construction is kept in the stream channels and prevents sediment and trash debris from subsequently obstructing channels.

15.19 STREAM BANK PROTECTION: To minimize sediment production from stream banks and structural deficiencies in natural situations.

15.20 TIMELY EROSION CONTROL MEASURES ON INCOMPLETE ROADS: To prevent road construction-related erosion. This will be prevented only at locations designated by the ER or TSA with input from the IDT specialists. In-channel erosion should be planned for low time periods and be accomplished in as short a time period as possible. Materials stockpiled or disposed of should be placed and contained in areas above the probable high water lines. Stream channels impacted by construction activity will be restored to their original plan and profile. Stream bed armor should be replaced to the extent possible.
15.21 MAINTENANCE OF ROADS: To maintain all roads in a manner which provides for soil and water protection by minimizing rutting, failures, side-cast, and blocking of drainage facilities. Road maintenance associated with a timber sale is the responsibility of purchaser. See cutting standards in the design features. The ER/SA will ensure the purchaser maintains roads according to the appropriate maintenance level.

15.22 ROAD SURFACE TREATMENT TO PREVENT LOSS OF MATERIALS: To minimize the erosion of road surfaces and, consequently, reduce the likelihood of sediment production. Selected road segments will be gravelled and/or treated with some type of dust abatement material. ER ensures contract compliance.

15.23 TRAFFIC CONTROL DURING WET PERIODS: To reduce the potential for road surface disturbance during wet weather and reduce sedimentation. Roads that must be used during wet periods should have a stable surface and sufficient drainage to allow such use with a minimum of resource impact. Road not constructed for all weather use should be closed during the wet season. Road restrictions and traffic control measures will be implemented on all roads when damage occurs. The decision to restrict a road is made by the ER. Hauling restrictions would be controlled by the TSA.

15.24 SNOW REMOVAL CONTROLS: To minimize the impact of snow melt on road surfaces and embankments and reduce the probability of sediment production resulting from snow removal operations. Snow removal will be kept current on all roads associated with winter logging operations. During snow removal, a minimum of 4 inches of snow will be left on the roadway. Cut banks shall not be undercut or shall not be gravelled off the roadway. Ditches and culverts shall be kept functional. Snow banks should be removed or breached at a spacing to provide surface drainage without discharge over embankment lift. Decaying logs will not be used without special authorization from the ER or TSA. The ER and TSA ensure compliance with contract provisions.

15.25 OBLITERATION OF TEMPORARY ROADS: To reduce sediment generated from temporary roads by obliterating them at the completion of their intended use. All new temporary roads in the decision area will be obliterated. The work will be done by the purchasers with compliance ensured by the TSA or ER. Obliteration will include removing culverts and reestablishing stream channel configuration, reshaping of shoulders and/or construction of waterbars, construction of access controls, and revegetation.

15.33 PROTECTION OF SOIL AND WATER FROM PRESCRIBED BURING EFFECTS: To maintain soil productivity, minimize erosion, and prevent ash, sediment, nutrients, and debris from entering surface water. Prescribed burn plans identify the conditions necessary to prevent soil damage and meet site preparation objectives while maintaining the integrity of riparian areas and retaining sufficient ground cover to prevent erosion of the burned areas. Practices include construction of waterbars in fire lines, and removal of debris added to stream channels as a result of prescribed burning. Additional practices may be needed in areas where burn intensity is greater than planned.

D-3 MONITORING

The objective of monitoring is to determine if land management activities are being implemented correctly and if they are effective. The following Monitoring Plans have been prepared for this project. They represent monitoring supplemental to other monitoring conducted by the Forest.

BMP MONITORING PLAN - Part 1

OBJECTIVE: To protect beneficial uses; to specify the BMPs to be incorporated into the Timber Sale Contract on a unit by unit basis, to document what BMPs were implemented to meet a specific SWCP and where they were applied, and provide an explanation of how the specific BMP was applied.

ITL-45 TO MONITOR: BMPs as identified in project design features (Appendix D) that are applicable to each timber sale.

TYPE OF MONITORING: Implementation and effectiveness.

METHODS/PARAMETERS:

Before the timber sale contract is completed, the Presale forester will review the contract with the IDT. The review will focus on any concerns with unit layout and a consistency check between the contract and the NEPA document. The consistency check will include a review of whether or not contract provisions have been included into the contract.

The SWCP objectives applicable to each unit in a timber sale (BMPs) will be listed in the BMPs. BMP reporting will be reported on timber sale inspection forms and kept in the official timber sale file by the TSA or COR. If the TSA or COR finds that BMPs are not being implemented or that the SWCP objectives listed for that activity are not being met, it is their responsibility to see that corrective measures are taken to assure that all SWCP objectives will be met by the BMPs. If a unit has been identified by the IDT as being at risk for direct effect on water quality, the TSA or COR will schedule an Implementation and Effectiveness review with the district watershed specialist before that activity is completed.

FREQUENCY/DURATION: Start Date: Beginning of Project. Completion Date: Final close-out of all sales identified in the South Manti decision area.

REPORTING PROCEDURES: Timber Sale Administrators and CORs will report all BMP on all timber sales resulting from this decision. Implementation documentation of BMPs are completed and forwarded to the Forest Hydrologist by December 31st each year until completion of sale.


MONITORING RESPONSIBILITY: The District Ranger is responsible for monitoring. The IDT is responsible for completing BMP reporting. Timber Sale Administrator and COR are responsible for the timely completion of the BMP reporting.
BMP MONITORING PLAN - Part 2

OBJECTIVE: To document that Soil and Water Conservation Practice (SWCP) objectives were included in the Timber Sale Contract and implemented, to determine if BMPs were appropriate to meet SWCP objectives, and to visually determine if the BMPs were effective (successful) in meeting the objective of the appropriate SWCP and protecting beneficial uses.

ITEM TO MONITOR: BMPs

TYPE OF MONITORING: Implementation and effectiveness

METHODS/PARAPETERS:

BMP Implementation and Effectiveness Reviews will be conducted on 100% of all units/roads with special watershed concerns within this decision by the District Watershed Specialist and Sale Administrator. Unit acceptance will ensure that if SWCP objectives are not being met, corrective measures can be made before sale closure.

Review will occur yearly on at least 10% of all units/roads without special watershed concerns within active or completed sales associated with this decision by IDT.

Criteria for selection of the site to be monitored will include proximity to larger ephemeral or perennial streams or other factors that could cause a concern for soil/water values. The District Watershed Specialist and District Ranger will determine which units/roads will be in each year's evaluation.

Monitoring the qualitative effectiveness of BMPs is accomplished by an IDT selected by the District Ranger. IDT membership will normally include a Hydrologist and/or Soil Scientist and an Engineer but may include Foresters, Wildlife or Fisheries Biologists, or other resources as needed.

Actual Review is accomplished by effectiveness of each identified practice as measured through ocular observation. The BMP is evaluated as it is reflected on the ground, and the observations are compared to the SWCP objective for the BMP. The effectiveness score will be the consensus opinion of the IDT.

FREQUENCY/DURATION: Start Date: Sale award
Completion Date: Timber sale closeout and acceptance at sale closure.

PROJECTED COSTS: Workforce: District IDT, Line and/or Staff Officers, SO/District Watershed Specialists. Total Costs: $2,500/year.

REPORTING PROCEDURES: Final to be completed by December 31st of the year of review.

MONITORING RESPONSIBILITY: The District Ranger is responsible for the Monitoring. Timber Sale Administrator and COR are responsible for the timely completion of the BMP reporting. Forest Hydrologist/District Watershed specialists to assist with analysis and reporting.

---

VEGETATION MONITORING PLAN - STAND STRUCTURE, TREATED AREAS

OBJECTIVE: To monitor stand structure to determine if the alternative implemented met projections stated in the document for stocking, beetle risk, vegetative structural stage distribution, snags, and down woody material. Includes field review and analysis of post harvest surveys.

ITEM TO MONITOR: Vegetation structure of treated stands. Method and quantity of post harvest treatments: fuels reduction treatments; weed and thin; and need for artificial reforestation.

TYPE OF MONITORING: Implementation and effectiveness.

METHODS/PARAPETERS: Current stand exam requirements for a walk thru exam.

FREQUENCY/DURATION: After harvest activities are complete prior to reforestation activities.

PROJECTED COSTS: 3 people for 8 days at $200/day = $2,400.

REPORTING PROCEDURES: Monitoring Report.

RESPONSIBILITY: District Silviculturist, District Wildlife Biologist, Zone Fuels Specialist.

VEGETATION MONITORING PLAN - REFORESTATION, NATURAL AND ARTIFICIAL

OBJECTIVE: To assure natural regeneration areas are meeting stocking certification requirements in Silvicultural Prescription. This includes monitoring for damage to seedlings caused by livestock, wildlife, or other causes.

ITEM TO MONITOR: Areas identified for regeneration.

TYPE OF MONITORING: Implementation and effectiveness.

METHODS/PARAPETERS: Stand examination of natural and artificial regeneration, measure survival plots, and review for animal damage.

FREQUENCY/DURATION: Perform 1st, 3rd and 5th year stocking surveys to monitor planted trees and assess natural regeneration. Measure survival and growth of staked rows the 1st and 3rd growing season after planting.

PROJECTED COSTS: $8.00/acre for each stocking survey.

REPORTING PROCEDURES: R4 RMIS reporting forms.

RESPONSIBILITY: District Ranger, District Silviculturist.
NOXIOUS WEEDS MONITORING PLAN

OBJECTIVE: To detect changes in noxious weed populations along Forest Development Roads leading to the timber sale area and within harvest units, and to assure the inclusion, implementation, and effectiveness of Special Provision CTS.279 - Noxious Weed Control. Requiring Timber Purchasers to furnish proof of weed-free equipment.

ITEM TO MONITOR: Changes in noxious weed populations along Forest Development Roads leading to the timber sale area and within harvest units.

TYPE OF MONITORING: Implementation and effectiveness.

METHODS/PARAMETERS: Visual observations at known inventoried locations within sale area and roads leading to sale.

FREQUENCY/DURATION: Start Date: Beginning of sale. Completion Date: One year after completion of sale.


REPORTING PROCEDURES: District Range Conservationist will write annual report documenting monitoring by December 31st of each year.

RESPONSIBILITY: District Ranger, District Range Conservationist, Sale Administrator.

CULTURAL RESOURCES MONITORING PLAN

OBJECTIVE: To protect significant Historical and Paleontological Resources from effects of action alternatives.

ITEM TO MONITOR: Monitor known National Register eligible/potentially eligible sites to prevent damage from action alternatives.

TYPE OF MONITORING: Implementation and effectiveness.

METHODS/PARAMETERS: Field review by Forest Heritage Staff and Sale Administrator during the life of the sale.

FREQUENCY/DURATION: Three times per year in active sale areas and once prior to closing of sale.

PROJECTED COSTS: Approximately $1800/year.


RESPONSIBILITY: District Ranger, Forest Archaeologist, Contracting Officer, Sale Administrator.
APPENDIX E
UNIT INFORMATION

[page intentionally left blank]
APPENDIX E - SUMMARY UNIT INFORMATION

Forest Health, Species Composition, Structural Diversity and Productivity
Alternative Analysis Rationale, and Economic Analysis Information

The Forest Health, Species Composition, Structural Diversity, and Productivity issue analysis and alternative recommendations for this Environmental Impact Statement were completed utilizing the information developed for the South Manti Timber Salvage Timber Sale Environmental Assessment (1996). Extensive information was developed for that document utilizing silviculture inventory data (RMSTAND program) and Forest Vegetation Simulator (FVS) model runs. This information provided the basis for the alternative evaluations and outputs which are presented in the current document. Alternatives 1 and 2 from the 1996 document evaluated the effects of full expansion of the spruce beetle outbreak throughout the project area, therefore, these alternatives with Alternative 3 (maximum treatment area proposed in 1996) provided the basic mortality and reforestation need information utilized to project alternative outputs for the current analysis. No site-specific information was available for Units G5 (134 acres) and G6 (139 acres) which were not evaluated in the original document, but have been added to this proposal. Estimates for these units were made by comparison of the percentage of units treated for planting, natural regeneration, gopher control, and reforestation/fencing, and gopher treatments. The documentation of the evaluation/computation of these figures is contained in a Quattro Pro spreadsheet in the project record.

The project proposal included the need to return Forest Plan TBR emphasis areas to a forested (stocked) condition in the shortest possible time-frame. Therefore, emphasis was placed on including TBR areas in the proposed salvage units in order to provide the opportunity to utilize timber from these areas for immediate planting and natural regeneration treatments. Although the majority of the area is classified as RNG emphasis, no proposals were made for the type conversion of these stands to open-meadow-like conditions. In fact, it was desirable for a variety of resource benefits to maintain or return as much of this type to spruce-fir or aspen forest as well, and as a result RNG units were included in the proposals for reforestation (planting and natural) treatments. This is supported by National and Forest Plan direction.

Given the fact that a portion of the area from the original project proposal has been treated and some area dropped from the proposal, total reforestation and protection needs for the current analysis were computed based on the percentage of the original emphasis areas compared to original emphasis area. The proportion of the original planting, natural regeneration, site preparation for natural regeneration, gopher control treatments, and fencing were computed in total on a proportionate basis to the acres treated and not on a unit by unit basis. The following information describes the rationale for computation of these figures based on the 1996 analysis.

Reforestation Needs: Planting and natural regeneration acreages were calculated for the 1996 document by comparison to the 1984 map of stockability and plantability made by Glen Jackson, Don Okerlund, and Greg Montgomery based on aerial photo interpretation and knowledge of the proposed treatment units. Inventory and FVS modeling was utilized (Montgomery) to make estimates of the area adequately stocked (at the time of analysis and following mortality projections) to project reforestation needs, which were then identified for planting, or natural regeneration. Machine scarification or site preparation for natural regeneration (SPN) treatments were projected based on the percentage of the tractor operable ground in the total treatment area less than 20 percent slope GIS computation.

For the FEIS, reforestation treatments with TBR (Timber Emphasis) management prescription areas were estimated based on the percentage of alternative treatment areas within TBR versus other management prescription areas. In the original document, machine scarification and planting acres were estimated for the nine alternatives which restricted machine treatments in portions of units proposed for harvest (Final Interim Rule). This would reduce scarification levels down to those in Alternative 4. This adjustment is projected to result in higher levels of stocking in the future to provide for better stocking. A habitat plan was prepared to provide the bulk of soil and reduced competition, natural regeneration of spruce would not occur in areas formerly projected for site preparation treatment.
### TABLES

#### Figure E-1 Reforestation and Protection Needs

<table>
<thead>
<tr>
<th>ALTERNATIVE</th>
<th>MINIMUM (acres)</th>
<th>MAXIMUM (acres)</th>
<th>MINIMUM (acres)</th>
<th>MAXIMUM (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL Reforestation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALTERNATIVE</td>
<td>MINIMUM (acres)</td>
<td>MAXIMUM (acres)</td>
<td>MINIMUM (acres)</td>
<td>MAXIMUM (acres)</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>1469</td>
<td>1909</td>
<td>497</td>
<td>646</td>
</tr>
<tr>
<td>3</td>
<td>1469</td>
<td>1909</td>
<td>497</td>
<td>646</td>
</tr>
<tr>
<td>4</td>
<td>566</td>
<td>1100</td>
<td>219</td>
<td>285</td>
</tr>
</tbody>
</table>

* Based on estimated harvest of 50-65 percent of total units.

#### Figure E-1 Reforestation and Protection Needs

<table>
<thead>
<tr>
<th>ALTERNATIVE</th>
<th>MINIMUM (acres)</th>
<th>MAXIMUM (acres)</th>
<th>MINIMUM (acres)</th>
<th>MAXIMUM (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL PLANTING (Artificial Reforestation)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALTERNATIVE</td>
<td>MINIMUM (acres)</td>
<td>MAXIMUM (acres)</td>
<td>MINIMUM (acres)</td>
<td>MAXIMUM (acres)</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>561</td>
<td>716</td>
<td>186</td>
<td>242</td>
</tr>
<tr>
<td>3</td>
<td>720</td>
<td>936</td>
<td>267</td>
<td>347</td>
</tr>
<tr>
<td>4</td>
<td>332</td>
<td>82</td>
<td>82</td>
<td>107</td>
</tr>
</tbody>
</table>

* Based on estimated harvest of 50-65 percent of total units.

#### Figure E-1 Reforestation and Protection Needs

<table>
<thead>
<tr>
<th>ALTERNATIVE</th>
<th>MINIMUM (acres)</th>
<th>MAXIMUM (acres)</th>
<th>MINIMUM (acres)</th>
<th>MAXIMUM (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL Natural Reforestation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALTERNATIVE</td>
<td>MINIMUM (acres)</td>
<td>MAXIMUM (acres)</td>
<td>MINIMUM (acres)</td>
<td>MAXIMUM (acres)</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>918</td>
<td>1193</td>
<td>311</td>
<td>404</td>
</tr>
<tr>
<td>3</td>
<td>749</td>
<td>973</td>
<td>230</td>
<td>299</td>
</tr>
<tr>
<td>4</td>
<td>553</td>
<td>719</td>
<td>137</td>
<td>178</td>
</tr>
</tbody>
</table>

* Based on estimated harvest of 50-65 percent of total units.
**Figure E-2 LOGGING SYSTEM AND FOREST PLAN EMPHASIS, ALTERNATIVE 2**

<table>
<thead>
<tr>
<th>UNIT #</th>
<th>UNIT Acres</th>
<th>Heli-Cable</th>
<th>Helicopter</th>
<th>TRACTOR</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-1</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>A-3</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>A-5</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>A-7/8</td>
<td>100</td>
<td>100</td>
<td>60</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>A-9</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>A-11</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>B-4</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>B-10</td>
<td>100</td>
<td>100</td>
<td>60</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>C-3</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>C-5</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>C-7</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>C-11</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>D-1</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>D-3</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>D-5</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>E-1</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>E-3</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>E-5</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>E-7</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>E-9</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>F-1</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>F-3</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>G-1/2</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>G-3</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>G-5</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>G-7</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>G-9</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>G-11</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>G-13</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>G-15</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>G-17</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>G-19</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>G-21</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>TOTAL</td>
<td>6240</td>
<td>6240</td>
<td>6240</td>
<td>6240</td>
<td>6240</td>
</tr>
</tbody>
</table>

*Based on gross acres as shown on maps in Chapters 1 and 2.

---

**Figure E-3 LOGGING SYSTEM AND FOREST PLAN EMPHASIS, ALTERNATIVE 3**

<table>
<thead>
<tr>
<th>UNIT #</th>
<th>UNIT Acres</th>
<th>Heli-Cable</th>
<th>Helicopter</th>
<th>TRACTOR</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-1</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>A-3</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>A-5</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>A-7/8</td>
<td>100</td>
<td>100</td>
<td>60</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>A-9</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>A-11</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>B-4</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>B-10</td>
<td>100</td>
<td>100</td>
<td>60</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>C-3</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>C-5</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>C-7</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>C-11</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>D-1</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>D-3</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>D-5</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>E-1</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>E-3</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>E-5</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>E-7</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>E-9</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>F-1</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>F-3</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>G-1/2</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>G-3</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>G-5</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>G-7</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>G-9</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>G-11</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>G-13</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>G-15</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>G-17</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>G-19</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>G-21</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>TOTAL</td>
<td>6240</td>
<td>6240</td>
<td>6240</td>
<td>6240</td>
<td>6240</td>
</tr>
</tbody>
</table>

*Based on gross acres as shown on maps in Chapters 1 and 2.
### South Manti Timber Salvage Final Environmental Impact Statement

**Appendix E - Summary Unit Information**

#### Figure E-4 LOGGING SYSTEM AND FOREST PLAN EMPHASIS, ALTERNATIVE 4

<table>
<thead>
<tr>
<th>UNIT #</th>
<th>UNIT TRACTOR HELI-CABLE HELICOPTER</th>
<th>HELICOPTER</th>
<th>TRACTOR</th>
<th>HELI-CABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-1</td>
<td>49</td>
<td>40</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>A-2</td>
<td>29</td>
<td>39</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>A-3</td>
<td>29</td>
<td>39</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>A-1/2</td>
<td>106</td>
<td>106</td>
<td>98</td>
<td>70</td>
</tr>
<tr>
<td>A-1/3</td>
<td>54</td>
<td>54</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>A-1/4</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>B-4</td>
<td>115</td>
<td>115</td>
<td>105</td>
<td>10</td>
</tr>
<tr>
<td>B-5</td>
<td>29</td>
<td>29</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>B-6</td>
<td>124</td>
<td>124</td>
<td>111</td>
<td>13</td>
</tr>
<tr>
<td>C-7</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>C-8</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>D-2</td>
<td>421</td>
<td>421</td>
<td>421</td>
<td></td>
</tr>
<tr>
<td>D-3</td>
<td>212</td>
<td>212</td>
<td>212</td>
<td></td>
</tr>
<tr>
<td>D-4</td>
<td>44</td>
<td>44</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>D-5</td>
<td>251</td>
<td>251</td>
<td>251</td>
<td></td>
</tr>
<tr>
<td>D-6</td>
<td>138</td>
<td>138</td>
<td>138</td>
<td>138</td>
</tr>
<tr>
<td>E-1</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>E-2</td>
<td>78</td>
<td>78</td>
<td>78</td>
<td></td>
</tr>
<tr>
<td>E-3</td>
<td>52</td>
<td>52</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>E-4</td>
<td>74</td>
<td>74</td>
<td>74</td>
<td></td>
</tr>
<tr>
<td>F-1</td>
<td>598</td>
<td>598</td>
<td>598</td>
<td>598</td>
</tr>
<tr>
<td>F-3</td>
<td>456</td>
<td>456</td>
<td>456</td>
<td>456</td>
</tr>
<tr>
<td>G-1/2</td>
<td>116</td>
<td>116</td>
<td>116</td>
<td>116</td>
</tr>
<tr>
<td>G-3</td>
<td>211</td>
<td>211</td>
<td>211</td>
<td></td>
</tr>
<tr>
<td>D-4</td>
<td>144</td>
<td>144</td>
<td>144</td>
<td></td>
</tr>
<tr>
<td>D-5</td>
<td>138</td>
<td>138</td>
<td>138</td>
<td></td>
</tr>
<tr>
<td>D-6</td>
<td>138</td>
<td>138</td>
<td>138</td>
<td></td>
</tr>
</tbody>
</table>

*Based on gross acres as shown on maps in Chapters 1 and 2.

---

**South Manti Harvest Plan**

The following are the proposed harvest methods and equipment needed to implement the various alternatives developed for the South Manti project.

On slopes less than 40%, the following equipment is permitted: wheel skidders, tractor, feller-buncher, and forwarders. The recommended distance between skid trails is 100 to 150 feet. Grapple equipped skidders and tractors are permitted, but to meet resource objectives a tractor or skidder equipped with a winch, capable of pulling 100 feet of rope may be required. Directional falling of trees will be required to protect resources and improvements found in the project area. These resources or improvements will be identified in the logging plan or sale area map. It is recommended that skidding takes place when soils in the area are dry or in a frozen condition. Timber sale contracts have provisions on soil displacement and disturbance and these will be enforced.

To comply with the Forest Service interim rules, logging systems, road construction, reconstruction, and landing locations have been modified from previous documents. This policy impacts logging operations associated with inventoried roadless areas and 1000 acre adjacent areas as analyzed in section 4.15. Areas where temporary roads and construction of skid roads are permitted are as follows: G-3, 4, 5, 6; A-1 3, 4, 7, 8; C-1, 2, 4, 6, and 7. In these areas, landings can be accessed by short temporary roads or work roads, skid roads can be constructed to access timber, existing closed roads can be opened and used for timber haul. Temporary roads are planned for some of the above units (see transportation plan and this write-up).

Landings, skid trails, skid roads, and work roads will be identified and approved in advance prior to construction. Tractor landings should not exceed ½ acre in size. Where tractor harvest is proposed in the inventoried roadless areas or contiguous >1000-acre areas, the following restrictions will be followed:

- Landings will be located adjacent to open maintained Forest Roads.
- Landings will be located so that no temporary road is required to access landing.
- No skid roads will be constructed but open trails/roads can be used to skid logs to the landings.
- Landings locations will be approved before construction.

### Cable/Helicopter

On slopes greater than 40% or where access or resource protection dictates, helicopter or cable yarding methods will be used. Cable yarding will be considered where temporary roads can be constructed or existing roads allows this type of harvest system. Helicopter yarding will be used in all other areas where tractor or cable harvest is not possible.

### Cable

The following is the minimum requirements recommended for cable yarding equipment:

- for distances less than 100 feet - tractor or skidder equipped with a winch
- for distances less than 300 feet - shovel loader with a single drum
- for distances greater than 300 feet - shovel loader or swing yarder with two cable drums, (capable of skyline yarding with one end suspension of the log and lateral yarding capability of 75 feet)
- fan yarding configurations with no more than 4 corridors are allowed, this is due to limited guy line anchors
- leave rub trees where possible to limit damage to residual trees
- dead man anchors will have to be constructed in unit C-4
- skyline corridors should be no wider than 15 feet
Helicopter

The minimum requirements for helicopter landing sites are 3,000 to 4,000 pound payload and a machine that is effective at 10,000 feet elevation. A helicopter in this area that meets these requirements is the K-Max. Helicopter landing sites have been identified in the South Manti document. The size of helicopter landing sites should be less than 2 acres and there could be up to 30 landings and 4 service landings. Where possible, existing tractor and helicopter landings will be used. There is no need for construction of any Helicopter pads to land woods workers at the harvest sites due to existing natural openings and topography.

Harvest Description By Alternative

A-1 - Helicopter / Alt. 2,3,4

Yard to a landing used for the Ogla Timber Sale. Landing is located adjacent to Skyline Drive (road 50150).

A-3 - Cable/ Helicopter / Alt 2,3,4

Cable yard to Skyline Drive to two landings. Unit will require a fan setting due to lack of guy line anchors in the center of the unit. Recommend unit to be yarded by a yarder capable of one end suspension. If helicopter harvest is selected use an existing landing developed for the Baldy timber sale located off road 5044.

A-4 - Helicopter / Alt. 2,3,4

Three landings have been identified for unit A-4 with one located off of road 50150 (Skyline Drive). The second landing is located at the end of a short spur road located off of Skyline Drive. The third landing is located off of road 50044. The first two locations are landings to be used for harvest of the Baldy Timber sale. The third landing will need to be constructed. Cultural resource surveys have identified sites to be protected, before any ground disturbance takes place the landing locations and harvest plans will be reviewed, and these sites will be avoided.

A-7B - Helicopter / Alt. 2,3,4

Yard to one landing located at the end of a short temporary road, which will be constructed for Duck Timber sale. The short temporary road is located off of road 50044.

A-9 - Helicopter / Alt. 2,3,4

Yard to one landing to be constructed. Landing is located in a possible contiguous 1000 acre roadless area. Landing is located off of the 50044 road, no temporary road is needed for access. This unit requires some up hill yarding of logs to the landing. Due to helicopter performance at high elevation, I would recommend this unit to be sold as Timber Subject To Agreement CT2.12.

B-4 - Tractor / Alt. 2

Tractor yard to a system road built for the Baldy Timber sale. The short spur road (51278) is located off of road 50150 (see transportation plan for road information). Unit B-4 is located in a mapped roadless area. No temporary road or constructed skid roads are permitted. To harvest the timber will require either the use of existing skid trails or a cable yarder to swing the logs to the landing. Option 1 would require a portion of the unit to be up hill tractor (cart) yarded to the landing on an existing skid trail. Option 2 is to skid the logs to a location where a cable system could yard the logs to the landing (cable swing). Both options will be evaluated by ID team members or concerned resource specialists before implementation.

B-4 - Helicopter / Alt. 3

Helicopter yard to the same landing as in alternative two. Under this alternative, it would require some up hill yarding to the landing. Due to helicopter performance at high elevation, I would recommend this unit to be sold as Timber Subject To Agreement CT2.11.

C-1/2 - Helicopter / Alt. 2,3,4

Helicopter yard to a landing located off of the 52364 road. This road and landing was constructed for the Duck Timber Sale.

C-3 - Helicopter / Alt. 2,3,4

Helicopter yard to the same landing used for A-9. Unit is at the same elevation as the landing. I would recommend this unit to be sold as Timber Subject To Agreement CT2.11.

C-4 - Helicopter / Alt. 2,3,4

Helicopter yard to landing located 200 feet off of the 50169 road. Landing requires light construction and is located near a summer sheep camp. Range specialists and sheep permit tee to be consulted before construction and timber harvest if harvest operations are during the time of permitted use.

C-6 - Helicopter / Alt. 2,3,4

Helicopter yard to existing landing located off of the 50169 road. Logs will be yarded across a road that access Blue Lake and hence, provide for flag person in the traffic control plan.

C-7 - Cable or Helicopter / Alt. 2,3,4

Designated as a cable harvest unit, this unit requires a yarder capable of one end suspension and approximately 1200 feet of temporary road to access landings. Deadman or other anchors for the yarder guylines may be necessary. Three types of anchors could be used as follows:

- first is a deadman anchor, a portion of a log is horizontally buried in the ground and a cable is attached from the log to the yarder.
- second is a bolt attached to rocks or a rod with a rotating plate that is driven in to the ground.
- the third is a mechanical anchor a tractor or other heavy equipment.

For this analysis, deadman anchors will be used as logs and needed equipment is available in the area. Before placement of the anchors engineer and or soil specialist will be consulted. Fan cable settings will be allowed to limit the number of deadman required for anchors. To limit damage to the residual trees, no more than 4 corridors per setting and utilize rub trees along the corridors where possible.

If helicopter harvest is selected, a landing which needs construction is located off of road 50169. This is also an alternative landing site for unit C-4.

C-8 - Helicopter / Alt. 2,3,4

Plan to helicopter harvest this unit to an existing landing. Yarding is up hill to the existing landing. I recommend that this unit be sold as Timber Subject To Agreement CT2.11.

D-1 - Helicopter / Alt. 2,3,4

Due to the interim road rule, the tractor harvest areas originally planned for have been changed to helicopter harvest. The landing for D-1 is the same landing planned for the D-3 unit. Due to yarding distances, volume estimates for D-1 could be less than originally planned and harvest cost will increase. I recommend that this unit be sold as Timber Subject To Agreement CT2.11.
D-2 - Helicopter / Alt. 2, 3.4
Helicopter yard unit to the landing planned for D-3. No new road construction is allowed, which increases the
yarding distances. This unit has scattered timber that is adjacent to wet areas and streams. Volume estimates
for D-2 could be less than originally planned, and unit has high logging costs. I recommend that this unit be sold
as Timber Subject To Agreement CT2.11.

D-3 - Tractor / Alt. 2, 3.4
Due to the interim road rule, the tractor harvest areas located along the western boundary have changed to
helicopter harvest. Tractor yarding units adjacent to the 50333 road will be retained. Yarding to the reconstructed
50333 road will require longer skids but will meet the interim road rule.

D-3 - Helicopter / Alt. 2, 3.4
Helicopter yard to one landing located adjacent to road 50333. This landing may be up to 2 acres in size due to
the estimated volume that is tributary to this landing. It may require more than one season to complete harvest
activities. At the end of each season, erosion control measures should be in place. Proposed unit with a yarding
distance of 1 mile or more should be sold as Timber Subject To Agreement CT2.11.

D-4/5 - Helicopter / Alt. 2, 3
Due to the interim road rule, the tractor harvest areas both within the mapped inventory roadless area and within a
1000 acre adjacent area has been changed to helicopter harvest. A landing has been located adjacent to road
50333. Estimates of volume and acres treated will be reduced; areas with yarding distance of 1-1.5 miles have
been dropped. Proposed units with a yarding distance of 1 mile be considered to be sold as Timber Subject To
Agreement CT2.11.

D-4/5 - Helicopter / Alt. 4
Helicopter harvest would only take place in areas adjacent to the inventory roadless areas. The land is the same as
in Alternatives 2 and 3, but unit volumes are reduced.

E-1/2 - Tractor / Alt. 2, 3
A large portion of E-1 and 2 is within an inventoried roadless area; the harvest plan is to tractor skid to existing
roads (52290 and 52065). Road 52290 is located in the northwest corner of E-1 just outside of the inventoried
roadless area. A landing will be located just outside of the roadless boundary on this road. The portion of the
road within the roadless area will be used as a skid trail to access this tractor unit (see Travel Management Plan).
Much of this area has been harvested in the past and has existing skid trails that will be used for this entry. The
landing will serve both a tractor and helicopter landing. The second road is road 50265 that access the Ferron
summer cabins. This road and the proposed tractor unit will be in all action Alternatives.

E-1/2 - Helicopter / Alt. 2, 3
Helicopter yard to 3 landings as follows: first landing is off of road 52290 which also serves as a tractor landing;
second landing is located adjacent to road 50022 road east of Ferron reservoir; and the third landing is located
adjacent to road 50022 road below the reservoir. The second landing will require construction and the third is an
alternate landing site. Landing sites have been located to provide flight paths to avoid the cabins were possible.
Flag persons will be required to regulate traffic during harvest operations. Summer cabin owners will need to be
informed of logging activities.

E-1/2 - Helicopter / Alt. 4
Only areas outside of the inventoried roadless boundary would be harvested to one landing identified in
Alternative 4. Some restrictions and requirements apply as in Alternative 2 and 3.
G-3 - Helicopter / Alt. 2,3,4
G-3 is split into two areas. Helicopter yard to two existing landings.

G-4 - Tractor / Alt. 2,3,4
There are up and down hill skidding to the open road. Some skidding will take place on the existing road. Areas above the perennial stream will require line skidding using a cable winch. Unit boundary is located 100 feet from the Twelve Mile Creek.

G-4 - Helicopter / Alt. 2,3,4
Helicopter yard to a landing constructed for the Six Timber sale that can be enlarged for helicopter operations.

G-5 - Helicopter / Alt. 2,3,4
Helicopter yard to one landing constructed for the Twelve Mile timber sale off of road 50022. The second landing was constructed for the Olga timber sale on the 52257 road.

G-6 - Cable/Helicopter / Alt. 2,3,4
Harvest timber to the Twelve Mile road 50022 and the Skyline Road 50150, using existing skid trails to avoid steep sections in the units and a temporary road of 400 feet. An area off of the Twelve Mile has optional cable harvest; the estimated yarding distance is 300 feet; a shovel loader equipped with tongs is adequate.

/Stephen J. Cote
Pre-Sale Technician / Logging Systems

[page intentionally left blank]
APPENDIX F
ROAD INFORMATION
APPENDIX F - SUMMARY ROAD INFORMATION

The transportation needs vary in each action alternative (see Figures 2.5, 2.6, 2.7, and F-1). All action alternatives would require reconstruction, while only Alternative 2 would construct any new Forest Development Roads (FDRs), approximately 1.1 mile. Alternatives 3 and 4 would restrict post harvest access to motor vehicles less than 50 inches in width on the last 0.5 miles of FDR 50049.

FDR Reconstruction

Where needed: place 4.5 inches aggregate surfacing, replace culverts, place additional cover material over culverts, construct turnout, improve sight distance by cutting trees, laying back cut banks, or reducing grades on vertical curves, and replacing material where the road template needs to be raised or reconstructed. Road condition surveys are needed for 50044, 52070, 50285, 52290, and 52602.

FDRs listed for reconstruction (50044, 52070, 50285, 52290, 50049, 50150, and 52333) would need reconstruction on part or all road segments.

Estimate of Specific Reconstruction Needs

FDR 52333: Reconstruct approximately 0.7 miles to eliminate steep grades and sharp curves. This segment is beyond the junction with trail 003. Survey data was collected in 1997 for use in design calculations. Also, a wider cattleguard is needed, or place a second cattleguard during haul (to make a double) and remove after haul to be placed elsewhere. Perform pre-haul maintenance on 0.9 miles. There is opportunity to close out some user developed roads in the area, as well as reclaim the north half of the loop, as identified in 1995 when Rangers and specialists met to discuss transportation needs.

FDR 50044: Approximately 5.2 miles of road (or segments along this stretch) would receive 4.5" of aggregate, depending on resource concerns and the volume of timber to be removed. Previous decisions on aggregate placement have been based on 5 to 10 MMFB haul over the road before aggregate placement becomes economical.

FDR 50049: For haul over Duck Fork Reservoir embankment, the Forest would place 12" of aggregate over the 125' embankment for load distribution. Following harvest activity, approximately 8" of aggregate will be removed from the embankment and placed on road #50049 in areas where the most benefit will be realized. The Forest Service does not plan to disturb the emergency spillway hydraulically. The gradient beyond the dam is unsuitable for haul trucks, and requires reconstruction for approximately 0.5 miles. Following harvest activity, motorized vehicles using road #50049 will be restricted to those less than 50" in width for the last 0.5 miles. Gating, barricading, and signing is intended to manage this restriction. User developed roads spurring off of the #50049 between Duck Fork reservoir and Lake Fork Creek are identified for reclamation as funds become available.

FDR 50150: Additional turnout sites or flagmen during hauling operations are needed throughout the full bench section above Emerald Lake. Forest Service intends each to be standard 65' length, with 50' spacers. A disposal site for the excavated material needs to be determined. Also, replace the cattleguard south of Twelvermile Flat Campground.

FDR 51170: Perform pre-haul maintenance and install a culvert.

FDR 52065: Curve widening, addition of aggregate to the intersection of 52065 and 50022, and installation of a culvert, if necessary.

FDR 52290: Drainage treatment is expected where the road crosses an intermittent stream.

Summary of Construction and Reconstruction

<table>
<thead>
<tr>
<th>Unit</th>
<th>New Construction Temporary Work Road</th>
<th>New Construction System Road</th>
<th>Reconstruction</th>
<th>Road Management Post Harvest</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-1, 2, E-1, 2, 3, 4, 5</td>
<td>0.7 (52333)*</td>
<td>LC, ML2, TSL D</td>
<td>LC, ML2, TSL-D</td>
<td>LC, ML2, TSL-D</td>
</tr>
<tr>
<td>E-3</td>
<td>0.1 (52070)*</td>
<td>LC, ML2, TSL-D</td>
<td>LC, ML2, TSL-D</td>
<td>LC, ML2, TSL-D</td>
</tr>
<tr>
<td>E-3</td>
<td>0.2 (50285)</td>
<td>LC, ML2, TSL-D</td>
<td>LC, ML2, TSL-D</td>
<td>LC, ML2, TSL-D</td>
</tr>
<tr>
<td>E-3</td>
<td>0.9 (50049)</td>
<td>0.4 miles: LC, ML1, TSL-D</td>
<td>0.5 miles: motorized use restricted to width less than 50&quot;</td>
<td></td>
</tr>
</tbody>
</table>

* In addition to reconstruction, pre-haul maintenance is necessary. TS operator will perform maintenance under CT 5.411.

F = Forest Service
TS = Timber Sale
LC = Long term road, Constant use
L = Long term road, Intermittent use
ML1 = Maintenance Level 1 = System Road, closed to public use
ML2 = Maintenance Level 2 = System Road, maintained for high clearance vehicles, seasonal use
TSL = Traffic Service Level

Road Reclamation: System roads, non-system roads, temporary roads

The following are Forest Development Roads (system roads) not used as haul routes, but identified for reclamation when funding becomes available (see Figure F-1 for location). 50285: The southwest trending leg of road #50285 is not needed for management of Forest resources. Additionally, its proximity with Little Horse Creek and multiple unprotected stream crossings is undesirable for water quality.

52333: Most of the north half of the this loop road would be reclaimed up to the local marker "Dewey Jensen" tree across Slide Fork. The south half would remain a system road, open seasonally to public use. Other damage is occurring in this same area due to ATV and 4x4 vehicles illegally creating trails. These trails would be reclaimed as funding becomes available.

51278: Under Alternative 4, this would not be used as a haul road and becomes listed for reclamation when funding becomes available. (0.2 miles)

52366: 0.2 miles; no longer needed for management of Forest resources.
50024: 0.3 miles from the intersection with 50022 to where it intersects 51170, the Old Baldy Guard Station road because 1: there is alternate access, 2: existing conditions are unsafe, and 3: resource damage is occurring.

Nonsystem roads were identified for reclamation in the 1996 Environmental Assessment, however funding for completing this has not yet been allocated. The same roads are listed again in this document to maintain awareness and to encourage funding action. Additionally, 0.9 miles of nonsystem roads were identified by aerial photos and orthophotos adjacent to the Duck Fork road, beyond the reservoir. For a map of these roads, see Figure F-1.

Temporary roads used for harvest activity will be reclaimed by the purchaser at the conclusion of harvest activity.

The roads identified for reclamation would be reclaimed as follows:

1. Remove drainage structures, reshape or re-contour the road prism at drainage channel crossings and at locations where the road prism affects the function of the flood plane, or where road prisms traverse unstable slopes as directed by the Forest Hydrologist.

2. Construct waterbars at appropriate spacing, (determined by hydrologist and engineer) so that the road surface does not concentrate surface runoff and cause rill or gully erosion.

3. Scarify all road surfaces to loosen soil and prepare a seed bed. Rip road template at locations specified by the hydrologist to improve water infiltration.

4. Revegetate disturbed areas with appropriate seed mixes or seedlings.

5. Control motorized vehicle access on reclaimed roads by incorporating one or more of the following, as directed by an interdisciplinary team:
   - install earth, rock, or log barrier at entrance
   - install buck and pole fence at entrance, possibly more than one installation
   - install gate
   - re-contour reclaimed road within sight distance from an existing road at entrance, based on geography, landscape, visuals, etc.
   - scattering of large, woody debris or other available material over reclaimed road

6. Install signs (e.g. "Reclamation Area for Resource Protection, Please Do Not Travel Beyond This Sign.") in compliance with Forest or District signing policies.

Prepared by: Martha DeFreest and Rob Davies
The following use codes from contract provision CTS-12# - Use of Roads by Purchaser (6/99) would be applicable to the following roads if used to access timber harvest units.

**USE CODE**

**Hauling Prohibited.** This use code prohibits loaded trucks from hauling on the road, but permits other vehicle traffic as long as it does not damage the road or resources and can be done safely.

**X**

<table>
<thead>
<tr>
<th>FDR NO.</th>
<th>NAME</th>
<th>TERMINI AND NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>50013</td>
<td>Blue Lake</td>
<td>From the junction with Skyline Drive Road (FDR 50150) southeast to Mile Post 0.8.</td>
</tr>
<tr>
<td>50022</td>
<td>Ferron-Mayfield</td>
<td>From the junction with Unnamed Road (FDR 52070) east to the Manti-La Sal National Forest Boundary.</td>
</tr>
<tr>
<td>50043</td>
<td>South Side</td>
<td>From the junction with Skyline Drive Road (FDR 50150) southeast to the Ferron-Mayfield Road (FDR 50022).</td>
</tr>
<tr>
<td>50044</td>
<td>Link Canyon</td>
<td>From the junction with the reconstructed section of Unnamed Road (FDR 52333) southeast to the Manti-La Sal National Forest Boundary.</td>
</tr>
<tr>
<td>50047</td>
<td>Six Mile</td>
<td>From the South Manti Project Area Boundary northwest to the Manti-La Sal National Forest Boundary.</td>
</tr>
<tr>
<td>50150</td>
<td>Skyline Drive</td>
<td>From the junction with Unnamed Road (FDR 52237) north to Forest Highway 8.</td>
</tr>
<tr>
<td>50161</td>
<td>Baseball Flat</td>
<td>From the junction with Skyline Drive Road (FDR 50150) south to the Manti-La Sal National Forest Boundary.</td>
</tr>
<tr>
<td>50285</td>
<td>Little Horse Creek</td>
<td>From the junction with Ferron-Mayfield Road (FDR 50022) west to the east boundary of Section 26.</td>
</tr>
<tr>
<td>52290</td>
<td>Unnamed</td>
<td>From the southern end of the reconstructed section south to end of road.</td>
</tr>
</tbody>
</table>

**USE CODE**

**Hauling Restricted.** This use code restricts use of the road for resource purposes or safety. A typical restriction is: "No hauling during weekends, holidays, and the day before the opening date and during the first 2 days of the general elk and deer hunts."

**R**

<table>
<thead>
<tr>
<th>FDR NO.</th>
<th>NAME</th>
<th>TERMINI AND NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>50013</td>
<td>Blue Lake</td>
<td>From Mile Post 0.8 northeast then northwest to end of road.</td>
</tr>
<tr>
<td>50022</td>
<td>Ferron-Mayfield</td>
<td>From the junction with Unnamed Road (FDR 52070) west to the Manti-La Sal National Forest Boundary.</td>
</tr>
<tr>
<td>50044</td>
<td>Link Canyon</td>
<td>From the junction with the reconstructed section of Unnamed Road (FDR 52333) north and north western the junction with Skyline Drive Road (FDR 50150).</td>
</tr>
<tr>
<td>50047</td>
<td>Six Mile</td>
<td>From the South Manti Project Boundary south to the junction with the Ferron-Mayfield Road (FDR 50022).</td>
</tr>
</tbody>
</table>

**USE CODE**

**Unsuitable for hauling prior to completion of agreed reconstruction.** This use code places the purchaser on notice that they will have to perform some reconstruction before they can use the road.

**U**

<table>
<thead>
<tr>
<th>FDR NO.</th>
<th>NAME</th>
<th>TERMINI AND NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>50150</td>
<td>Skyline Drive</td>
<td>From the junction with the Baseball Flat Road (FDR 50161) northwest and south to the Fishlake National Forest Boundary.</td>
</tr>
</tbody>
</table>

**USE CODE**

**Use prohibited.** This use code prohibits all use of the road and would normally apply to a road that is physically blocked.

**P**

<table>
<thead>
<tr>
<th>FDR NO.</th>
<th>NAME</th>
<th>TERMINI AND NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>This code would not be applicable to any South Manti Project roads.</td>
</tr>
</tbody>
</table>
### USE CODE
Public use restriction. This use code would restrict public use of a road during or following operation of the sale. This code was added to provision C(7)/S.128 on 6/99.

<table>
<thead>
<tr>
<th>FDR NO.</th>
<th>NAME</th>
<th>TERMIN AND NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>50285</td>
<td>Little Horse Creek</td>
<td>From the junction with Unnamed Road (FDR 50285) southeast to the junction with the ATV trail. This code would apply to the proposed 1.1 miles of construction in Alternative 2. Beginning of construction would be at a junction with the Little Horse Creek Road (FDR 50285) and proceed to the southwest to end of construction. Following a timber sale operation this road will be closed and become a Level 1 maintenance road.</td>
</tr>
<tr>
<td>Unnumbered</td>
<td>Unnamed</td>
<td>From the junction with Skyline Drive Road (FDR 50150) west and north to end of road. Constructed for Baldy Timber Sale. Following a timber sale operation, the road will be reclaimed.</td>
</tr>
<tr>
<td>51278</td>
<td>Unnamed</td>
<td>From the junction with Six Mile Road (FDR 50047) northwest to end of road. Constructed for Six Timber Sale. Following a timber sale operation this road remains a Level 1 maintenance road.</td>
</tr>
<tr>
<td>51280</td>
<td>Unnamed</td>
<td>From the junction with Six Mile Road (FDR 50047) southwest and west to end of road. Constructed for Six Timber Sale. Following a timber sale operation this road remains a Level 1 maintenance road.</td>
</tr>
<tr>
<td>51282</td>
<td>Unnamed</td>
<td>From the junction with Link Canyon Road (FDR 50044) west to the junction with Unnamed Road (FDR 52364). Constructed for Duck Timber Sale. Following a timber sale operation this road remains a Level 1 maintenance road.</td>
</tr>
<tr>
<td>52363</td>
<td>Unnamed</td>
<td>From the junction with Unnamed Road (FDR 52363) southwest to end of road. Constructed for Duck Timber Sale. Following a timber sale operation the road will remains a Level 1 maintenance road.</td>
</tr>
</tbody>
</table>

### USE CODE
Regulation waiver. This use code would allow a waiver of a regulation that may be established on a road. As an example, a road may have a bridge with a 30 Ton weight limit. The Forest Service could waive the restriction on the use of the road if the purchaser would agree to install more support beams to increase the weight limit to 40 Tons. This code was added to provision C(7)/S.128 on 6/99.

<table>
<thead>
<tr>
<th>FDR NO.</th>
<th>NAME</th>
<th>TERMIN AND NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td></td>
<td>This code would not be applicable in any South Manti Project roads.</td>
</tr>
</tbody>
</table>
APPENDIX G

PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS
Appendix G - Past, Present, And Reasonably, Foreseeable Future Actions

FIGURE G-1
Summary of Past Actions

<table>
<thead>
<tr>
<th>MINERALS</th>
<th>TIMBER</th>
<th>EFFECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975-1985</td>
<td>Camel Rock (North Limestone Quarry) KEHWN, Sec. 19, T. 19 S., R. 4 E., SLN</td>
<td>Pine = 3 ac; 1,500 ft. of road x 30 ft. wide = 1 ac. Total Dist. = approx. 4 ac. Vegetation has been removed and erosion has increased along the access roads. It would take approx. 1 year to restore understory vegetation to 50% of original ground cover following reclamation. 4 ac.</td>
</tr>
<tr>
<td>1994</td>
<td>Camel Rock (South Limestone Quarry) KEHWN, Sec. 20, T. 19 S., R. 4 E., Same as Above. 5 ac.</td>
<td>Laminitis and deforestation. Pine = 3 ac; 2,500 ft. of road x 30 ft. wide = 17 ac. Total Dist. = approx. 25 ac.</td>
</tr>
<tr>
<td>2001</td>
<td>Baseball Flat Limestone Quarry (NHW), Sec. 19, T. 20 S., R. 4 E., SLN</td>
<td>Pine = 2 ac; 3,000 ft. of road x 30 ft. = 1 ac. Total Dist. = approx. 20 ac.</td>
</tr>
<tr>
<td>1994-2005</td>
<td>High Top Limestone Quarry (SHB), Sec. 5, T. 19 S., R. 4 E., SLN</td>
<td>Same as Above. 6 ac.</td>
</tr>
</tbody>
</table>

RANGE & WILDLIFE

<table>
<thead>
<tr>
<th>TIMBER</th>
<th>EFFECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>Black Mountain &quot;rescribed Burn; 800 ac., T. 19 S., R.3 E., Sec. 9, 16, 17</td>
</tr>
<tr>
<td>1995</td>
<td>Whiskey Hill Prescribed Burn 1990 ac., T. 19 S., R. 3 E., Sec. 17, 20, 21, 29, 35, 34</td>
</tr>
<tr>
<td>1995</td>
<td>Justice Flat Prescribed Burn 1900 ac., about 150 actually burned, T. 20 S., R. 4 E., Sec. 26, 27, 34, 35, 36</td>
</tr>
<tr>
<td>1992</td>
<td>Duck Fork Prescribed Burn 400 ac., T. 19 S., R. 4 E., Sec. 11, 12</td>
</tr>
<tr>
<td>1992</td>
<td>Six Mile Prescribed Burn 300 ac., T. 19 S., R. 4 E., Sec. 2</td>
</tr>
<tr>
<td>1993</td>
<td>Beaver Prescribed Burn 1900 ac., T. 20 S., R. 3 E., Sec. 7, 18, 16, 17, 19, 20, 21</td>
</tr>
</tbody>
</table>

SOIL & WATERSHED

<table>
<thead>
<tr>
<th>TIMBER</th>
<th>EFFECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>A soil and water improvement project of about 300 acres was completed on Ferron Mountain in the MI Creek drainage of the Ferron Creek watershed in about 1965. The project consisted of contour trenching, which controlled excessive soil erosion that was occurring at the time.</td>
</tr>
</tbody>
</table>

RECREATION

<table>
<thead>
<tr>
<th>TIMBER</th>
<th>EFFECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>Ferron Reserve Campground Sevinl Spray Project. Spray tree species with Sevin throughout the campground. In 1995, 75 tree sprays were done. In 1996, 49 tree sprays were done.</td>
</tr>
<tr>
<td>1995</td>
<td>Ferron Reserve Summer Home and Lodge Area Sevinl Spray Project. Spray Engelmann spruce trees with Sevin within the summer home area. In 1995, 40 tree sprays were done.</td>
</tr>
<tr>
<td>1995</td>
<td>Pocket gopher populations reduced. Higher survival of hand planted spruce seedlings.</td>
</tr>
</tbody>
</table>

TIMBER

<table>
<thead>
<tr>
<th>TIMBER</th>
<th>EFFECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>Timber Canyon Gopher Control Project. Placement sympathetic treated mats in cockpit gopher's underground burrows. About 810-90 acres were treated during the fall of 1995 and again in the spring of 1996. In 1995, 70 tree sprays were done. In 1996, 49 tree sprays were done.</td>
</tr>
<tr>
<td>1999</td>
<td>Timber Canyon Gopher Surface Retreatment. About 30,000 Engelmann spruce seedlings were hand planted on 300 acres during the spring of 1991. The remaining 30 acres were planted in 1991. Approximately 60 acres were reseeded in 1999 due to a reestablishment failure caused by drought. Fencing was installed to keep livestock out of both plantations for 10-15 years. In 1999, 70 tree sprays were done. In 1996, 49 tree sprays were done.</td>
</tr>
<tr>
<td>1999</td>
<td>Timber Canyon Gopher Surface Slash Disposal. About 300 acres were chopped and scattered. Landing slash piles were burned in the fall of 1997. In 1997, 2000 acres were burned. In 1998, 49 tree sprays were done.</td>
</tr>
</tbody>
</table>

In general the site is in good condition because of the mentioned rehabilitation efforts. The South Fork District Office reported that there are no negative effects from the campground to other resources at all.

The campsite is in good condition and all 3 have universally accessible services. Overall, the Forest Service facilities are in good shape.

According to the Forest District Office there are no negative effects to any other resources resulting from development and/or use at this resource. Problems with septic system at resort may be affecting water quality of Ferron Reserve.

In consequence the type of use at these lakes and reservoir, and the ending of the dispersed use at "Twinlees Flat", negative effect to associated resources is nil.
### Appendix G - Present, And Reasonably, foreseeable Future Actions

#### TIME PERIOD

<table>
<thead>
<tr>
<th>Time</th>
<th>TIMING</th>
<th>PAST</th>
<th>EFFECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>Twentieh Timber Sale Slash Disposal. Slash within 200 feet of Fernon-Mayfield Road and Twentieh Flat Campground were burned. The area is about 11 acres with about 12 Tons of slash per acre. Another 180-195 acres were taped and scattered. Slash piles were burned in the fall of 1997.</td>
<td>T. 19 S. R. 4 E., Sec. 29</td>
<td>Reduction of fuel loading, improve visual appearance adjacent to Twentieh Flat Campground and along the Fernon-Mayfield Road. Air quality remains unaffected by smoke for 1 to 2 days.</td>
</tr>
</tbody>
</table>

---

### South Manti Timber Salvage Final Environmental Impact Statement

#### TRANSPORTATION

<table>
<thead>
<tr>
<th>Time</th>
<th>TIMING</th>
<th>PAST</th>
<th>EFFECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994 - 1999</td>
<td></td>
<td></td>
<td>The traffic mix will benefit from construction projects that placed surfacing, improved alignment, or provided additional turnouts. Specifically for aggregate placement, benefits will be improved operational costs and continued access during wet weather conditions and the environment will benefit from reduced fugitive dust.</td>
</tr>
<tr>
<td>1994 - 1995</td>
<td>The Twentieh sale has paid for the reconstruction of 940 feet of narrow and steep roadway and 3.85 miles of reconstructing roadway on the Fernon-Mayfield road, (2002). Aggregate has been placed on 1.65 miles of road (6 layers) in this project area.</td>
<td>The Oga sale constructed 2 roads south of Twentieh campground, adding 2.5 miles of road to the transportation system.</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>The Thirty sale constructed 0.2 miles (51796), 0.1 miles (52595), reconstructed 0.7 miles on M004 (aggregate placement), reconstructed 50168 by replacement, reconstructed 1.3 miles on 50110 (aggregate placement) and 20151 (0.1 miles aggregate placement, 0.9 miles reconstruction), and added 0.2 miles of the old 50136 alignment.</td>
<td>The Six and Duk timber sales constructed 1.0 miles (51929), 0.1 miles (51091), and 0.4 miles (51092), constructed 0.5 miles extending 50112; constructed 0.7 miles (52695), 0.3 miles (52696), 0.2 miles (52695), and 0.1 miles (52696); constructed 3.4 miles (2002 east of Twentieh campground), 0.72 miles (51175), 0.35 miles (501103), 3.4 miles (50044 aggregate placement, 0.5 miles (50199), 0.65 miles (20636), obliterated 0.38 miles (old 51175 alignment)</td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>The development of South Skyline Gravel Source (near BaseBall Field) adds construction equipment to the Skyline Drive as well as placement of aggregate surfacing (also on Skyline Drive).</td>
<td>Continued placement of aggregate out of South Skyline Gravel Source improves the travelway on Skyline drive.</td>
<td></td>
</tr>
</tbody>
</table>

#### Mine Ranges

<table>
<thead>
<tr>
<th>Time</th>
<th>TIMING</th>
<th>PRESENT</th>
<th>EFFECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994 - 1999</td>
<td></td>
<td></td>
<td>None</td>
</tr>
</tbody>
</table>

#### RANGE & WILDLIFE

<table>
<thead>
<tr>
<th>Time</th>
<th>TIMING</th>
<th>PRESENT</th>
<th>EFFECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 90</td>
<td>Jungle Prescribed Burn. 2000 ac.</td>
<td>T. 19 S. R. 4 E., Sec. 13, 18, 19, and 24.</td>
<td>Burn will be spotty and where it burns hot there may be soil loss until ground cover can be established, usually between 3 to 5 years.</td>
</tr>
</tbody>
</table>

#### SOIL & WATER

<table>
<thead>
<tr>
<th>Time</th>
<th>TIMING</th>
<th>PRESENT</th>
<th>EFFECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>No soil and watershed improvement projects are being conducted in the project area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Soil conditions have improved from past projects on Fernon Mountain.</td>
</tr>
</tbody>
</table>
South Manti Timber Salvage Final Environmental Impact Statement
Appendix G - Past Present, And Reasonably, Foreseeable Future Actions

TIMBER

- 1296-present
  - Baby Timber Sale: Commercial salvage of 5,888 MFBF of dead Engelmann spruce saw timber on 111 acres. Construction and reconditioning of roads in T. 19 S., R. 4 E., Sec. 7, 17, 18, 32, and 33, and in T. 29 S., R. 4 E., Sec. 5, 6, 17, 18, and 19.
  - Road construction and reconditioning has been completed. Harvest started in 1987. Slash work, thinning, and planting for Baby II was completed in 1987. Slash work and thinning for Baby III, 11, and 12 was completed in 1989. Planting is scheduled for 2000.

- 1296-present
  - Duck Timber Sale: Commercial salvage of 8.117 MFBF of dead and infected Engelmann spruce saw timber on 726 acres. This sale will harvest timber using both tractor skidding and helicopter loading. Construction and reconditioning of roads in T. 19 S., R. 4 E., Sec. 14, 15, 16, and 21, T. 20 S., R. 4 E., Sec. 3, 9, 10, 17, 18, 19, and 20.
  - Road construction and reconditioning is ongoing. Timber has been removed from 3 plots. Slash work and thinning are scheduled for 2000. Placering is scheduled for 2001.

- 1296-present
  - Six Timber Sale: Commercial salvage of 3,964 MFBF of dead and infected Engelmann spruce saw timber on 201 acres. This sale will harvest timber using both tractor skidding and helicopter loading. Construction and reconditioning of roads in T. 19 S., R. 4 E., Sec. 7, 17, 18, 20, 21, 22, 26, 27, and 29.
  - Road construction and reconditioning is ongoing. Harvest started winter of 1998-1999. Slash work and thinning was completed for Six 28, 29, and 34 in 1998. Placering is scheduled for 2000.

2000
  - Treadle Camground Salvage Project: Engelmann spruce trees infected with spray bark beetles will be cut and removed from the developed camground. The remaining uninfected trees were sprayed with Sevinol.
  - Seventy percent of the spruce trees survived during the spruce bark beetle epidemic in surrounding areas. Salvage of the dead and dying will occur in 2000. No road construction will occur. Slash work is also planned for 2000. Reforestation is planned for 2000.

2000
  - Treadlevele Camground Sevinal Spray Project: Engelmann spruce trees infected with spray bark beetles were cut and removed from the developed camground. The remaining uninfected trees were sprayed with Sevinol.
  - Fire and harvest of the dead and dying is planned for 2000. No road construction will occur. Associated slash work is planned for 2000/2001. Reforestation is planned for 2001.

2000
  - Ferron Reservoir Summer Home and Lodge Area Sevinal Spray Project: Salvage harvest of dead and dying trees for public safety and protection of facilities. T. 19 S., R. 4 E., Sec. 22.
  - Reforestation is planned for 2001.

2000
  - Emerald Lake Sevinal Spray Project: About 255 Engelmann spruce trees were sprayed with Sevinol in the dispersed recreation area around Emerald Lake. T. 25 S., R. 4 E., Sec. 17.
  - Reforestation is planned for 2001.

FIGURE G-3
Summary of Reasonably Foreseeable Future Actions (within ten years; 1995-2005)

Transportation

- 2000-2005
  - The Baby Timber Sale, adding approximately 6 vehicles per day (VDP), is active until the end of the 2000 harvest season. The Six Timber Sale, adding approximately 1 VDP, is active until the end of the 2001 season. The Duck Timber Sale, adding approximately 7 VDP, is active until the end of the 2003 harvest season.

TUNING

- 1999-2003
  - Isolated tree heights. High frequency fire events could occur during periods of average to dry climate conditions. Low intensity, low frequency fire events could occur during below average precipitation cycles at a statistical frequency of 1 in 300 years.

- 1995-2003
  - Future high intensity, low frequency stand replacement fire events could reduce soil productivity, increase erosion, alter conditions of upland and montane ecosystems, and increase potential for wildfires.

- 1999-2003
  - Naturally occurring fires have impacted the South Manti landscape for thousands of years and are expected to continue. Human-caused fires are also reasonably foreseeable.

- 1999-2005
  - Continued use access, protection of resources, sediment reduction, and investments.
APPENDIX H

STREAM CROSSINGS
**APPENDIX H - STREAM CROSSINGS**

<table>
<thead>
<tr>
<th>Stream Name</th>
<th>Legal Description</th>
<th>Type of Road Work</th>
<th>Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unnamed Tributary to Indian Creek</td>
<td>T19S, R4E, Sec 21 SW1/4, SW1/4</td>
<td>Reconstruction #50022</td>
<td>2, 3, and 4</td>
</tr>
<tr>
<td>Little Horse Creek</td>
<td>T19S, R4E, Sec 23 SE1/4, SE1/4</td>
<td>Reconstruction #52070</td>
<td>2 and 3</td>
</tr>
<tr>
<td>Tributary to Little Horse Creek</td>
<td>T19S, R4E, Sec 24 SW1/4, SW1/4</td>
<td>Reconstruction #50285</td>
<td>2</td>
</tr>
<tr>
<td>Tributary to Little Horse Creek</td>
<td>T19S, R4E, Sec 26 NW1/4, SE1/4</td>
<td>Construction #50285</td>
<td>New</td>
</tr>
<tr>
<td>Tributary to North Fork Muddy Creek</td>
<td>T20S, R4E, Sec 5 NE1/4, SE1/4</td>
<td>Reconstruction #50044</td>
<td>2, 3, and 4</td>
</tr>
<tr>
<td>Tributary to North Fork Muddy Creek</td>
<td>T20S, R4E, Sec 4 SW1/4, SW1/4</td>
<td>Reconstruction #50044</td>
<td>2, 3, and 4</td>
</tr>
<tr>
<td>Beaver Creek</td>
<td>T20S, R4E, Sec 22 NW1/4, NW1/4</td>
<td>Reconstruction #50044</td>
<td>2, 3, and 4</td>
</tr>
<tr>
<td>Fish Creek</td>
<td>T20S, R4E, Sec 27 NW1/4, NW1/4</td>
<td>Reconstruction #50044</td>
<td>2, 3, and 4</td>
</tr>
<tr>
<td>Tributary to Slide Fork Creek</td>
<td>T20S, R4E, Sec 27 SW1/4, SW1/4</td>
<td>Reconstruction #50044</td>
<td>2, 3, and 4</td>
</tr>
<tr>
<td>Slide Fork Creek</td>
<td>T20S, R4E, Sec 27 SW1/4, SW1/4</td>
<td>Reconstruction #50044</td>
<td>2, 3, and 4</td>
</tr>
</tbody>
</table>

**LEGEND:**
- Stream Crossings with roads to be constructed or reconstructed
- Project Boundary
- Streams
- Road Reconstruction
- Road Construction
- Open system road
- System road to be reclaimed, 50385, 53333, 52396, 60005, 51263
- System road to be closed after use by the project, level 1
APPENDIX I
NATIONAL FOREST MANAGEMENT ACT CONSISTENCY
APPENDIX I - NFMA CONSISTENCY

Because this analysis involves vegetative management treatments, NFMA compliance items covered under 36 CFR 219.27(b) "Vegetative Manipulation", 36 CFR 219.27(c) "Silvicultural Practices", and 36 CFR 219.27(d) "Eve...ng Management" is summarized below:

Vegetative Manipulation

219.27 (b)(1): "Be best suited to the multiple use goals established for the area with potential environmental, biological, cultural resource, aesthetic, engineering, and economic impacts, as stated in the regional guides and forest plans."

In Chapter 4, each resource is evaluated as to how each alternative addresses multiple use goals that are inherent in the Forest Plan standards and guides (S&G). As described in these effects discussions, all action alternatives comply with Forest Plan S&G. The Forest Plan S&G are a product of the Regional guides developed specifically for the Manti-La Sal National Forest.

219.27 (b)(2): "Assure that lands can be adequately restocked as provided in paragraph (c)(3) of this section, except where permanent openings are created for wildlife habitat improvement, vistas, recreation uses and similar practices."

No permanent openings are being created by harvest activities under any alternative. There are no regeneration harvest treatments prescribed under any alternative. Any areas requiring regeneration are a direct result of spruce beetle activity and not directly caused by harvest activity.

219.27 (b)(3): "Not be chosen primarily because they will give the greatest dollar return or the greatest output of timber, although these factors will be considered."

While economics and outputs are considered, additional factors related to reducing the impacts of the spruce beetle and protection of resources within the project area as described in Chapters 3 and 4 will also be used to determine the best action to implement. The reasons for the decision will be fully described in the Record of Decision.

219.27 (b)(4): "Be chosen after considering the effects on residual trees and adjacent stands."

Areas proposed for treatment under the Action Alternatives were those most impacted by the spruce beetles, at the highest risk of future loss, and/or had potential to put other stands at risk if beetle activity continues. Effects on other stands and residual trees are discussed in Chapter 4.

219.27 (b)(5): "Avoid permanent impairment of site productivity and ensure conservation of soil and water resources."

SWCPs implemented in project design and contract initiation are designed to minimize impacts of soil and water resources. These are discussed in Chapter 4 and Appendix D. Contract provisions will be used that implement SWCPs, such as directional felling, designated skid trails, landings, etc.

219.27 (b)(6): "Provide the desired effects on water quantity and quality, wildlife and fish habitat and other resource yields."

The analysis of the No Action Alternative shows that there would be an increase in water yield of 10 percent in the affected watersheds (Chapter 4). Salvage harvest (created openings) in the Action Alternatives would have no significant additive effects compared to the increases in water yield predicted under no action. Affects to water quality and fish habitat would be negligible from the Action Alternatives, due to the implementation of the required SWCPs.

219.27 (b)(7): "Be practical in terms of transportation and harvesting requirements, and total cost of preparation, logging, and administration."

The transportation and harvest methods described are capable of being implemented, based on the Silvicultural information and transportation plan and feasibility report (Refer to the Project file). The economic analysis as outlined in Chapter 4 demonstrates that all costs are within expected revenues.

Silvicultural Practices

219.27 (c)(1): "No timber harvesting shall occur on lands classified as not suited for timber production pursuant to 219.14 except for salvage sales. These lands shall continue to be treated for reforestation purposes if necessary to achieve the multiple-use objectives of the plan."

Treaty has been discussed under the section 3.6 Forest Health, Diversity, and Productivity. Based on discussions in this section, all harvest activities proposed are in full compliance with this management requirement.

219.27 (c)(2): "The selected sale schedule provides the allowable sale quantity for the first planning period. Within the planning period, the volume of timber to be sold in any one year may exceed the annual allowable sale quantity so long as the total amount does not exceed the allowable sale quantity. Nothing in this paragraph prevents salvage or sanitation harvesting of timber stands which are substantially damaged by fire, windthrow, or other catastrophic, or which are in imminent danger of insect or disease attack and where such harvests are consistent with silvicultural and environmental standards. Such timber may either substitute for timber that would otherwise be sold under the plan or, if not feasible, be sold over and above the planned volume.

Portions of the volume to be sold under the Proposed Action or other Action Alternatives may contribute to the allowable sale quantity (ASQ) for the first planning period for the Forest Plan. Sale of any volume proposed under the Proposed Action or Action Alternatives would not result in exceeding the ASQ for the planning period because salvage or sanitation harvesting may either substitute for timber that would otherwise be sold under the plan or, if not feasible, be sold over and above the planned volume.

Volumes sold off of lands classified as unsuited for timber harvest would not contribute to the ASQ. Refer to "Forest Land Suitability" for acres classified as unsuitable.

219.27 (c)(3): "When trees are cut to achieve timber production objectives, the cuttings shall be made in such a way as to assure that the technology and knowledge exists to adequately restock the lands within 5 years after final harvest. Research and experience shall be the basis for determining whether the harvest and regeneration practices planned can be expected to result in adequate restocking."

NFMA requires that timber be harvested from National Forest Systems lands only where there is assurance that such lands can be adequately restocked within 5 years of final harvest (16 U.S.C. 1554).

Under the Proposed Action, and other Action Alternatives, dead, dying and spruce beetle infested trees are being cut. Only in the areas where spruce beetle populations have killed substantial numbers of trees would an unstocked opening be created, and regeneration activity be necessary. Regeneration in these areas is not a result of silvicultural treatments aimed at achieving timber production objectives, but are a result of site rehabilitation on areas impacted by a major disturbance event (spruce beetle infestation). Therefore, the NFMA 5 year requirement does not apply to regeneration activities proposed under the Proposed Action, or any Action Alternative.

Monitoring would be used to assess the success of regeneration efforts following project completion. Desired results and forest plan standards would be specifically stated in the detailed silvicultural prescriptions written for each area. The details of the monitoring plan are in Appendix D.
Although the Manti-La Sal National Forest has had limited experience planting in these forest types, experience from forests of similar elevation and habitat types indicates stands in the project area requiring regeneration activity following implementation of the Proposed Action, or other Action Alternatives, can be successfully regenerated in accordance with the National Forest Management Act (NFMA 1976) requirements.

219.27 (c)(4). "Cultural treatments such as thinning, weeding and other partial cutting may be included in the forest plan where they are intended to increase the rate of growth of remaining trees, favor commercially valuable tree species, favor species age classes which are most valuable for wildlife, or achieve other multiple-use objectives."

No commercial thinning treatments are proposed in any of the alternatives. Some release and weeding cultural treatments are included in the design features of the action alternatives. These treatments are in compliance with the objectives stated in 219.27 (c)(4) and Forest Plan S&Gs.

219.27 (c)(4). "Harvest levels based on intensified management practices shall be decreased no later than the end of each planning period if such practices cannot be completed substantially as planned."

This applies to Forest Plan level decisions, not to project level decisions.

219.27 (c)(5). "Timber harvest cuts designed to regenerate an even-aged stand of timber shall be carried out in a manner consistent with the protection of soil, watershed, fish ... resources, and the regeneration of the timber resource."

No treatments designed to regenerate even-aged stands are proposed under the Proposed Action or other Action Alternatives. However, as discussed in Chapters 3 and 4, the SWCP's are designed to protect soil, water, and stream resources. Pertinent SWCP's are retention of adequate ground cover, harvest restrictions in critical soil and watershed areas, wet condition restrictions, designated skid trails, and ripping of skid trails.

219.27 (c)(7). "Timber harvest and other silvicultural treatments shall be used to prevent potential damaging population increases of forest pest organisms. Silvicultural treatments shall not be applied where such treatments would make stands susceptible to pest-caused damage levels inconsistent with management objectives."

The purpose and need for this action is defined to 1) Reduce the potential for large and intense wildfires across forest areas and to 2) Facilitate rapid reestablishment of Engelmann spruce through replanting of spruce in timber management units identified in the Forest Plan. Damaging (epidemic) population levels of spruce beetles have already been reached in the project area with associated high mortality levels in the large-diameter Engelmann spruce trees. No proposed treatments will make stands susceptible to further damage from spruce beetle.

Even-aged Management

OPTIMIZATION OF CLEARCUTTING: The National Forest Management Act states that clearcutting is to be used on National Forest System lands only where it is determined to be the optimum method.

The Manti-La Sal National Forest has interpreted this requirement to mean that clearcutting would be used only where it is consistent with the Forest Plan standards and guidelines, and where it would accomplish Forest Plan objectives that is accomplished through other harvest methods.

Salvage of dead and dying trees is the only proposed harvest treatment under the Proposed Action, or other action alternatives. Clearcutting is not a proposed treatment. Some areas have, or are being heavily impacted by spruce beetle. Insect defoliated trees and a portion of the dead trees would be removed in these areas. This may result in some areas being "under-stocked" (not fully meeting desired trees per acre or desired species composition goals) due to spruce beetle activity. Live, non-infested trees would not be removed from these areas. Damage to live trees that have survived the bark beetle infestation would be minimized by strict adherence to contract requirements for protection of residual green trees. No clearcuts or large human-created even-aged openings are planned or proposed through harvest of live trees. Some areas under-stocked because of spruce mortality, where dead spruce are salvaged, may appear as clearcuts following harvest treatments.

APPROPRIATENESS OF EVEN-AGED MANAGEMENT: The National Forest Management Act (NFMA) places special requirements on the use of even-aged silviculture systems on National Forest Systems lands. This is contained in NFMA (16 USC 1604 (g)(3), (F) and (I)) which states that "cuts designed to regenerate an even-aged stand of timber would be used as a cutting method only where such cutting is determined to be appropriate, to meet the objectives and requirements of relevant land management plan."

The Forest Plan (p. III-27) allows use of even-aged (shelterwood) or uneven-aged (group or single tree selection) methods in spruce-fir. In some areas, spruce beetles have, or are projected to kill a large proportion of the overstory, creating a more even-aged condition. However, an option would still exist in the future for managing these stands for uneven-aged structures depending on desired conditions at that time; it would just take longer for them to achieve an uneven-aged distribution.

219.27 (d)(1). "Openings shall be located to achieve the desired combination of multiple-use objectives. Regional Guides shall provide guidance on dispersion of openings. As a minimum of the overstory, creating a more even-aged condition. However, an option would still exist in the future for managing these stands for uneven-aged structures depending on desired conditions at that time; it would just take longer for them to achieve an uneven-aged distribution."

Refer to the discussion under 219.27 (d)(2), below.

219.27 (d)(2). "Individual cut blocks, patches, or strips shall conform to the maximum size limits for areas to be cut in one harvest operation established by the Regional Guide. This limit may be less than, but will not exceed, 40 acres for all other forest types except as provided in paragraphs (d)(2)(i) through (iii) of this section. (i) Cut openings larger than those specified may be permitted where larger units will produce a more desirable combination of net public benefits (ii) Size limits exceeding those specified in paragraphs (d)(2)(i) and (iii) of this section are permitted on an individual timber sale basis after 60 days' notice and review by the Regional Forester. (iii) The established limit shall not apply to the size of areas harvested as a result of natural catastrophic condition such as fire, insect and disease attack, or windstorm."

The Regional Guide for the Intermountain Region (1984), page 3-21, states "An opening created in the Forest by application of even-aged management that exceeds 40 acres will require Regional Forester approval. Where such openings exceed 60 acres in size to produce a more desirable combination of net public benefits, they will be subject to BLM public notice requirements." The Regional Forester will review and approval is required for harvesting larger units under catastrophic conditions. Appropriate public notice will also be given. (a) Evidence of a catastrophic condition must be reviewed and approved by the Regional Forester, if created openings will exceed 60 acres.

The Forest Vegetation Simulator (FVS) was used to project vegetation structural stages to estimate potential effects resulting from high levels of spruce mortality on stand structure. FVS projections indicated that some treatment units may be classified as openings as a result of the spruce beetle epidemic and mortality of the larger Engelmann spruce. This does not mean that these areas would qualify as clearcuts or continuous even-aged stand treatments. Comparison of these areas with past treatment inventory, and existing, opening or SWCP stands in the Fire Canyon Salvage Areas indicate that the majority of these stands would retain 10- to 40-square feet of basal area (primarily subalpine fir). Some residual Engelmann spruce would be present. This would maintain a forested structure in some areas, and limit the size of continuous openings resulting from spruce mortality and salvage harvest. On the ground reviews of the project area have validated the presence of residual stocking and that no group openings would be greater than 40 acres within any of the proposed treatment units. Generally, most of the openings would be less than 10 acres in size.

These areas of open stand conditions are a direct result of the impacts created by the spruce beetle epidemic and subsequent mortality of the Engelmann spruce. Harvest operations proposed in these stands would not cause any increase in opening size as a result of spruce mortality.
APPENDIX J

BIOLOGICAL ASSESSMENT AND BIOLOGICAL EVALUATION
I. INTRODUCTION

The purpose of this biological evaluation is to evaluate the potential effects of the Forest Service's proposed salvage timber sale on sensitive species that may occur in the project area and whether any impacts on those species are anticipated. Although not required under the Endangered Species Act, it is Forest Service policy to analyze potential impacts to sensitive species as well (Forest Service Manual (FSM) 2670.3t-32). Sensitive species are those identified by the Forest Service Regional Forester as "those . . . for which population viability is a concern, as evidenced by . . . significant current or predicted downward trends in population numbers or density . . . or significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution." (FSM 2670.5).

II. PROPOSED ACTION & ACTION ALTERNATIVES

Alternative 1, the No Action Alternative, will not be discussed in this document. Maps of alternatives 2, 3, and 4 can be found in Chapter 2 of the Final Environmental Impact Statement.

Alternative 2 - Proposed Action Based upon additional field review and public comment, Alternative 2 is a modification of the original proposal (February 17, 1998) and incorporates the Agency's interim road rule. Alternative 2 represents the intent of the original proposal. This alternative includes harvest in 3 Rare II Inventoried Roadless areas and 1 Forest Plan Inventoried Roadless area.

- Alternative 2 proposes salvage harvesting of 32-H MMBF of dead and dying spruce trees across 6,349 acres. Past experience indicates that 50 to 65 percent of the treatment area is likely to be harvested (3,174 to 4,127 acres). Logging systems planned are tractor, helicopter, and cable. It is estimated that this timber would be removed in 6-8 years with multiple sales.

- Estimated road work associated with the proposal as follows: construction of 1.1 miles of FDR, reconstruction of 11.0 miles of FDR, and 0.5 miles of temporary road (would not be open to public travel and included after use) to meet current and future resource management needs in the area. 1.9 miles of system roads would be put into level maintenance 1 (closed to public travel) after post sale activities, which includes the 1.1 miles of constructed road in the Heliotrope area.

- 4.1 miles of FDR and 19.3 miles of nonsystem roads would be claimed that are no longer needed for long term management of National Forest resources.

- Planting Engelmann Spruce on 551-716 acres, site preparation of 426-554 acres, and naturally reforest 918-1,198 acres. Gopher control for reforestation protection may take place on 868-708 acres.

- Treat harvest generated and existing fuels through various methods as follows: whole tree yard tractor yarding units on an estimated 437-568 acres, top and scatter 2,696-3,505 acres of the helicopter yarding units, and jackpot burn 10% of the helicopter yarding units (270-351 acres).
Alternative 3

Alternative 3 proposes salvage harvest as Alternative 2, but without constructing roads in inventoried roadless areas (RARE II and Forest Plan) or using ground-based logging equipment in such areas.

- Alternative 3 proposes salvage harvesting of 32-41 MMBF of dead and dying spruce trees across 6,349 acres. Past experience indicates that 50 to 65 percent of the treatment area is likely to be harvested (3,174 to 4,127 acres). Logging systems planned are tractor, helicopter, and cable. It is estimated that this timber would be removed in 6-8 years with multiple sales.

- Estimated road work associated with the proposal as follows: reconstruction of 10.8 miles of FDR, and 0.5 miles of temporary road (would not be open to public travel and reclaimed after use) to meet current and future resource management needs in the area. 0.8 miles of system roads would be put into level maintenance 1 (closed to public travel) after post sale activities.

- 4.1 miles of FDR and 19.3 miles of nonsystem roads would be reclaimed that are no longer needed for long term management of National Forest resources.

- Planting Engelmann Spruce on 720-936 acres, site preparation of 257-334 acres, and naturally reforest 749-973 acres. Gopher control for reforestation protection may take place on 792-1,030 acres.

- Treat harvest generated and existing fuels through various methods as follows: whole tree yard tractor yarding units on an estimated 230-299 acres; top and scatter 2,903 - 3,773 acres of the helicopter yarding units; and jackpot burn 10% of the helicopter yarding units (290 - 377 acres).

Alternative 4

Alternative 4 proposes salvage harvest and associated activities without harvesting in or developing roads in inventoried roadless areas.

- Alternative 4 proposes salvage harvesting of 19-25 MMBF of dead and dying spruce trees across 3,823 acres. Past experience indicates that 50 to 65 percent of the treatment area is likely to be harvested (1,912 to 2,485 acres). Logging systems planned are tractor, helicopter, and cable. It is estimated that this timber would be removed in 5-7 years with multiple sales.

- Estimated road work associated with the proposal as follows: reconstruction of 9.2 miles of FDR; and 0.5 miles of temporary road (would not be open to public travel and reclaimed after use) to meet current and future resource management needs in the area. 0.4 miles of system roads would be put into level maintenance 1 (closed to public travel) after post sale activities.

- 3.8 miles of FDR and 19.3 miles of nonsystem roads would be reclaimed that are no longer needed for long term management of National Forest resources.

- Plant Engelmann Spruce on 332-431 acres, site preparation of 257-334 acres, and naturally reforest 553-719 acres. Gopher control for reforestation protection may take place on 385-474 acres.

- Treat harvest generated and existing fuels through various methods as follows: whole tree yard tractor yarding units on an estimated 230-299 acres; top and scatter 1,639 - 2,313 acres of the helicopter yarding units; and jackpot burn 10% of the helicopter yarding units (164 - 213 acres).

敏感物种可能受到拟议项目的潜在影响

- 斑点蝙蝠 (Euderma maculatum)
- 长耳蝙蝠 (Corynorhinus townsendii)
- 密林鸟 (Flammulated owl)
- 细长콥 (Peregrine Falcon)
- 北方角枭 (Northern Goshawk)
- 低地吹鸟 (Three-toed woodpecker)
- 布里恩维尔库特高原鸟 (Bonneville Cutthroat Trout)
- 科罗拉多河库特高原鸟 (Colorado River Cutthroat Trout)
- 卡林顿的飞蛾 (Carrington's daisy)
- 马斯内绿洲 (Musnea groundsel)
- 雷吉营 (Maguire campion)
- 亚利桑那柳 (Arizona Willow)

注：此列表中的物种可能受森林服务（FS）敏感物种列表的影响。

区域和确定性

斑点蝙蝠 (Euderma maculatum)

生活史：研究人员将斑点蝙蝠与多种栖息地相关联，包括ponderosa pine、desert scrub、Pinyon-Juniper以及open pasture和hay fields。Poche认为，当环境因素导致斑点蝙蝠消失时，有可能重新在石灰岩和石灰石的交界处及附近区域发现它们。

确定性：斑点蝙蝠的分布范围已由Euderma maculatum和Euderma polyspilos这两个物种的具体区域进一步缩小。这些物种的确定性可能受到一定影响。
South Manti Timber Salvage Final Environmental Impact Statement
Appendix J - Biological Evaluation / Assessment

Flammeulated owl (Otus flavescens)
Life History: Flammeulated owls are found throughout the Western United States including Utah. They can be found in the mixed pine forests, from pine mixed with oak and pinyon at lower elevations to pine mixed with spruce and fir at higher elevations. They have also been found in aspens and second growth Ponderosa pine. However, they prefer mature Ponderosa pine-Douglas fir forests with open canopies. Large diameter dead trees with cavities are important nest site characteristics. They avoid foraging in young dense stands where hunting is difficult. Flammeulated owls are dependent upon mature conifer stands for nesting. Those nesting areas are known to avoid cut-over areas. Flammeulated Owls are almost exclusively insectivorous, preying on small to medium sized moths, beetles, caterpillars, and crickets (Reynolds and Linkhart 1992; Johnsgard 1988; and Bull et al. 1990).

Analysis: Flammeulated owls have been found in the Quailchupah drainage and the head of the Muddy drainage on the Ferron/Price Ranger District. All but one of these locations is associated with Ponderosa pine. This location, in the head of the Muddy, is within the analysis area. This location or “sighting” is near the only stand of Douglas-fir in the project area. Douglas-fir would not be harvested within any of the alternatives.

Determination: The proposed project May Impact Individuals but would not likely contribute to a trend in Federally listing or loss of viability of the Flammeulated owl.

Northern Goshawk (Accipiter gentilis)
Life History: Goshawks prefer closed tree canopies and abundant prey (small rodents and birds). Nest areas are typically characterized as older and stands that have a high density of large trees, high tree canopy cover, and high basalt areas. Post-fledging family areas (PFA)s contain patches of dense, large trees that provide protection for the young and small trees for hiding cover near the ground. Foraging areas contain the greatest diversity over the largest area. Diversity is obtained by having different landforms, diverse cover types, and a variety of vegetation structural stages. No adverse management activities in PFA's should occur during the nesting season from March 1 to September 30 (Management Recommendations for the Northern Goshawk in the Southwestern United States, USDA Forest Service, Richard T. Reynolds, et al. General Technical Report RM-217, August 1992 and Forest Plan Amendment April 14, 2000).

Analysis: Most of the goshawk nests found locally on the Wasatch Plateau are located in mixed conifer/aspen habitat types and specifically within aspen trees. There is nesting habitat for this species in proximity to the project area, including George's Fork of Ferron Creek. At this time, recent surveys have shown that there are no known goshawk nests near the proposed harvest units. Additional surveys, one year prior to harvest of each section, will occur during Project Design Features, Appendix D. It is likely that the project area is within the foraging area of one or more nesting territories and it is expected that the proposed project would impact goshawks foraging habitat.

Determination: The proposed project May Impact Individuals but would not likely contribute to a trend in Federally listing or loss of viability of the goshawk.

Peregrine Falcon (Falco peregrinus)
Life History: Peregrines have a wide range of habitats. They are typically found in open country near rivers, marshes, and coastal areas. Cliffs are preferred nesting sites, although reintroduced birds now regularly nest on man-made structures such as towers and high-rise buildings. Peregrines are known to travel more than 18 miles from the nest site to hunt. However, a 10 mile radius around the nest is an average hunting area, with 80 percent of the foraging occurring within a mile of the nest. Peregrine falcons prey on a wide variety of birds including shorebirds, waterfowl, grouse, and pigeons (Rutcliffe, 1980).

Peregrine falcons have recovered to a level of approximately 160 eyries in the state of Utah. Well above the 21 active eyries set as a goal by the American Peregrine Falcon Recovery Plan. Migrating or transient, peregrines have been seen on the Wasatch Plateau. In 1996, surveys conducted by U.S. Forest Service, Utah Division of Wildlife Resources, and Pacific Corp Company discovered peregrines exhibiting nesting behavior in Cottonwood Canyon (approximately 4 miles east of Joe's Valley Reservoir). The pair was observed copulating and defending a territory however, egg laying and incubation did not occur at this site. Additional surveys (1996)

Conducted by Forest Service personnel found a pair of peregrines occupying a territory on the east rim of South Horn Mountain (approximately 6 miles southeast of Joe's Valley Reservoir). This pair was found using the cliff systems directly below the existing electronic site. In 1996 the Utah Division of Wildlife Resources discovered an active peregrine nest near the Star Point Mine (approximately 10 miles southeast of Price, Utah). The nest was occupied with eggs but it is not known if the nest produced young. Other nest sites are lacking the nest bank of Joe's Valley; Reservoir and Link Canyon on the southern end of the Ferron/Price Ranger District. These nesting areas are inventoried annually. There are no known Peregrine Falcon nests in the South Manti timber sale area. Nesting habitat is very limited. Any birds observed in the analysis area would be incidental.

Analysis: Suitable nesting habitat for peregrine falcons does not exist in the project area. It is doubtful that any peregrines are using this area or would be affected by this project.

Determination: The proposed project would have No Impact on peregrine falcons or their habitat because no peregrine falcons are expected to utilize any of the proposed project area, except perhaps for very infrequent foraging or migration.

Northern Three-toed Woodpecker (Picoides tridactylus)
Life History: Typically found in conifer forests, three-toed woodpeckers have been located throughout the Wasatch Plateau, nesting in mixed conifer/aspen. There is a direct relationship between the number of three-toed woodpeckers and older forests with their complex of disease, decay and insects. Three-toed woodpeckers require snags for feeding, perching, and roosting. They nest primarily in conifer snags and aspen (aspen or green). Their nest cavities are excavated in trees with heart-rot and they feed primarily on larvae of wood boring beetles.

Analysis: Habitat for this species exists within proximity to the project area. Hundreds of acres of spruce mort occurs on the project area due to a large scale spruce beetle epidemic. Three-toed woodpecker habitat is considered to be very high quality in this area. Removal of dead trees in the area would be a very low percentage of the total number of dead spruce available in the immediate area of the proposed project.

Determination: The proposed project May Impact individuals or habitat but would not likely contribute to a trend towards Federal listing or loss of viability to the population or species.

Bonneville Cutthroat Trout (Oncorhynchus clarki utah)
Habitat: Bonneville cutthroat trout require cool, clear, well oxygenated water and the presence of clean, well sorted gravels with minimal sedimentation. Project Design Features, Appendix D. Optimum habitat characteristics include areas with a 1:1 pool to riffle ratio and slow deep water with vegetated streambanks for shade, bank stability, and cover. They prefer summer water temperatures of about 55 degrees Fahrenheit, but can survive in water up to 70 degrees.

Analysis: Historical range of Bonneville cutthroat trout falls only on the west side of the project area, (Twelvemile Creek and Sixmile Creek). These two watersheds are part of the Sevier River Basin and currently do not support any known populations of native cutthroat. Both Twelvemile Creek and Sixmile Creek have high sediment loads and channel damage from floods and landslides, most predominately in the lower reaches. The upper headwaters contain the only suitable habitat for this species. Introduction of Yellowstone Cutthroat trout and habitat degradation (mostly from natural landslides and floods) are likely causes of elimination of Bonneville Cutthroat trout in these watersheds. Existing habitat in Twelvemile Creek and Sixmile Creek would be protected from harvest activity by applying buffer zones of 100 feet each side of perennial streams and 35 feet each side of intermittent streams (50 feet of no mechanical entry on intermittent streams). Buffer zones of this width have been proven effective in filtering sediment from timber harvest activity and eliminating measurable affects to aquatic resources (Newbold et al. 1980).

Determination: The proposed project will have No Impact on the Bonneville cutthroat trout.
Colorado River Cutthroat Trout (Oncorhynchus clarki leuconictus)

Habitat: This species is generally limited to small headwater streams in remote areas where other trout species have not been introduced. The major threats to this species are hybridization with other introduced species of trout and degradation of water quality and water quantity (Baxter and Simon 1970; and Behnke and Benson 1980). Pure populations of Colorado River cutthroat trout no longer occur in most of the range they inhabited 100 years ago.

Analysis: Historic range and possible remnant populations of Colorado River cutthroat trout exist only on the East side of the project within the upper Colorado River Basin (Ferron Creek and Muddy Creek watersheds). At this time the only known populations of Colorado River cutthroat trout on the Manti Division of the Manti-La Sal National Forest occur within several tributaries of the Huntington Creek watershed, 12 miles to the Northeast. These populations, their tributaries, and the reaches downstream, no longer contain native cutthroat trout due to hybridization and competition with non-natives. Native Colorado River cutthroat trout historically may have occupied the Ferron Creek and Muddy Creek watersheds but they are not known to inhabit these waters at this time (Louis Berg UDWR, personal communication, 1999). Duck Fork Creek upstream of the Reservoir and Little Horse Creek, (Both tributaries to Ferron Creek), are proposed for re-introduction of native Colorado River cutthroat trout as identified in recent modifications of the Conservation Agreement and Strategy for this species (Louis Berg UDWR, personal communication, 1999). Existing habitat in the project area streams would be protected from harvest activity by applying buffer zones of 100 feet of upstream reaches and 35 feet each side of intermittent streams (50 feet of no mechanical entry on intermittent streams). Buffer zones of this width have been proven effective in filtering sediment from timber harvest activity and reducing measurable effects to aquatic resources (Newbold et al., 1980).

Determination: The proposed project will have No Impact on Colorado River cutthroat trout.

Carrington's Daisy (Erigeron carringtoniae)

Habitat: Small isolated populations have been found mostly on Flagstaff limestone outcrops, at the head of Mill Creek, top of East Mtn., south rim of Heliotrope Mtn., top of Ferron Mtn., and Head of Cove Creek. They are found on wind blown ridge tops and snow drift sites at elevations of 9,000 to 11,000 ft., and low Forb vegetation types. No known populations occur within the project areas.

Determination: The proposed project will have No Impact on this plant species.

Musinea groundsel (Senecio musineensis)

Habitat: The Musinea Groundsel prefers habitat in rock talus and slide rock sites near snow drifts in the Flagstaff limestone formation. Population sites have been located on Heliotrope Mountain, High Top, and Camel Rock at the head of Twemylee Canyon. No known population occurs within the proposed timber harvest areas.

Determination: The proposed project May Impact individuals or habitat but would not likely contribute to a trend towards Federal listing or loss of viability to the population or species. The potential impact comes from activities associated with the rock quarries used in conjunction with the proposed project.

Maguire Campion (Silene petersoni)

Habitat: Scattered mostly on Flagstaff limestone formation outcrops on high elevation ridges and snowdrift sites. There are populations from Wagon Road Ridge south, to the top of White Mtn., Wasatch Plateau, Manti-La Sal NF. There are also small populations on Mt. Bailey and Black Mtn. This plant is part... the sub-alpine low forb plant community. Populations occur within the edges of several proposed helicopter treatment units on barren outcrops of limestone. No harvest activities are planned for these areas.

South Manti Timber Salvage Final Environmental Impact Statement
Appendix J - Biological Evaluation / Assessment

Determination: The proposed project May Impact individuals or habitat but would not likely contribute to a trend towards Federal listing or loss of viability to the population or species. The potential impact comes from incidental activities associated with the proposed project.

Arizona Willow (Salix arizonica)

Arizona Willow requires a specific habitat that occurs as narrow strips along perennial streams around meadows and is dominated by mesic graminoids and mesic forbs. Elevation 8,000 to 10,500 ft. Only one population has been found on the Manti-La Sal National Forest in Upper Beaver Creek of the Muddy Creek Drainage. Potential habitat occurs along a west tributary of Ferron Reservoir but no harvest units occur along this stream and no other known populations occur within other harvest units of the project area. Buffer zones of 100 feet each side of perennial streams and wetlands, and 35 feet each side of intermittent streams would protect any potential Arizona Willow populations.

Determination: The proposed project will have No Impact on this plant species.

SUMMARY OF CONCLUSION OF EFFECTS

<table>
<thead>
<tr>
<th>Species</th>
<th>No Impact</th>
<th>May Impact Individuals Or Habitat, But Will Not Likely To Contribute To A Trend Towards Federal Listing Or Loss Of Viability To The Population Or Species</th>
<th>Will Impact Individuals Or Habitat With A Consequence That The Action May Contribute To A Trend Towards Federal Listing Or Cause A Loss Of Viability To The Population Or Species</th>
<th>Beneficial Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spotted Bat</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Big-eared Bat</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flammulated Owl</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern Goshawk</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parry's Falcon</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Three-toed Woodpecker</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bonnieville Cutthroat</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colorado River Cutthroat</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erigeron carringtoniae</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senecio sparsis</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silene petersoni</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salix arizonica</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DOCUMENTATION

References used to determine the presence (or absence) of Sensitive Species as well as species characteristics and habitat information include:


BIOLOGICAL ASSESSMENT

FERRON/PRICE & SANPETE RANGER DISTRICTS
MANTI-LA SAL NATIONAL FOREST
BIOLOGICAL ASSESSMENT
FOR
FEDERALLY LISTED PLANT AND ANIMAL SPECIES
FOR
FOREST SERVICE PROPOSAL FOR THE SOUTH MANTI
TIMBER SALVAGE SALES

Prepared by
Steve Romero
Ferron/Price Wildlife Biologist

Approved by:

Rod Player
Wildlife Biologist

Robert Davies
Fisheries Biologist

Robert M. Thompson
Botanist

I. INTRODUCTION

The purpose of this biological assessment is to evaluate the potential effects of the Forest Service's proposed salvage timber sale on Threatened, Endangered, and proposed plant and animal species that may occur within the area.

The Endangered Species Act of 1973 (PL 93-205, as amended) requires federal agencies to ensure that any activities they authorize, fund, or carry out, do not jeopardize the continued existence of any wildlife species federally listed as Threatened or Endangered (Section 7). This biological assessment is an analysis of which Threatened, Endangered, or Proposed species may occur in the project areas and whether any impacts on those species are anticipated. This biological assessment is prepared using direction from the Forest Service Manual 2672.4. Discussions with Utah Division of Wildlife Resources, U.S. Fish and Wildlife Service, and staff with the USDA Forest Service also provided information for this assessment.

II. PROPOSED ACTION & ACTION ALTERNATIVES

Alternative 1, the No Action Alternative, will not be discussed in this document. Maps of alternatives 2, 3, and 4 can be found in Chapter 2 of the Environmental Impact Statement.

Alternative 2 - Proposed Action

Based upon additional field review and public comment, Alternative 2 is a modification of the original proposal (February 17, 1998) and incorporates the Agency's interim road rule. Alternative 2 represents the intent of the original proposal. This alternative includes harvest in 3 Rare II Inventoried Roadless areas and 1 Forest Plan Inventoried Roadless area.

- Alternative 2 proposes salvage harvesting of 32-41 MMBF of dead and dying spruce trees across 6,349 acres. Past experience indicates that 50 to 65 percent of the treatment area is likely to be harvested (3,174 to 4,127' acres). Logging systems planned are tractor, helicopter, and cable. It is estimated that this timber would be removed in 8-8 years with multiple sales.

- Estimated road work associated with the proposal as follows: construction of 1.1 miles of FDR; reconstruction of 11.0 miles of FDR; and 0.5 miles of temporary road (would not be open to public travel and reclaimed after use) to meet current and future resource management needs in the area. 1.9 miles of system roads would be put into level maintenance 1 (closed to public travel) after post sale activities, which includes the 1.1 miles of constructed road in the Helicopter area.

- 4.1 miles of FDR and 19.3 miles of nonsystem roads would be reclaimed that are no longer needed for long term management of National Forest resources.

- Planting Engelmann Spruce on 551-716 acres, site preparation of 426-554 acres, and naturally reforest 918-1,198 acres. Gopher control for reforestation protection may take place on 606-788 acres.

- Treat harvest generated and existing fuels through various methods as follows: whole tree yard tractor yarding units on an estimated 437-568 acres; top and scatter 2,696 - 3,505 acres of the helicopter yarding units; and jackpot burn 10% of the helicopter yarding units (270 - 351 acres).
Alternative 3 proposes salvage harvest as Alternative 2, but without constructing roads in inventoried roadless areas (RARE II and Forest Plan) or using ground-based log yarding equipment in such areas.

- Alternative 3 proposes salvage harvesting of 32-41 MMBF of dead and dying spruce trees across 6,349 acres. Past experience indicates that 50 to 65 percent of the treatment area is likely to be harvested (3,174 to 4,127 acres). Logging systems planned are tractor, helicopter, and cable. It is estimated that this timber would be removed in 6-8 years with multiple sales.
- Estimated road work associated with the proposal as follows: reconstruction of 10.8 miles of FDR; and 0.5 miles of temporary road (would not be open to public travel and reclaimed after use) to meet current and future resource management needs in the area. 0.8 miles of system roads would be put into level maintenance 1 (closed to public travel) after post sale activities.
- 4.1 miles of FDR and 19.3 miles of non-system roads would be reclaimed that are no longer needed for long term management of National Forest resources.
- Planting Engelmann Spruce on 726-936 acres, site preparation of 357-334 acres, and naturally reforested 749-573 acres. Gopher control for reforestation protection may take place on 792-1,030 acres.

Treat harvest generated and existing fuels through various methods as follows: whole tree yard tractor yarding units on an estimated 230-299 acres; top and scatter 2,903 - 3,773 acres of the helicopter yarding units; and jackpot burn 10% of the helicopter yarding units (290 - 377 acres).

Alternative 4 proposes salvage harvest and associated activities without harvesting in or developing roads in inventoried roadless areas.

- Alternative 4 proposes salvage harvesting of 19-25 MMBF of dead and dying spruce trees across 3,823 acres. Past experience indicates that 50 to 65 percent of the treatment area is likely to be harvested (1,912 to 2,485 acres). Logging systems planned are tractor, helicopter, and cable. It is estimated that this timber would be removed in 5-7 years with multiple sales.
- Estimated road work associated with the proposal as follows: reconstruction of 9.2 miles of FDR; and 0.5 miles of temporary road (would not be open to public travel and reclaimed after use) to meet current and future resource management needs in the area. 0.4 miles of system roads would be put into level maintenance 1 (closed to public travel) after post sale activities.
- 3.8 miles of FDR and 19.3 miles of non-system roads would be reclaimed that are no longer needed for long term management of National Forest resources.
- Plant Engelmann Spruce on 332-431 acres, site preparation of 257-334 acres, and naturally reforested 553-719 acres. Gopher control for reforestation protection may take place on 365-474 acres.

Treat harvest generated and existing fuels through various methods as follows: whole tree yard tractor yarding units on an estimated 230-299 acres; top and scatter 1,839 - 2,313 acres of the helicopter yarding units; and jackpot burn 10% of the helicopter yarding units (164 - 213 acres).

III. SPECIES POTENTIALLY AFFECTED BY THE PROJECT

Known or Possible Threatened, Endangered, and Proposed Plants and Animals on the Ferron/Price & Sanpete Ranger District:

**SPECIES**

<table>
<thead>
<tr>
<th>Classification</th>
<th>Species Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threatened</td>
<td>Canada lynx (Lynx canadensis)</td>
</tr>
<tr>
<td>Threatened</td>
<td>Bald Eagle (Haliaeetus leucocephalus)</td>
</tr>
<tr>
<td>Threatened</td>
<td>Southwestern Willow Flycatcher (Empidonax traillii)</td>
</tr>
<tr>
<td>Threatened</td>
<td>Heliotrope Milk-Vetch (Astragalus monb)</td>
</tr>
<tr>
<td>Endangered</td>
<td>Colorado Pikeminnow (Ptychocheilus lucius)</td>
</tr>
<tr>
<td>Endangered</td>
<td>Bonytail Chub (Gila elegans)</td>
</tr>
<tr>
<td>Endangered</td>
<td>Humpback Chub (Gila cypha)</td>
</tr>
<tr>
<td>Endangered</td>
<td>Razorback Sucker (Xyrauchen texanus)</td>
</tr>
</tbody>
</table>

Note: The above species were derived from a U.S. Fish and Wildlife Service (USFWS) list of threatened, endangered, and proposed species that may be present in the general Wasatch Plateau area, describing species and habitat in Utah by County. This list was received January 7, 1998, and is the current list used (Martinez, pers. comm. 1998). A new list was obtained in January 2000. This updated list did not include the peregrine falcon, which has been delisted. The FWS was consulted for the Draft EIS. Because the determinations have not changed, no further consultation has been done for this revised document.

IV. SPECIES OCCURRENCES AND HABITAT NEEDS

**Canada Lynx**

The Canada lynx, the only lynx in North America, is a solitary, secretive forest-dwelling cat of northern latitudes and high mountains. There it feeds primarily on small mammals and birds, and is especially dependent on snowshoe hare for prey. It was historically found throughout much of Canada, the forests of northern tier States, and subalpine forests of the central and southern Rockies. There is only one historic record of a lynx specimen from the Wasatch Plateau (Durrant, 1952). There have been no recorded sightings, or specimens from the Wasatch Plateau in recent years. In fact the specimen cited above is the only recorded instance of lynx on the Wasatch Plateau (Bates, 1990). This lack of occurrences indicates that there never has been a large population of lynx on the Wasatch Plateau.

The Lynx is a medium-sized cat, similar to the bobcat, but appears somewhat larger. It has longer hind legs and very large well-furred paws, adaptations to the deep winter snows typical throughout its range. It also has unique long tufts of the ears and a short, black-tipped tail. Measurements for adult males average 22 lbs. in weight and 33.5 inches in length with an average weight for females at 19 lbs. and 32 inches in length. The home range of a lynx can be up to 100 square miles (USFWS, 1998).

In the West, lynx live primarily in coniferous forests, but have been seen occasionally on arid rangelands. While mature forests with downed logs provide cover for denning, escape and protection from severe weather, it is believed that lynx sometimes will move to rangelands or transition areas between rangelands and mountain forests in pursuit of food. Lynx tend to avoid open spaces and prefer traveling in corridors that provide cover. The Wasatch Plateau does not contain large contiguous tracts of suitable forested habitat. However, it does contain large tracts of forest. Largely, because of fire suppression the forest habitats are lacking in diversity with an over- abundance of mature forests. While mature forests are important to lynx for denning and shelter, the younger age class forests provide habitat for the majority of prey species. Accordingly, ideal lynx habitat contains a diversity of age classes and forested cover types (Novak et al, 1987).
West wide development and urbanization, forest fire suppression and unsuitable types of forest management have caused the loss of the lynx’s forest habitat. In recent years, recreation and road access has increased the number of people in the forests. Such activities create packed snow trails that allow bobcats and coyotes to enter the deep snow, breaking up the domain of lynx, and out compete lynx for food and space. Similar impacts have occurred on the Wasatch Plateau.

Recent surveys have been conducted specifically for Canada lynx on the Wasatch Plateau in the fall of 1999. Genetic analysis of fur samples are still being processed at this time. The predicted study is not expected to reveal the presence of Lynx near the project area, on the Wasatch Plateau due to the lack of evidence in the form of historic and recent sightings. The recently approved Canada Lynx Conservation Assessment and Strategy does not include the Manti-La Sal National Forest within the conferencing/consultation area.

**Bald Eagle**

During the breeding season Bald Eagles are generally closely associated with water, along coasts, lake shores, or river banks. During the winter Bald Eagles tend to concentrate wherever food is available. This usually means open water where fish and waterfowl can be caught. They also winter on more upland areas feeding on small mammals and deer carrion. At winter areas, Bald Eagles commonly roost in large groups. These communal roosts are located in forested stands that provide protection from harsh weather (Stillmaster, 1987).

Bald Eagles are occasionally found near the lakes and reservoirs in the analysis area, during the late fall and early winter (October-early December). Here they prey upon fish and waterfowl. When the lakes and reservoirs freeze over eagles leave the analysis area. No Bald Eagles are known to nest on the Forest. However, there is an active Bald Eagle eyrie near the town of Castle Dale, approximately 24 miles east of the project area. During 1995, the nesting territory was observed to determine the foraging area and fledging area. None of these activities were observed on National Forest System lands.

**Southwestern Willow Flycatcher**

The Southwestern Willow Flycatcher is found mainly in the southwestern United States extending its range to the lower one-fourth of the state of Utah. These flycatchers are closely associated with riparian habitat such as willow or alder thickets along streams, on the shores of ponds, or bordering marshy areas. They are also found in the brushy margins of fields, along mountain streams, and in shrubby floodplain areas. They prefer areas of high shrub densities interspersed with openings or meadows. The woody component of their habitat is almost exclusively deciduous including willows, alders, cottonwoods, aspens, and shrubs such as chokecherry, hawthorn, sumac and wild rose. As the name implies, Southwestern Willow Flycatchers are insectivores, eating wasps, bees, beetles, flies, moths and butterflies (Unitl 1987).

Surveys for Southwestern Willow Flycatchers have been conducted within the Ferron/Price & Sanpete Ranger Districts. Willow Flycatchers were detected in some of the areas surveyed (Fish Creek (Scofield tributary), and Upper Joe's Valley). However, it is not known if the Willow Flycatchers detected in those areas were Southwestern Willow Flycatcher or Empidonax trivialis (northern variety). Sonogram and DNA samples were taken from those populations to determine the species of willow flycatcher. Areas of known suitable habitat for Willow Flycatchers occur at Peter's Hole, Chicken Creek, Huntington Canyon. There are some areas within the analysis area that appear to be suitable habitat (near Julia Phil Reservoir).

Excerpts from the proposed route that appeared in Federal Register, Vol. 28, No. 140, 7/23/93 indicated the Ferron/Price Ranger District is outside the range of this species. Discussions with the U.S. Fish and Wildlife Service (May 1997) indicate no known presence of Southwestern Willow Flycatcher within the area. Sonogram testing of the Fish Creek population indicate the Willow Flycatchers detected there are probably not Southwestern Willow Flycatchers but the Empidonax trivialis subspecies (Sedgewick, pers. comm. 1998).

**Heliotrope Millivetch**

Habitat of this plant, within the Ferron/Price Ranger District, is only found at high elevations (10,000 to 11,000 ft.) on Flagstaff limestone outcrops. Associated with low growing subsurface vegetation, populations are located on top of Heliotrope, Ferron, and White Mountains. These areas are within and adjacent to the analysis area.
V. DETERMINATION OF EFFECTS

Effects of the Timber Salvage

Canada lynx (Lynx canadensis)

None of the alternatives would impact lynx directly because there is no evidence that lynx currently are found in the analysis area. However, all the action alternatives would have an impact on potential lynx habitat. The adverse impacts would be both beneficial and adverse. The beneficial impacts would result from the restoration efforts that would improve conditions for coyotes and bobcats which would then increase competition between lynx and these species for prey.

Bald Eagle (Haliaeetus leucocephalus)

None of the action alternatives should have a noticeable adverse effect on Bald Eagles. The foraging activities of the Bald Eagles nesting near Castle Dale do not occur on the Forest (Boschen, 1995). One possible impact would be a disturbance factor to migrating Bald Eagles foraging in the late fall and early winter if helicopter activity is allowed beyond the normal operating period of October 1. Impacts could come from helicopters disrupting the foraging behavior of bald eagles. If the bald eagles are feeding on the lakes and reservoirs prior to the lakes freezing over. If helicopter activity is permitted from October 1 through November 15, eagle activity will be monitored within the area and helicopter flights will not be allowed within 1/2 mile (line of sight) area where foraging eagles are found.

Underground treatment of gophers will occur only where needed. The most effective and the least likely method to cause damage to wildlife is underground baiting. Underground baiting for gopher control using strychnine presents minimal hazards to non-target wildlife, either by direct consumption of bait or by eating poisoned gophers (Hygnstrom et al., 1994).

Southwestern Willow Flycatcher (Empidonax Traillii extimus)

None of the action alternatives will have an effect on Southwestern Willow Flycatchers. Although there is potential habitat within the analysis area, no harvest activity will occur within riparian/willow areas. For perennial streams, no harvest will occur within 100 feet. For intermittent streams, no harvest will occur within 35 feet, and no mechanical entry will be allowed within 50 feet. The Forest Service species list requested (January 1998) from the U.S. Fish and Wildlife Service indicates Southwestern Willow Flycatcher is not known to be present within Sanpete County (analysis area).

Heliotrope Milkvetch (Astragalus montii)

Astragalus montii is the only Federally listed, threatened plant species on the Forest. Known habitat and population centers do occur within the analysis area, however this plant and its critical habitat is located outside of the proposed timber harvest units and would not be impacted by any of the sale activities.

Colorado Pikeminnow (Phoxinus lucius), Bonytail Chub (Gila splendens), Humpback Chub (Gila cophi), and Razorback Sucker (Xyrauchen texanus)

These endangered fish species of the Colorado River are analyzed together because they occur in waterways more than 100 miles away from the proposed action. The proposed action is not expected to cause any measurable changes in sediment yields or water flow into the Green River Drainage. Hydrologic analysis of all alternatives including the no action alternative predicts an increase in water yield as a result of large scale die-off of sycamore from a beetle epidemic. This project would not cause any measurable water depletions and therefore would not affect this species or any stage of its life history, nor would it adversely affect their Designated Critical Habitat (USFWS, 1995).

VI. Rationale for the Summary of Conclusions of Effects

Bald Eagle (Haliaeetus leucocephalus)

The proposed timber harvesting "May Effect but is not likely to Adversely Affect" the viability of this bird for the following reasons:

1) Bald eagles could consume a treated gopher, however gopher control will utilize underground methods to prevent eagle and gopher interaction. Treatment of gophers will occur only where it is needed.
2) Helicopters may disrupt migrating bald eagles however, helicopter flights will not be allowed within 1/2 mile (line of sight) area where foraging eagles are found from October 1 through November 15.
3) Habitat areas for perching will be protected near lakes, reservoirs and ponds.
4) Foraging of the Bald Eagles in Castle Dale do not occur within National Forest System lands.

Southwestern Willow Flycatcher (Empidonax Traillii extimus)

The proposed timber harvesting will have NO EFFECT on the Southwestern Willow Flycatcher for the following reasons:

1) No harvesting activity will occur within any willow riparian habitats.
2) No Southwestern Willow Flycatchers have been observed or are expected to occur within the analysis area.

Heliotrope Milkvetch (Astragalus montii)

The proposed timber harvesting will have NO EFFECT on Heliotrope Milkvetch for the following reasons:

1) No harvesting activity will occur within any known or potential habitat of this species.
2) Although this species is found within the analysis area, harvesting and road construction/reconstruction will not take place on or near any known populations on suitable habitat.
Canada lynx (Lynx canadensis)

The proposed timber harvesting "May Effect but is not likely to Adversely Affect" the viability of this mammal for the following reasons:

1) There is no evidence that lynx are currently found in the analysis area nor on the Wasatch Plateau.
2) Replantation efforts would improve habitat for lynx prey species.
3) The analysis area is frequented used for winter recreation, to the point that it is very unlikely that lynx would be found in the area. Therefore, the additional disturbance caused by logging activities should make no or little difference to lynx that may be found in the area.
4) Because there are no large contiguous blocks of forested areas in the analysis area specifically the Wasatch Plateau, the Wasatch Plateau contains only marginal habitat.
5) The spruce bark beetle epidemic has greatly altered the habitat over thousands of acres creating a more open forest which limits the suitability of the habitat for lynx.

Colorado Pikeminnow (Ptychocheilus lucius), Bonytail Chub (Gila elegans), Humpback Chub (Gila cisco), and Razorback Sucker (Xyrauchen texanus)

The proposed timber harvesting will have "No Effect" these endangered fish of the Colorado River for the following reasons:

1) There would not be any measurable water depletions from this project and therefore there would not be any effect to downstream habitat or any life stage, nor would it adversely affect their designated Critical habitat.
2) These endangered fish species of the Colorado River occur in waterways more than 100 miles away from the proposed activity.
3) There is not expected to be any measurable changes in sediment yields or habitat in the Colorado River Drainage.

VIII. CUMULATIVE EFFECTS

Past and present recreation activities have and will continue to impact wildlife populations and their habitats. Undeveloped and unauthorized roads and trails are created by Off Highway Vehicles (OHV) which has become a major concern because the effects result in many acres of lost foraging habitat (removal of herbaceous and browse cover competition) and encroachment into wildlife security zones. Developed designated roads and trails, summer-fall camping, viewing, hiking, hunting, and bicycling all bring a large number of recreationists into the area most of the year. Perhaps the greatest recreational impact comes from big-game hunting. The land occupied within and adjacent to the project area receive intensive use during the big-game hunting season. During the hunt, hunters and their camps can be found throughout the area. Wildlife are basically avoiding areas where humans are competing for the animals for space. Past and present timber harvesting has decreased wildlife cover and security areas. Approximately 2000 acres have currently been harvested and a maximum of 4,000 acres are planned to be cut. Combined with the loss of vegetative cover and traffic use (recreation, logging), wildlife will avoid using areas.

Noxious weed invasion and Aspen regeneration play an important ecological role within the project area. As more forest users interact with this local landscape, the risk of continued weed encroachment increases. Currently mutt thistle, white top and Canada Thistle are the dominant invaders within and adjacent to the analysis area. Acres of spread are increasing as human activities and natural dispersion continue. Weed control is difficult and is mostly addressed within Federal lands. These invaders slowly decrease the quality and quantity of the habitat many wildlife species depend on. The lack of aspen regeneration could result in habitat competition among wildlife species and domestic species utilizing the areas.

Spruce bark beetle outbreaks, at epidemic levels, quickly and at large landscape scales after the habitat. These changes impact wildlife species both adversely and favorably. The spruce cover type has and is continuing to rapidly evolve from a closed overstory to more of an open overstory. This change should benefit those wildlife species dependant upon more open forest settings and negatively impact those species dependant upon a closed, interior forest settings. The effects, positive or negative, is the delay in time for the open forest character to occur and then evolve back to a closed overstory.

Although gas and coal activities are not directly involved within the analysis area, activities adjacent to the site at lower elevations can have indirect effects. As wildlife are displaced from forest actions within the analysis area, some will move into sites outside the project boundary where coal and gas activity are occurring. Mineral operations will alter vegetation through the removal of herbaceous and browse species and removal of large trees for the road and construction. Again animals and plants are disturbed through either displacement or indirect mortality. Although habitat reclamation efforts are typical efforts after mineral actions, devoid as these add to the overall fragmentation of habitat within a time period.

Other forest use practices and natural events have affected wildlife habitat within and adjacent to the project area. Livestock grazing is a primary forest use that adds to the overall effect. Livestock will decrease forage and cover opportunities for wildlife and plants through competition. Habitat is altered through grazing resulting in further displacement of wildlife.

The total effects from the project proposal to all present, past and foreseeable effects should not have harmful impacts upon the local threatened and endangered species provided all the planned designed features for the project are implemented. However, as future human actions increase, additional uses from all aspects like mining, recreation, grazing, fire suppression, etc. over space and time, the existing habitat will probably become less effective for those species Federaly listed.

VII. DOCUMENTATION

References used to determine the presence (or absence) of Threatened, Endangered, Proposed Species as well as species characteristics and habitat information include:

Bates, Bill. 1999. Utah Division of Wildlife, Mammals Program Coordinator. Personal communication with Rod Player.


Forest Service References


District wildlife observations records

Federal Register Vol. 58 No. 140, 7/23/93


US Fish and Wildlife Service References


Instream flow: The quantity of water necessary to meet seasonal stream flow requirements to accomplish the purposes of the National Forests, including, but not limited to fisheries, visual, and recreational opportunities.

Intermediate term: A team of individuals with skills from different disciplines that focuses on the same task or project.

Intermediate cut: The removal of trees from a stand sometime between the beginning or formation of the stand and the regeneration cut. Types of intermediate cuts include thinning, release, and improvement cuttings.

Intermediate stand: A stand that grows only at certain times of the year when it receives water from streams or from some surface source, such as melting snow.

Intermediate range: The portion of the USDA Forest Service, also referred to as Region 9, that includes National Forests in Utah, Nevada, southern Colorado, and southwestern Wyoming.

Irreversible: One of the categories of impacts mentioned in the National Environmental Policy Act to be included in statements of environmental impacts. An irreversible effect applies to loss of production or commitment of renewable natural resources. For example, while an area is used as a ski area, some or all of the timber production there is irreversibly lost. If the ski area closes, timber production could resume. The loss of timber production during the time that the area was devoted to winter sports is irreversible. However, the loss of timber production during that time is not irreversible, because it is possible for timber production to resume if the area is no longer used as a ski area.

Irreversible: A category of impacts mentioned in statements of environmental impacts that applies to non-renewable resources, such as minerals and archaeological sites. Irreversible effects can also refer to effects of changes that can be renewed only after a very long period of time, such as the loss of soil productivity.

J: A lightweight ground lead yarder using tons and usually mounted on a truck with a spar and boom.

Key summer range: The portion of a wildlife species' summer range that is essential for the animal's life, post, and reproduction cycles. Key summer ranges require "learning areas" where does give birth and hold their fawns for an essential period of time in the spring.

Key winter range: That portion of big game's range where the animals find food and cover during severe winter weather.

Ladder fuels: Vegetation located below the crown level of forest trees which can carry fire from the forest floor to tree crowns. Ladder fuels may be low-growing tree branches, shrubs, or smaller trees.

Largonophides: Hares and rabbits.

Land classes: The ecological relief of a unit of land. Land classes are separated by slope, which comprises the inventory process. The three land classes used in the Forest Plan are defined by the following slope ranges: 0 to 35 percent, 36 to 55 percent, and greater than 55 percent.

Landing: Any place where cut timber is assembled for further transport from the timber sale area.

Landline: The boundary lines for National Forest land.

Landscape: A large land area composed of interacting ecosystems that are repeated due to factors such as geology, soils, climate, and human impacts. Landscapes are often used for coarse analysis.

Tendable events: Low frequency/high magnitude In frequent tendable events that occur over a regional (high magnitude) rather than over an area of low frequency. Typically, tendable events are localized, distressing, and very stressful. The effects of these tendable events may persist for a number of years or decades if treatment is not taken. Tendable events such as heavy snow accumulation, wind storms, and wildfire can be controlled by the National Forest Plan. The effects of these events would be short-term if a valid plan were in place. However, if a valid plan were not in place, the effects of these events would be long-term.

Land use planning: The process of organizing the uses of the land and their resources to best meet people's needs over time, according to the land's capabilities.

Large, intense wildfires: Large, intense wildfires that, for this project, are described as 200 acres or greater. Greater than 30% greater than 100 acres of PM 10 emissions, and 50% or greater dust consumption.

Late forest succession: The stage of forest succession in which most of the trees are mature or overmature.

Late Initial 1: (see maintenance level 1)" The range of values that have distinct plant and animal characteristics determined by elevation, latitude, and climate. As ascending a high mountain, you will pass through these life zones. Examples of life zones include the Upper Sonoran, where Cedar City is located and grains sagebrush, and scattered pinyon juniper predominate, and the Transition zone, where Ponderosa pine is predominant.

Forest litter: The debris fallen or only slightly decomposed vegetal material on the forest floor. This layer includes foliage, bark fragments, leaves, and fruit.

Litter accumulation: The extent to which the forest floor is covered with litter.

Litter accumulation: The mass of litter that is on the forest floor. It is measured in tons per acre. Litter accumulation is a measure of the amount of dead material on the forest floor that is not disturbed by natural processes or human activities.

Litter accumulation: The mass of litter that is on the forest floor. It is measured in tons per acre. Litter accumulation is a measure of the amount of dead material on the forest floor that is not disturbed by natural processes or human activities.
For In-Place management. The removal of trees near the end of a rotation to open the canopy so the crown of seed-bearing trees can enlarge. This improves seed production and encourages natural regeneration. (See rotation.)

prescribed fire- The use of fire intended in wildfires under prescribed conditions and circumstances. Prescribed fire can rejuvenate forest ecosystems, improve wildlife habitat, prepare sites for natural or prescribed restoration, or reduce the extent and severity of wildfires.

prescription - Management practices selected to accomplish specific land and resource management objectives. Prescription are not random (i.e., unplanned) or opportunistic actions applied to natural ecosystems to achieve a desired, healthy, and functioning landscape condition. Traditional practices are not prescribed.

presuppression- Activities carried out in advance of fire occurrence to ensure effective suppression when the need arises.

primitive ROSS (Recreaction Opportunity Spectrums)- A classification of wilderness and recreation opportunity. It is characterized by an essentially unmodified environment, where trails may be present but structures are rare, and where it is highly probable to be isolated from the sights and sounds of people. (See ROSS)

productive- The abillity of an area to provide goods and services and to sustain ecological values.

project roads- Roads needed in support of timber salvage activities and not needed for future management of forest resources within the analysis area.

public lands- The territory ceded to the Federal government by the original thirteen states, plus additions by treaty, cession, and purchase.

public involvement- The use of appropriate procedures to inform the public, obtain early and continuing public participation, and consider the views of interested parties in planning and decision making.

Q- Quadratic mean diameter (QMD)- indicates the diameter of the cross-section of average area. This number is used for determining basal area and volume.

R- Range- On land where the principle natural cover is composed of native grasses, forbs, and shrubs that are valuable as forage for livestock and big game.

range management- The art and science of planning and directing range use intended to yield the sustained maximum animal production and perpetuation of the natural resources.

range variability indices called the historic range of variability or natural range of variability. The components of healthy ecosystems fluctuate over time. The range of sustainable conditions in an ecosystem is determined by time, processes (such as fire), native species, and the land itself. For instance, ecosystems that have a 100-year fire cycle have a narrower range of variation than ecosystems with 200-300 year fire cycle. Past management has placed some ecosystems outside their range of variability. Future management should make such ecosystems toward their natural, sustainable range of variation.

Ranger District- The administrative sub-unit of a National Forest that is supervised by a District Ranger who reports directly to the Forest Supervisor.

raptor- A bird of prey, such as a eagle or hawk.

RARE II: Roadless Area Review and Evaluation. The national inventory of roadless and undeveloped areas within the National Forests and Grasslands.

recreation- The addition of water to ground water by natural or artificial processes. recreation visitor days (RVD)- Twelve visitor hours, which may be aggregated continuously, intermittently, or simultaneously by one or more parties.

reforestation- The restocking of an area with forest trees, by either natural or artificial means, such as planting.

rejuvenation- The renewal of a tree crop by either natural or artificial means. The term is also used to refer to the young crop itself.

Regional Forester- The official of the USDA Forest Service responsible for administering an entire region of the Forest Service.

revegetation- The restoration of a land or area with trees or shrubs.

residual stand- The trees remaining standing after an event such as selection cutting.

restoration- The return to a state of integrity, and ecological processes following a disturbance.

restorableness- Means to refer to a unit or area with trees or shrubs.

responsible official- The Forest Service employee who has been delegated the authority to carry out a specific planning action, restoration of management action. Actions taken to modify an ecosystem to achieve a desired, healthy, and functioning landscape condition.

retention- A visual quality objective; management activities are not vis;illy evident; activities repeat form, line, color, or texture characteristics found in the landscape.

revegetation- The re-establishment and development of a plant cover by either natural or artificial means, such as re-seeding, riparian areas- The area along a watercourse or around a lake or pond.
unvegetated harvest: Tree harvest that is not part of the allowable sale quantity (ASQ). It can include the removal of cull or dead material or non-commercial species. It also includes volume removed from non-revenue areas for research, to meet objectives other than timber production (such as wildlife habitat improvement), or to improve administrative sites (such as campgrounds).

unsuitable land: Forest land that is not managed for timber production. Reasons may be matters of policy, ecology, technology, silviculture, or economics.

use, allowable: An estimate of proper range use. Forty to fifty percent of the annual growth is often used as a rule of thumb on ranges in good to excellent condition. It may also mean the amount of forage planned to be used to accelerate range rehabilitation.

'Ver' class - A way to classify landscapes according to their visual features. This system is based on the premise that landscapes with the greatest visual or diversity have the greatest potential for scenic value.

vegetation management - Activities designed primarily to promote the health of forest vegetation for multiple-use purposes.

vegetation type - A plant community with distinguishable characteristics.

vegetative structural stage - A method of describing the growth stages of a stand of living trees. It is based on tree size (DBH: diameter at breast height) and total canopy cover. The stages are: Grass/forb shrub (VSS 1) = 0-1 inch DBH; Seedling sapling (VSS 2) = 1.5 inches DBH; Young Forest (VSS 3) = 5-12 inches DBH; Mid-Aged Forest (VSS 4) = 12-18 inches DBH; Mature Forest (VSS 5) = 18-24 inches DBH; Old Forest (VSS 6) = 24+ inches DBH.

vertical diversity - The diversity in a stand that results from the different layers or tiers of vegetation.

visible population - The number of individuals of a species sufficient necessary to ensure the long-term existence of the species in natural, self-sustaining populations, adequately distributed throughout its range.

virgin forest - A natural forest virtually uninfluenced by human activity.

visual quality objective - A set of measurable goals for the management of forest visual resources used to measure the amount of visual contrast with the natural landscape caused by human activities.

visual resource - A part of the landscape important for its scenic quality. It may include a composite of terrain, geologic features, or vegetation.

watershed - The entire area drained by a waterway (or into a lake or reservoir). More specifically, a watershed is an area of land above a given point on a stream that contributes water to the streamflow at that point.

water table - The upper surface of groundwater. Below it, the soil is saturated with water.

water plot - The runoff from a watershed, including ground water and surface. Ideal annual water yield is the amount of water that flows from the area and appears in streams expressed in area-inches. Two area-inches over 1 acre would equal 2 acre-inches.

weeding - A release treatment in stands not past the sapling stage that eliminates or suppresses undesirable vegetation regardless of crown position.

wetlands - Areas that are permanently wet or are intermittently covered with water.

wilderness (Wilderness Areas) - Undeveloped federal land retaining its primordial character, with permanent human habitation or improvements. It is protected and managed to preserve its natural condition. Wilderness Areas are designated by Congress.

wildfire - Any wildfire that is not a prescribed fire.

wildlife habitat diversity - the distribution and abundance of different plant and animal communities and species within a specific area.

windthrow - Trees uprooted by wind.

wood fiber production - The growing, tending, harvesting, and regeneration of harvestable trees.

woodland products - Harvestable items from primary woodlands. These include fuelwood, posts, pine nuts and Christmas trees.

yards - Moving the cut trees from where they fell to a central location (landing) for hauling away from the stand.

zone of influence - The area influenced by Forest Service management activities.
INDEX
S
Scenic Conditions ................................................................. 3-43
Scope of the Project ......................................................... 1-9
Scoping .............................................................................. Appendix B
Sediment ............................................................................ 3-13
Significant Issue .................................................................. 2-6
Soils .................................................................................... 3-9 to 10, 4-8 to 11
Spotted Bat ........................................................................ 3-33 to 34, 4-45 to 48
Stand Development ............................................................ 3-26 to 27
Stream Crossing ................................................................. Appendix H-1
Summary of Previous Analyses ........................................... 1-4 to 5
Summary of Road Information ............................................ Appendix F-1 to 4

T
Threatened, Endangered, and Sensitive Aquatic Species ........... 3-16 to 17, 4-22 to 23
Threatened, Endangered, and Sensitive Plant Species ............. 3-27 to 32, 4-20 to 32
Transportation ...................................................................... 3-38 to 39, 4-52 to 56
Tree Cavity Dependant Species .............................................. 3-33, 4-43 to 44

U
Undeveloped Character .......................................................... 3-42 to 43, 4-61 to 9565
Unroaded Areas ..................................................................... 3-34, 4-63-88

V
Vegetation Resource ............................................................... 3-17 to 28, 4-23 to 32
Visual Landscape .................................................................. 3-40 to 42, 4-58 to 61

W
Water Resources .................................................................... 3-11 to 16, 4-11 to 23
Water Quality ........................................................................ 3-11, 4-12 to 17
Wildlife Resources ............................................................... 3-31 to 38, 4-38 to 53
Wood Fiber Production and Utilization Management Unit Direction ............................................. Appendix C-8
REFERENCES


Berg, L. 1999. Regional Fisheries Manager, Utah Division of Wildlife Resource, Southeast Region, Price, Utah, Personal communication.


Bonar, Ronald E. 1997. The Northern Pocket Gopher Most of What You Thought You Might Want to Know, but Hesitated to Look Up. USDA Forest Service. 9524-2806-MTDC.


Cote, Diane and Steve Cote. 1998. Documentation of Personal Communication Regarding Continuous Harvest Treatment and Opening Size. Documents communication between Steve Cote, Diane Cote, Doug Jones, and Greg Montgomery regarding size of continuous treatment areas and openings associated with spruce mortality and proposed salvage. 8-18/10/98.


Exec. Order No. 11.990, 42 FR 26961. 3 CFR. (1977).


Hibbert, Alden W. 1979. Vegetation Management for Water Yield Improvement in the Colorado River Basin. USDA Forest Service. Rocky Mountain Forest and Range Experiment Station. Fort Collins Colorado. p. 31-34.


References, Page - 2

References, Page - 3
South Manti Timber Salvage Final Environmental Impact Statement

References


State of Utah Natural Resources Division of Wildlife Resources. 1996. Utah Big Game Annual Report.


South Manti Timber Salvage Final Environmental Impact Statement

References


References, Page - 4

References, Page - 3
The U.S. Department of Agriculture (USDA) prohibits discrimination in all of its programs and activities on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, sexual orientation, or marital or family status. (Not all prohibited bases apply to all programs). Persons with disabilities who require alternative means for communication of program information (Braille, large print, auto tape, etc.) should contact USDA’s TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410 or call (202) 720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.