3

AFFECTED ENVIRONMENT

Changes between Draft and Final EIS

General

- **Removed references to Unit 1 from Tables and text.**
- **Corrections of typographical and data errors throughout the chapter.**

3.4 Water Quality

- **Added discussion of water quality sampling**

3.7 Roadless Resource

- **Reduced discussion of roadless resources, because it is not affected by the Alternatives.**

3.8 Infrastructure and Improvements

- **Minor changes to text, added discussion of motorized access in Mill Creek.**

3.9 Vegetation

- **Minor changes to text, reduced discussion of insects.**

3.10 Fire and Fuels

- **Changes in text to eliminate information that will be moved to project file.**

3.11 Wildlife

- **Updated analysis to reflect 2003 survey results for beaver, snowshoe hare, and goshawk.**
- **Additional discussion on management indicator species**
- **Expanded discussion of forest land birds.**

3.14 Economics

- **Expanded discussion of costs. Reworked tables.**

3.15 Air Quality

- **New Section**

3

AFFECTED ENVIRONMENT

3.0 Introduction

This chapter describes the character and resources of the analysis area. It provides a description of current environmental conditions, as well as past uses, existing trends, and reasonably foreseeable potential uses of the land and water in the analysis area. This information is portrayed as a basis from which to develop and assess the consequences of the various activities and management alternatives.

This chapter specifically focuses on the resources of the relevant (key) issues described in Chapter 2. The resources are generally displayed in order of: (1) Physical Factors, (2) Biological Factors, and (3) Socio Economic Factors.

Information displayed within this chapter is a summary of data provided in reports written by various resource specialists (see list of preparers). These reports remain in the East Fork Salvage EIS Project File at the Evanston Ranger District office.

3.1 Regional Setting of the East Fork Fire

Of the total land area (1.2 million acres) on the Wasatch-Cache National Forest, approximately 1 percent (14,200 acres) was affected by the East Fork Fire in 2002. About 6,171 acres burned within inventoried roadless or wilderness areas.

3.2 Project Location

The Wasatch-Cache National Forest East Fork Salvage Project area lies approximately 35 miles south of Evanston, Wyoming (see Appendix A, Map 1.1.1). The general analysis area encompasses approximately 71,200 acres of land which includes National Forest and private ownerships. The project area boundary encompasses approximately 14,200 acres of land within the East Fork Fire perimeter with intermingled private ownership (see Appendix A, Map 1.1.3). Key geographic features of the area include three prominent drainages: East Fork of the Bear River, Mill Creek, and West Fork Blacks Fork River.

Three definitions are used to describe the geographic extents of the project, fire perimeter and analysis area boundary (Figure 3.2.1).

Project Perimeters Defined

Fire Perimeter – define the areas burned by the East Fork Fire inside of the Project Area Boundaries.

Analysis Area Boundary – defines the area where effects may occur and the analysis of these effects is determined. Analysis Area Boundary is the boundary of the watersheds in which the fire perimeter is located.

Cumulative Effects Analysis Boundary
Cumulative effects analysis boundaries vary by the resource being analyzed. The Cumulative Effects boundary may be larger or smaller than the Analysis Area.

Figure 3.2.1. Project Perimeters. *Three perimeter definitions are used to describe the geographic extent of the East Fork project*.

3.2.1 Fire Perimeter

The East Fork Fire burned approximately 14,220 acres. Total National Forest lands within the fire are 9,663; 4,571 acres are privately owned.

3.2.2 Analysis Area and Cumulative Effects Boundaries

The Area included for analysis will vary by resource, encompassing boundaries relevant to assessing the effects for resources (see Maps 1.1.3, 3.4.2 and 3.11.1, Appendix A). Most resource analysis will be conducted within the the analysis area boundary. However, some resources such as lynx, big game winter range, and roads may require a larger area to adequately analyze effects. Figure 3.2.2 displays the Analysis Area Boundaries selected and described for each resource.

Analysis Area and Cumulative Effects Area Boundaries

Resource	Boundary	Acreage
Soil	Analysis Area	71,228
Water	Watershed Area	105,481
Scenic	Analysis Area	71,228
Heritage	Analysis Area	71,228
Unroaded	Analysis Area	71,228
Fire and Fuels	Fire Perimeter	14,220
Vegetation and Forest Resources	Analysis Area	71,228
Insects	Analysis Area	71,228
TES Plants	Fire Perimeter	14,220
Noxious Weeds	Fire Perimeter	14,220
Wildlife		
Lynx	Lynx Analysis Units 34 and 35	104,823
All other sensitive species	Analysis Area	71,228
Forest Landbirds	Analysis Area	71,228
Fragmentation, Corridors, Linkages	Analysis Area	71,228
Fish	Analysis Area	71,228
Recreation	Fire Perimeter	14,220

Figure 3.2.2. Analysis Boundaries. *The Analysis Boundaries vary by resource, encompassing boundaries relevant to assessing the effects for each resource.*

3.2.3 Land Ownership

Land ownership within the Analysis Area Boundary is made up of National Forest System Lands, Anadarko Petroleum Lands, and other private ownership. Water bodies (including the surface area of lakes and rivers) make up less than 1 percent of the total area.

Land Ownership

Ownership	Approximate Acres	
Analysis Area:		
National Forest System	59,335	(83%)
Anadarko Petroleum/Other	11,893	(17%)
Within Fire Perimeter:		
National Forest System	9,633	(68%)
Anadarko Petroleum/Other	4,571	(32%)

Figure 3.2.3. Land Ownership. *Land ownership within the Project Area Boundaries is made up of National Forest System Lands, State and private ownerships.*

3.3 Forest Plan Direction

3.3.1 Goals, Standards and Objectives

The Wasatch-Cache National Forest Revised Forest Plan (USDA Forest Service 2003) provides the framework for determining the management of areas burned by the East Fork Fire, and of the watersheds adjacent to the fire perimeters. The Forest Plan also provides a broad, relative description of the Desired Future Condition of the Forest.

Implementation of the Wasatch-Cache National Forest Revised Plan has been influenced by over a decade of changes in Forest Service policy, scientific awareness, legislation, and public expectation. While the Goals, Objectives, and Standards of the Plan provide overall direction for land management they remain dynamic; and supplement, not replace evolving National and Regional policies and guidance.

Monitoring and Evaluation Reports assess whether the Forest Plan's Goals, Objectives, and Standards are being met, and recommend changes in action. Changes may include Forest Plan amendments, supplements, or direction,

which modify the course of action taken during management activities.

This project reflects the goals and objectives outlined within the Wasatch-Cache National Forest Revised Forest Plan. Two of the goals are more pertinent to the East Fork Salvage EIS (EFSEIS) because they reflect: (1) the Purpose and Need of the project, (2) resource conditions within the Project Area, and (3) recent Forest Service direction relative to managing burned areas, aquatic species, and watersheds (i.e. National Fire Plan and Clean Water Act). These two "key" goals are displayed in Figure 3.3.1.

"Key" Forest Plan Goals

Maintain and/or restore overall watershed health and provide for long-term soil productivity (Forest Plan Goal 2)**.**

This goal drives the "ecosystem management" principles emphasized by this project, including (1) improvement of hydrologic conditions, and (2) protection of soil properties and site productivity.

Contribute to the social and economic well-being of local communities by promoting sustainable use of renewable natural resources and…provide timber for commercial harvest consistent with goals for watershed health, sustainable ecosystems, biodiversity and viability and scenic/recreation opportunities (Forest Plan Goal 10)**.**

This goal drives one element of the project… salvage of dead and dying timber from areas burned by the East Fork Fire.

Figure 3.3.1. Key Forest Plan Goals. *Two Forest Plan goals are more pertinent to the East Fork Salvage EIS.*

Additional information on the Goals, Objectives, and Standards of the Forest Plan may be found on pages 4-16 through 4-25 of the Wasatch-Cache National Forest Revised Forest Plan (USDA, Forest Service 2003).

3.3.2 Management Area Direction

Forest Plan Management Area (MA) designations, and associated desired future conditions, provide the baseline for discerning where land management activities may occur within the East Fork Salvage Project Area, and what these activities may be. Within the MA management prescriptions, resource conditions, needs, and issues further define what, where, and how management activities may occur.

The East Fork Salvage Project Area is contained within 2 Management Areas (Western Uintas and Eastern Uintas) defined by the Forest Plan (see Map 1.1.3, Appendix A). Table 3.3.1 defines and summarizes the goals of the management areas found within the analysis area.

■ Suitable and Unsuitable Timber Land Allocations

None of the 59,335 National Forest acres within the Analysis Area are allocated to "Suitable" lands. Of the 9,633 National Forest acres within the burn perimeter, approximately 46 percent (4,396 acres) is allocated to management prescriptions that do not permit timber harvest. The remaining 54 percent (5,237 acres) is allocated to management prescriptions that allow timber harvest, dependent upon site-specific resource conditions (see Appendix A, Map 1.1.3). The Wasatch-Cache National Forest Plan defines Suited Land as *"Forest land designated in the Forest plan to be managed for timber production on a regulated basis."* (USDA Forest Service 2003).

Table 3.3.1. Forest Plan Management Area Direction. *The East Fork Salvage project analysis area is contained within 2 Management Areas defined by the Wasatch-Cache Forest Plan. The Desired Future Conditions for vegetation is similar in both Management Areas (See Map 1.1.3., Appendix A)*

MA	Drainage	DFC	NF Acres
Western Uintas	Bear River including the Hayden Fork, Stillwater, East Fork and Mill Creek	The area will be managed for aspen, mixed lodgepole pine and aspen, and lodgepole pine in patch sizes, species composition and stand structure and ages similar to what fire historically created. These treatments will be accomplished through timber harvest, mechanical treatment, and prescribed and wildland fire use consistent with management prescriptions.	35,600 (60%)

MA	Drainage	DFC	NF Acres
Eastern Uintas	Blacks Fork River	Vegetation will be managed for aspen, mixed lodgepole pine and aspen, and lodgepole pine in patch sizes, species composition and stand structure similar to what fire historically created. These treatments will be accomplished through timber harvest, mechanical treatment, and prescribed and wildland fire use consistent with management prescriptions.	23,735 (40%)

3.3.3 Management Prescriptions

Management Prescription Categories are defined as "management practices and intensity selected and scheduled for application on a specific area to attain multiple-use and other goals and objectives." Each prescription includes a set of standards and guidelines showing activities that are not allowed, and parameters within which allowed activities should be conducted. Each Category identifies emphasis and focus, highlighting considerations that must be included in the harmonious and coordinated management of the various resources there, without impairment of the productivity of the land, with consideration being given to the relative values of the various resources consistent with the definition of multiple-use. Prescriptions are meant to identify the tools/activities that can be used to achieve objectives (See Map 1.1.3, Appendix A and Table 3.3.2).

■ Management Prescription Category 5.1

Approximately 23 percent (16,464 acres) of the analysis area is allocated to MPC 5.1, with 3,457 acres within the fire perimeter. MPC 5.1 emphasizes maintaining or restoring forested ecosystem integrity while meeting multiple resource objectives. This MPC is the primary designation for the intermixed lands and areas north and west of Deadman Mountain.

■ Management Prescription Category 4.1

Six percent (approximately 4,781 acres) of the analysis area is allocated to MPC 4.1, with 1,941 of those falling within the fire perimeter. MPC 4.1 emphasizes backcountry non-motorized settings, and does not allow timber harvest or road construction. MPC 4.1 lands are located in the East Fork of the Bear, generally south of the Bear River – Smiths Fork Trail.

■ Management Prescription Category 4.4

Seven percent of the analysis area (approximately 4,063 acres) is allocated to MPC 4.4. The fire perimeter includes 898 acres of this MPC, which emphasizes recreation motorized settings and allows timber harvest and road construction. This MPC is located on the western edge of the analysis area/fire perimeter north of the Bear River-Smiths Fork Trail.

■ Management Prescription Category 3.2d

Approximately 1 percent (445 acres) of the analysis area is allocated to MPC 3.2d, with 350 of those acres within the fire perimeter. This management prescription, which emphasizes terrestrial habitat where development is allowed, is located on the west slope above the Stillwater Fork, and immediately south of the MPC 4.4 lands in the East Fork of the Bear. Timber harvest and road construction are allowed in this MPC.

■ Management Prescription Category 3.1a

Three percent (2,250 acres) of the analysis area is allocated to MPC 3.1a, which emphasizes aquatic habitat. Approximately 532 acres are within the fire perimeter. This MPC allows timber harvest for maintaining or improving riparian and aquatic habitat. Road construction is not allowed except for stream crossings.

■ Management Prescription Category 1.5

Management Prescription Category 1.5 is recommended Wilderness. Within the analysis area, 7,776 acres are assigned this MPC, with 2,429 of them within the fire perimeter. No timber harvest or road construction is permitted on these lands.

■ Management Prescription Category 1.2 and 1.3

These two categories are designated Wilderness, in which no timber harvest, road building, new recreation development, mountain biking, or use of motorized equipment is allowed. Approximately 22,960 acres of the analysis area

are within this MPC; only 26 acres are within the burn perimeter.

Table 3.3.2. Forest Plan Management Prescription Categories. *Lands within the East Fork Fire Salvage Analysis area and Fire Perimeter contain several Management Prescription Categories defined by the Wasatch-Cache Forest Plan (See Map 1.1.3, Appendix A).*

MPC	Emphasis	Permitted Activities	Acres in Analysis Area	Acres Within Burn
5.1	Maintaining or restoring forested ecosystem integrity while meeting multiple resource objectives	Timber harvest, vegetation/fuel treatment, prescribed fire and wildland fire use are allowed to maintain or restore proper functioning conditions, for hazardous fuel reduction, to protect property in the wildland urban interface, and to provide for commodity and non commodity outputs and services. Road construction, new recreation development and new trail construction are allowed.	16,464	3,457
4.1	Emphasis on backcountry non-motorized settings	Timber harvest, road construction and new recreation development are not allowed. Vegetation/fuel treatment, prescribed fire, and wildland fire use are allowed to mimic historic conditions and to restore ecosystem functioning.	4,781	1,941
4.4	Emphasis on recreation motorized settings	Timber harvest, vegetation/fuel treatment, road construction, prescribed fire and wildland fire use are allowed to mimic historic conditions, to restore ecosystem functioning, and to protect property; in the wildland urban interface, and are designed to be compatible with motorized recreation, but must not detract from the recreation setting over the long-term.	4,063	898
3.2d	Terrestrial habitats emphasis, in those areas where development is allowed for the purpose of maintaining, improving, or restoring key habitat elements.	Timber harvest, road construction, vegetation/fuel treatment, prescribed fire and wildland fire use are allowed for the purposes of maintaining, improving or restoring terrestrial habitat, for oil and gas exploration, for hazardous fuel reduction, and to protect property in the wildland urban interface.	445	350
3.1a	Aquatic habitat emphasis, stream and adjacent riparian areas	Timber harvest vegetation/fuel treatments, prescribed fire, and wildland fire use are allowed only for the purposes of maintaining, improving or restoring riparian and aquatic habitat to desired conditions or to protect property in the wildland urban interface.	2,250	532
1.5	Recommended Wilderness	Timber harvest, vegetation/fuel treatment, road building, new recreation development, new trail construction, mountain biking, and use of motorized equipment such as chainsaws and helicopters are not allowed.	7,776	2,429
1.2/1.3	Designated Wilderness	Timber harvest, vegetation/fuel treatment, road building, new recreation development, new trail construction, mountain biking, and use of motorized equipment such as chainsaws and helicopters are not allowed.	22,962	26

3.4 Soils and Water

3.4.1 Introduction

Soils help define the physical, chemical and biological interactions by forming the basis of the terrestrial ecosystems found within the project area. Together, these interactions determine how a soil relates and functions within

an ecosystem. When disturbances, whether natural or human caused, occur, soil interactions change with respect to their timing, intensity and occurrence. Fire, such as in 2002, is one type of disturbance that can change the interaction and function of the soil and varies within low, moderate, and severely burned areas.

Changes in the interactions and functions of the soil are characterized by the changes in specific physical, chemical and biological attributes. Modifications in these attributes influence the type, timing, and degree of effects on the soil and the soils interactions with other components of an ecosystem. This can result in potential accelerated sediment delivery, loss or reduction of future vegetative growth, and a reduction in nutrient availability.

3.4.2 Resource Information and Assessment

Existing site-specific soil and watershed conditions within this section are assessed within the 2002 East Fork Fire burn perimeter boundary. Reference documents for this assessment include the Wasatch-Cache North Slope Soil Survey (1992) and the East Fork Fire Burned Area Emergency Rehabilitation Summary Report (BAER) (USDA Forest Service, October 2002). Information from the BAER report focused on burn severity as it affects erosion hazard, sediment delivery, and runoff response within the burn perimeter. In addition to information derived from the Soil Survey and BAER reports, the assessment of the soil resources included the review of a number of publications (maps, journals, etc), and documentation collected during field reconnaissance of the burn area, proposed harvest units, and road locations during the summers of 2002 and 2003. Most of the information in this section is derived from a soils technical report (Rone 2003) and a water resources specialist report (Condrat 2003).

■ Region 4 Soil Quality Standards

Using field observations and measurements, the existing soil condition was described in terms of soil quality criteria for disturbance and effective ground covers. These criteria are defined within the Region 4 Soil Quality Standards directive (FSM 2500, R-4 Supplement 2509.18-2002-1).

3.4.3 Regulatory Requirements, Guidance, and Coordination

Several Federal and State acts and regulations pertain to activities affecting the soils resource. These include the Clean Air Act of 1990, Executive Order 11990, Forest and Rangeland Renewable Resource Planning Act, Utah State Best Management Practices, and Forest Service Manual and Handbook Guidelines. In addition to these regulations, several goals and standards in the Wasatch-Cache National Forest Revised Plan are relevant to soils (Figure 3.4.1).

The desired condition is based on current forest plan direction. Most soils have at least minimal protective ground cover, soil organic matter, and coarse woody debris material. Soils have adequate physical properties for vegetative growth and soil-hydrologic function. Physical, chemical, and biological processes in most soils function similarly to soils that have not been harmfully disturbed. Degradation of soil quality and loss of soil productivity is prevented. Soil-hydrologic function and productivity in riparian areas is protected, preserving the ability to serve as a filter for good water quality and regulation of nutrient cycling. Soil productivity, quality, and function are restored where adversely impaired and contributing to an overall decline in watershed condition.

Forest Plan Goals, Standards and Guidelines for Soil

Forestwide Goal: Maintain and/or restore overall watershed health (proper functioning of physical, biological, and chemical conditions). Provide for long-term soil productivity.
Subgoal 2: Maintain and/or restore water quality to provide stable and productive riparian and aquatic ecosystems.
Subgoal 7: Maintain and/or restore soil productivity to improve watershed functioning through managing groundcover, soil compaction, and vegetation.

Standard S1: No ground-based skidding is allowed on slopes greater than 40%.
Standard S2: Runoff control is to be applied to prevent pollutants including fuels, sediments, oils, from reaching surface and ground water.
Standard S20: When constructing or maintaining roads, trails and facilities, Best Management Practices are to be used to minimize sediment discharge into streams, lakes, and wetlands.

Guideline G4: No more than 15% of an activity area is allowed to have detrimental soil displacement, puddling, compaction, and/or severely burned.
Guideline G9: Soil disturbing activities on steep, erosive, and unstable slopes and in wetlands, floodplains and wet meadows are to be avoided.
Guideline G11: BMP's and Soil and Water Conservation practices during project level assessment and implementation are to be used to ensure maintenance of soil productivity, minimization of sediment discharge into streams, lakes and wetlands, and protection of water related beneficial uses.
Guideline G12: Locate new actions (such as…staging areas, facilities...) outside of Riparian Habitat Conservation Areas. If the only suitable location for such actions is within Riparian Habitat Conservation Areas, sites will be located to minimize resource impacts.
Guideline G45: Access routes for heavy equipment should be selected to limit disturbance to riparian vegetation and to limit the number of stream crossings.

Figure 3.4.1. Forest Plan Goals and Standards for Soil. *A number of goals and standards apply to the soils resource on the Forest.*

3.4.4 Specific Soil and Water Issues

Combined Public and Internal Issue Statements related to soil and water were identified and are summarized in Figure 3.4.2.

Soil and Water Issues

The fire has increased the potential for accelerated soil erosion to occur by removing ground covering vegetation and litter and creating a hydrophobic layer in some areas. There is an area in the West Fork Blacks Fork with unstable soils and landform where the potential for a landslide due to the fire may have increased. Timber salvage and road construction could result in additional detrimental soil impacts.

Removal of forest tree cover by the fire can increase erosion, in-stream flows, peak discharges, and sediment loads in streams and wetlands, which may adversely affect channel morphology and stability and ecological functions of streamside riparian areas, seeps, bogs, and fens. Timber salvage operations, road construction, and increased motorized recreational use could further increase these effects. Road maintenance, decommissioning, and salvage operations could also mitigate some of them.

Figure 3.4.2. Soil and Water Issues. *Internal and public issues pertaining to soil and water were combined into 2 issue statements.*

3.4.5 Existing Conditions

■ Geologic and Soils Environment

The Uinta Mountains are a high, elongate east-west trending range consisting entirely of metasedimentary and sedimentary rocks uplifted in a broad asymmetrical anticline (Marsell, 1969). Following the development of ancient erosion surfaces, renewed uplift of the range brought about a deepening of the drainage channels and the ultimate formation of the present canyons by late Pleistocene glaciers (Bradley, 1936). The landscape of the post burn project area has been modified and sculpted by several periods of glaciation and their effects are still clearly visible today in the shapes of the mountain crests and the drainage heads and valleys. The project area includes a series of landforms across the landscape going from sub-alpine basins and ridges, to mid-elevation mountain slopes, to dissected moderately sloping foothills, and ending in lower elevation alluvial stream deposits. The geomorphic process is fluvial over earlier glaciation.

All the great canyons of the Uintas originate near the crest of the range and descend to the north or south. Characteristic U-shaped valleys formed due to glaciation. The upper portions were well cleaned out by the ice, but their middle and lower portions contain heavy hummocky moraine deposits that are often bordered by terraces and mantled in part by soil and vegetation. Formations in the project area consist chiefly of sediments of marine and continental (lake, floodplain, and eolian) origin. Precambrian deposits of the Uinta Mountain Group are of stream origin consisting of conglomerate, coarse sandstone, and minor amounts of shale now somewhat metamorphosed (Untermann, 1969). Other lithology consists of Mississippian limestones, Weber sandstone, and Wasatch conglomerate. Extensive deposits of till dominate and are represented typically by unsorted deposits of coarse, angular to subrounded rock fragments, mostly quartzite, embedded in a matrix of varying proportions of silt and clay (Marsell, 1969). This thick outwash burden extends into the Wyoming Basin.

As climate changes along an elevational gradient, so do soil characteristics. Organic matter content increases from lowland to montane grasslands, but decreases further into

the alpine zone. Weathering of bedrock materials into soil and plant production is highest in mid-elevations where more moisture is available during the growing season. Severe climates tend to restrict soil as well as vegetation development. The harsh environmental conditions above treeline make growth and accumulation of biomass a slow process. Furthermore, soil formation takes much longer at high elevations because of the retarded pace of biological processes. Wind erosion and frost action enlarge areas that have been denuded by trampling of wildlife and livestock.

All proposed harvest units are within three major watersheds, the East Fork Bear River, Mill Creek, and the West Fork Blacks Fork. Table 3.4.1 displays the soil mapping units in the Analysis area (see Appendix A, Map 3.4.1).

Table 3.4.1. Soil Types within the Analysis Area. *Several soil type map units are found within the analysis area. Not all are within the burn perimeter.*

Map Unit	Acres by Soil Type	
	Analysis Area	Burn Perimeter
102	355	20
104	2,333	723
202	253	
207	476	
208	1,037	145
221	1,395	379
222	5,939	515
223	7,295	3,038
225	9,284	3,141
226	1,419	684
238	6,970	1,386
312	531	5
352	68	
354	2,909	3
371	468	
372	2,481	323
482	646	
483	1,174	769
484	2,484	1,537
501	434	
502	11,075	799
503	1,625	
520	3,191	752
525	2,768	
531	2,584	
Total	**71,209**	**14,218**

■ East Fork of the Bear River

☐ ***Geology***

Distinct lateral moraines extend up the canyon on both sides in the East Fork of the Bear River drainage. These moraines have been little modified by erosion and stand out as shelf-like forms on the valley slopes. Tributaries, such as Boundary Creek, have cut small V-shaped notches in the main canyon lateral moraine. The basin above the tributary mouth is a remnant of an independent glacier heavily masked with drift deposits. The East Fork moraines are composed largely of fragments of quartzite, sandstone, and limestone boulders with outcrops of Tertiary conglomerate showing on the east slope of the canyon near Deadman Mountain.

☐ ***Soils***

The majority of proposed harvest units in the East Fork Bear River drainage consist of lodgepole pine, mixed conifer, and spruce-fir forest types that are found primarily on very deep (40 to 60 inches) loamy Duchesne and moderately deep (20 to 40 inches) clayey Embargo soils on high mountain slopes and glacial moraines (USDA Forest Service, 1992; Table 3.4.2). These are primarily glacial till and colluvial soils derived from quartzite, limestone, and shale sources of the Uinta Mountain Group. Landforms generally have moderate (20 to 40 percent) to very steep (< 50 percent) relief, especially near Deadman Mountain, but are occasionally interrupted by gentle (0 to 20 percent) slopes on terraces along moraines.

■ Mill Creek

☐ ***Geology***

Mill Creek has a symmetrical U-shaped form characteristic of mountain glaciation. The glacier was less than 3 miles long and occupied the upper reaches of the valley. The chief deposits of drift, predominantly quartzite and limestone, are in the lateral moraines near the terminus located near the main wetland meadow (Section 29, Elizabeth Mtn. Quad) and confluence with the

only other east-west trending valley of the drainage.

☐ ***Soils***
Within Mill Creek, lodgepole pine, mixed conifer, and spruce-fir forest types are found throughout the entire drainage on primarily very deep Duchesne-Furniss clayey soils with some stands occurring on the very deep Duchesne-Mirror Lake and moderately deep clayey Embargo soil types (USDA Forest Service, 1992; Table 3.4.2). Glacial till and colluvium from mostly quartzitic parent material dominate and contain high amounts of surface rock fragments (35 to 70 percent) within a variable matrix of clay. Lodgepole pines usually take over on lower elevation south facing slopes whereas spruce-fir prefer higher, north facing terrain. Mill Creek has relatively moderate relief and gentle slopes. In its upper reaches, the valley is dominated by steep (40 to 50 percent) topography with moderately sloping knob and kettle terrain found primarily in the valley bottom.

■ **West Fork Blacks Fork**

☐ ***Geology***
The outermost moraines in the valley are lateral moraines lodged on the valley slopes with remnants of an outwash or valley train alluvium (Atwood, 1909). The moraines show signs of erosion and indicate to be of much greater age than those left by the last ice age in the region. Lying between the outermost lateral moraines are broad alluvial terraces of glacial drift consisting of predominantly quartzite, sandstone, grit, limestone, and the fines thereof. Portions of these lateral moraines are of the hummocky or knob and kettle type, giving an exceedingly rough topography to the valley slopes (Atwood, 1909). These are especially apparent on the east facing slopes north of Trail Creek and south of "The Woodpile". The bottom of the canyon contains irregular patches of drift, which have assumed a rolling topography separated by intervals of broad meadowlands.

☐ ***Soils***
Soils in the West Fork Blacks Fork are very deep Duchesne loams on which lodgepole pine and spruce-fir forest types can be found (USDA Forest Service, 1992; Table 3.4.2). Moderate to gentle slopes with distinct terraces and knob and kettle terrain are often filled with small ponds and sedge meadows that define this broad glacial valley. Above the terraces of predominantly quartzitic glacial till on lateral moraines, steep, barren sandstone and limestone outcrops and talus dominate. Unconsolidated material of the Tertiary Wasatch formation has created hummocky, unstable terrain due to a landslide within the proposed harvest unit 24 (see Appendix A, Map 3.4.3).

Within the project area, map unit 102 has moist, fine textured soils estimated to be highly susceptible to soil compaction when subjected to wheeled or tracked equipment loadings (Table 3.4.2). Soils of map units 102, 104, and 238 are characterized as having poor drainage, puddling, and flooding potential (Table 3.4.2). For areas of similar terrain, slope aspect, and gradient within the project area, map unit 223 and 225 soil types have high erosion potential. Soils of map units 238, 312, 354, 483 and 484 have very high erosion potential (Table 3.4.2). Greater potential for accelerated erosion to occur exists, regardless of soil type, on steeply sloped landforms in all three watersheds, especially at higher elevations. Within the project area, all soil types have comparatively moderate to high amounts of surface organic matter and good inherent fertility. Consequently, there are no soil types vulnerable to displacement and removal of litter and duff. Susceptibility of soils to removal of large woody debris is somewhat independent of inherent soil properties and depends more upon the potential of specific silvicultural practices to remove woody debris from a site.

Table 3.4.2. Soil Types and Characteristics. *(See Map 3.4.1, Appendix A). A variety of factors determine the sensitivity of soils, including slope, clay content, surface rock content, and drainage class. Soil type mapping is based on remote sensing that has been ground truthed with soil test pits. Accuracy is reasonably good at a landscape assessment scale. However, there are many places where there are small inclusions of different soil types within any given map unit. Map unit boundaries are also often not exact. Additional information is available in the project file.*

Map Unit	Slope	Soil Type	Surface Rock	Clay	Compaction Potential	Runoff	Erosion Potential	Drainage class	Depth class	Vegetation
102	0 to 10	Sessions-Furniss families assoc.	10 to 35	35 to 50	high	slow	slight	mod. well	very deep	sagebrush meadows
	0 to 10		10 to 35	18 to 35	medium	slow to rapid	none	poor	very deep	wet meadows
104	0 to 4	Foxcreek-Turson-Monchego families assoc.	0 to 15	0 to 10	medium	very slow	slight	poor to mod. well	very deep	wet floodplains
	0 to 2		0 to 15	0 to 10	medium	very slow to slow	slight	poor	very deep	semiwet floodplains
	0 to 4		0 to 15	0 to 10	medium	slow	slight	mod. Well	very deep	sagebrush meadows
208	0 to 10	Fourmile family	35 to 75	20 to 27	low	slow	slight	well	very deep	sagebrush meadows
221	0 to 10	Duchesne family	35 to 60	20 to 35	low	slow	slight	well	very deep	LP, SF
222	10 to 20		35 to 60	20 to 35	low	medium	moderate	well	very deep	LP, SF
223	20 to 40		35 to 60	20 to 35	low	rapid	high	well	very deep	LP, SF
225	40 to 70	Duchesne-Mirror Lake family	35 to 60	20 to 35	low	rapid	very high	well	very deep	LP, SF
	41 to 70		35 to 70	0 to 10	low	very rapid	very high	well	very deep	LP, SF
226	10 to 40	Duchesne-Mirror Lake families assoc.	35 to 60	20 to 35	low	medium to rapid	mod. to high	well	very deep	LP, SF
	10 to 40		35 to 70	0 to 10	low	medium to rapid	mod. to high	well	very deep	LP, SF
238	0 to 40	Duchesne-Furniss family assoc.	35 to 60	20 to 35	low	slow to rapid	high	well	very deep	LP, SF
	0 to 40		10 to 35	18 to 35	medium	slow to rapid	none	poor	very deep	wet meadows
312	20 to 40	Seitz-Cliff families assoc.	35 to 60	35 to 50	medium	rapid	high	well	very deep	LP, SF
	20 to 40		36 to 60	35 to 50	medium	rapid	high	well	very deep	aspen, grasses
354	20 to 40	Seitz family, cold	35 to 60	35 to 50	medium	rapid	high	well	very deep	LP, SF
483	20 to 40	Embargo family	35 to 75	35 to 50	medium	rapid	high	well	mod. deep	meadows, spruce-fir
484	40 to 80		35 to 75	35 to 50	medium	very rapid	very high	well	mod. deep	meadows, spruce-fir
520	40 to 80	Mirror Lake family, Talus-Rock outcrop complex	36 to 75	0 to 10	low	very rapid	very high	well	very deep	LP, SF

■ Hydrophobicity

Soil hydrophobicity is a naturally occurring phenomenon that is usually found at the mineral soil surface. It is caused by the leaching of hydrophobic compounds, such as aliphatic hydrocarbons, from the litter and humus layers (Huffman et. al, 2001) and is commonly associated with fungal mycelia. This natural water repellency has been frequently observed within the East Fork Fire burn perimeter and is closely related to the presence of *vaccinium*, or ground whortleberry understory, beneath conifer stands (Duncan, personal communication, 2003). The heat of a fire vaporizes hydrophobic compounds in the organic matter and moves them into the soil layer where they condense and form a water repellant coating on the soil particles. The persistence of a post-fire hydrophobic layer will depend on the strength and extent of hydrophobic chemicals after burning and the many physical and biological factors that can aid in breakdown (DeBano, 1981). Soil hydrophobicity usually returns to pre-burn conditions in no more than 6 years (DeBano, 1981; Dyrness, 1976) and several studies have documented a much more rapid recovery of one to three years (Huffmann et al., 2001). This variability means that the persistence of post-fire hydrophobicity cannot be readily extrapolated between regions.

A substantial amount of soils on the East Fork fire shows moderate to high burn severity (USDA Forest Service, October 2002). See Map 1.1.2, Appendix A and Table 3.4.3. Field observations during the first few storms in the summer of 2002 revealed a very irregular spatial distribution of hydrophobicity that often varied within several feet. Runoff generally occurred on

preferential flow paths that eventually either infiltrated in areas containing weak or no hydrophobic layers or settled out on terraces or toe slopes (USDA Forest Service, October 2002).

Table 3.4.3. Burn Severity within the East Fork Fire Perimeter. *Hydrophobicity is more likely to occur in areas that had high reflectivity and were therefore classified as high or moderate burn severity.*

Burn Severity	Acres
High	4,077
Moderate	2,848
Low	3,350
Unburned	3,929

The acres above are those that showed high reflectivity on remote sensing and resulted in 40% high, 28% medium, and 32% low severities. It indicates the relative effects of the fire on vegetation. Soil monitoring transects done by the BAER team on the ground showed 16% high, 52% moderate, and 32% low severity. Within the high severity class (transects), hydrophobic soil conditions varied based upon aspect and pre-existing duff layer thickness. Aspects within 90 degrees of due north saw high hydrophobic conditions on 25% of the high severity burn while aspects within 90 degrees of due south saw high hydrophobic conditions on 90%.

Several studies report a cease in hydrophobicity with wetting upon reaching a soil moisture threshold (Huffman et al. 2001; Wells et al. 1979) and a reestablishment of hydrophobic conditions upon drying (Huffman et al. 2001). The effect of soil moisture on soil hydrophobicity means that runoff from spring snowmelt is less affected by soil hydrophobicity than runoff from summer rainstorms (Huffmann et al., 2001). Slow snowmelt rates should therefore wet the soil above the soil moisture threshold and allow meltwater to readily infiltrate, while mid- and late-summer precipitation events may increase runoff when the soil surface is dry and hydrophobic. These findings suggest that sediment delivery on susceptible soils vary during different seasons and should be determined through repeated testing on individual harvest units.

3.4.6 Current Conditions Resulting From Past and Ongoing Activities

■ Timber Harvests

The project area is strongly influenced by historic (turn of the century) tie hack drives. There was little or no governmental control during the first period of timber cutting (1870-1900) and, with no thought for the future, no system of silviculture was employed (Colton, 1967).

Recent logging in the area took place 30 to 40 years ago but the old timber sales have recovered from a hydrologic perspective (See Map 2.6.11, Appendix A). Table 3.4.4 displays the total acres harvested since 1950.

Table 3.4.4. Past Harvest – East Fork Fire.

Past Harvest Activities		
Watershed	**Ownership**	**Total Acres**
East Bear	NF	3,500
	Pvt	0
Mill Creek	NF	1,414
	Pvt	1,189
W. Blacks	NF	227
	Pvt	585
Total		6,915

The West Fork Blacks Fork timber sale in the mid-80's included some prescribed burning but the fire of 2002 did not impact the new growth in this area. Partial cutting on private land (Section 7 and 13, Elizabeth Mtn. Quad) took place over the past two years though no new roads were established within the area. There has also been logging activity on private lands adjacent to areas that have burned.

■ Boy Scout Camp, East Fork Bear River Drainage

Improvements in the Boy Scout Camp located in the East Fork Bear River drainage are ongoing but have not involved much ground disturbance (See Map 1.1.3, Appendix A).

■ Grazing

Impacts within the project area have been limited primarily to grazing that occurred in the early 1900's. It is possible that overgrazing around the turn of the century led to loss of topsoil and reduced productivity at some sites. There are not many historical accounts of grazing in the Uinta Mountains but it is certain that grazing followed patterns similar to those reported throughout the West.

Effects of past and recent grazing include, but are not limited to narrow (less than 6 inches wide) trails and barren patches in pasture areas where animals, primarily sheep, concentrate during a short period (July through September) in the summer time. These areas are generally at higher elevations (9,000 to 11,000 ft) near timberline or on alpine benches (See Map 2.6.12, Appendix A). The reduction in ground cover due to grazing could cause erosion of topsoil with associated loss of productivity. However, the current impacts are minimal and ground cover potentials are within standards (85% of potential) (R. Zobell, personal communication, March 2003). Within the assessment area, grazing of cattle in the East Fork Bear River and sheep in Mill Creek and the West Fork Blacks Fork are ongoing and have not shown to cause degraded watershed conditions (R. Zobell, personal communication, 2003).

Table 3.4.5. Grazing in the East Fork Fire Analysis Area. *The Analysis area contains all or portions of several allotments.*

Grazing Allotments in East Fork Fire Analysis Area					
Drainage	**Allotment Name**	**Type**	**Status**	**AUMs**	**Acres**
East Fork Bear River	Stillwater	Sheep	Active	251	2,738
	East Fork Bear River	Cattle	Active	338	20,122
Subtotal				589	22,860
Mill Creek	Mill Creek	Sheep	Active	1,946	9,476
	Luke Lym	Sheep	Active	929	3,256
Subtotal				2,875	12,732
West Fork Blacks	West Fork Blacks Fork	Sheep	Active	2,583	17,848
	Larson	Sheep	Active	880	7,868
	Lyman Lake	Sheep	Active	532	2,096
	Mt. Elizabeth #2	Sheep	Active	140	433
	Ltl West Fork Blacks	Sheep	Active	23	97
	Mid. Fork Blacks Fork	Sheep	Active	75	346
	Woodpile	Sheep	Inactive	0	3,504
Subtotal				4,233	32,192
Analysis Area Total				7,697	67,784

■ Wildfire and Prescribed Burns

Impacts from past burns are difficult to find. Most of the effects to the soil are very short term (one growing season or less) and only several wildfires occurred over past decades in the area. The Boy Scout Fire took place in 1994 and burned about 250 acres (See Map 2.6.14, Appendix A). Fire suppression included hand dug fire line with no construction of new roads or dozer lines. The Lily Lake Burn of 1980 impacted about 3,500 acres between Lily Lake and Mill Creek. Approximately 15 miles of low standard road was built for salvage and firewood cutting followed by about 10 miles of road decommissioning over the past three years. Once the vegetation has recovered, the majority of the impacts are not visible.

■ Roads and Trails

An extensive road and trail system covers the project area and is maintained to reduce adverse effects of sediment delivery into surrounding

creeks and rivers. However, several areas have been identified as potential sources of accelerated sediment movement or lack adequate drainage features. Section 3.8, Table 3.8.1 summarizes the roads and trails within the analysis area.

■ BAER Projects and Fire Suppression Rehabilitation

BAER funds were utilized for installing check dams to reduce sediment flow out of several drainages on burned slopes adjacent to the Boy Scout Camp access road (FR 059). Excessive runoff filled the culverts to capacity and resulted in the flooding of the road during storms after the fire. Reestablishment of ground cover over the next growing seasons will likely reduce runoff and drainage patterns will revert to previous conditions.

Funds were also used to improve the drainage on, and reduce sediment delivery from, a portion of the upper Mill Creek road (FR 093) located in the valley bottom. Sixteen miles of dozer line and 43 miles of hand-line were water-barred and repaired with fire suppression funds (See Map 2.6.13, Appendix A)..

■ Foreseeable Activities

Decisions are in place (USDA, Jan. 2003) to close an approximated 20 miles of roads in Mill Creek and the West Fork Blacks Fork drainage over the next 4 or 5 years.

Grazing of cattle in the East Fork Bear River and sheep in Mill Creek and the West Fork Blacks Fork are ongoing and have not shown to cause degraded watershed conditions (R. Zobell, personal communication, 2003).

3.4.7 Water Resources

Several sources of information are used in this analysis. Field reviews of conditions were conducted during the fire suppression effort and Burned Emergency Area Rehabilitation (BAER) review in July 2002. Water quality information was obtained from the State of Utah. Aerial photos taken after the East Fork Fire in September 2002, topography maps, and GIS coverages containing information such as soils, water features, and roads were reviewed for assessment of erosion and sediment delivery.

3.4.8 Desired Future Conditions

The desired future condition for watershed conditions for the study area is taken from forest-wide and the Eastern and Western Uintas Management area descriptions in the Wasatch-Cache National Forest Plan (USDA Forest Service 2003).

■ Forest-wide Desired Future Condition

Riparian areas have a range of vegetative structural stages that are at or moving toward properly functioning condition, provide a transitional zone between upland terrestrial habitats and aquatic habitats, and have the features necessary to promote stable stream channels and diverse habitat conditions. Desirable riparian vegetation occupies the historical floodplain. Riparian areas provide for fish, wildlife, and water quality requirements.

Riparian vegetation and large woody debris reduce erosion, maintain water quality, filter sediment, aid floodplain development, improve floodwater retention, improve groundwater recharge, develop root masses that stabilize streambanks, and develop diverse channel characteristics. These channel characteristics provide habitat, water depth, duration, and temperature necessary for desired native and non-native fish viability and other designated beneficial uses, while supporting biodiversity.

Public waters are restored where water quality does not support beneficial uses and otherwise are maintained or improved.

■ Western Uintas Management Area Desired Future Condition

No specific desired future watershed condition is described for the East Fork Fire Analysis area in the Western Uintas Management Area description. However, desired future aquatic conditions include management to maintain cool, clear water and well-vegetated stream banks for cover and bank functioning. Instream cover, in the form of deep pools and structures such as boulders and logs, will be maintained and their value recognized. Water temperature will be preserved through stable well-vegetated banks. Natural reproduction (of aquatic organisms) will be maintained through minimizing sediment

input from roads, trails and campgrounds and providing for instream flows.

■ Eastern Uintas Management Area Desired Future Condition

For the Eastern Uintas Management area, tie-hacking and probably turn-of-the-century grazing have left an impact on most of the watersheds on the North Slope of the Uintas. Tie-hackers cleared obstructions and straightened channels to permit floating of ties to collection points. Anecdotal accounts of turn-of-the century grazing indicate substantial erosion and likely effects on stream channel conditions. This has caused many indirect influences on current management. Restoration of properly functioning stream channels is expected to be a long process that includes careful management of streamside and upland facilities and uses, and consideration of streamside vegetation management and instream structures to augment the process of restoration.

Needs for water downstream from the Forest are increasing as growth and development of adjacent communities occurs. There could be requests to evaluate increased storage in existing reservoirs in the area (Stateline and Meeks Cabin) to meet needs of a growing population.

☐ 3.4.9 Past Events Affecting Current Conditions

Several past activities have had an effect on soil and water resources in the analysis area. These activities include timber harvest, wildfire and prescribed burns, facilities such as the Boy Scout Camp, grazing, roads and trails, and ongoing activities such as travel planning. Timber harvest, grazing, and Boy Scout Camp activities that may affect water quality are the same as summarized in section 3.4.6.

■ Wildfire and Prescribed Burns

In July 2002, the East Fork Fire burned about14,200 acres in the East Fork Bear River, Mill Creek, and West Fork lacks Fork drainage. A substantial amount of soils on the East Fork fire shows moderate to high burn severity (See Map 1.1.2, Appendix A). Field observations during the first few storms in the summer of 2002 revealed a very irregular spatial distribution of hydrophobicity that often varied within several feet. Runoff generally occurred on preferential flow paths that eventually either infiltrated in areas containing weak or no hydrophobic layers or settled out on terraces or toe slopes.

■ Roads and Trails

Wolverine trail system development reconstructed old roads for ATV's in Lily Lake area in the early 1990's. North Slope road reconstruction has narrowed and seeded about 4 miles of road to reduce sediment movement into McKenzie and North Fork Mill Creek over the past 3 years. A private road and bridge was installed across the West Fork Blacks Fork in the mid 1990's.

☐ ***Mill Creek:***
- Culverts on road across small stream on FR 293 do not function properly during high runoff of storm events and allow sediments from the road to enter the stream.
- Stream crossing of FR 093 at meadow (Section 29, Elizabeth Mtn. Quad.) Located on private land, this crossing was originally a bridge, but it was washed out in the early 1980s. The location is now a ford with steep approaches that generates an increased sediment load into Mill Creek. The private landowner (Anadarko Petroleum) is planning to replace the non-functioning culverts on Forest Road 293 and use that road to access the east side of Mill Creek. This will bypass the ford, and the road segments leading to the ford from both directions will be obliterated.

☐ ***West Fork Blacks Fork***:
- Stream crossing on FR 063 (Section 26, Elizabeth Mtn. Quad.) generates increased sediment load into West Fork Blacks Fork. The travel plan identifies mitigation measures to install adequate drainage and restore, scarify and reseed additional side roads within the drainage.
- Improper drainage of road system on private land creates accelerated erosion.

■ Ongoing

Travel plan decisions are in place to close a fairly substantial road mileage in Mill Creek and West Fork Blacks Fork drainage over the next 4 or 5 years.

☐ 3.4.10 Water, Wetland and Riparian Features

The watersheds within the study area (105,481 acres) are in the headwaters of two major drainages that are separated in the project area by the ridge that runs from Elizabeth Pass along Table Top past Deadman Pass to Mt Beulah (See Map 3.4.2, Appendix A). Water west of the ridge flows into either the East Fork Bear River or Mill Creek then into the Bear River and eventually into the Great Salt Lake. Water east of this ridge flows into the West Fork Blacks Fork and eventually reaches the Green River.

Large wetlands and riparian areas are located adjacent to the West Fork Blacks Fork, East Fork Bear River. From Mill Creek at the North Slope road, small wetlands are located along Mill Creek for about 4 miles and two large wetland complexes with beaver ponds in them are located about 2 miles and 4 miles upstream. Most of the headwater streams have small riparian areas adjacent to the stream and are in very good condition.

☐ 3.4.11 Water Quality

The State of Utah has designated the streams draining the Bear River and Blacks Fork River watersheds above the National Forest boundary as Antidegradation Segments. This indicates that the existing water quality is better than the established standards for the designated beneficial uses. Water quality is required by state regulation to be maintained at this level. The beneficial uses of streams within these watersheds, as designated by the Utah Department of Environmental Quality, Division of Water Quality, are:

- Class 2B – protected for recreation
- Class 3A – protected for cold water species of game fish and other cold water aquatic species
- Class 4 – protected for agricultural uses.

The numeric water quality standards can be found in Section R317-2, Utah Administrative Code, *Standards of Quality of Waters of the State* (Utah, State of. 2000).

Water quality samples have been collected on East Fork Bear River at below Scout Camp (STORET #490990), Mill Creek at North Slope Road crossing (STORET #490953), and West Fork Blacks Fork above confluence with East Fork Blacks Fork (STORET #493945) since 1992 as part of a cooperative effort between the US Forest Service and the State of Utah for the purpose of assessing the water quality along the North Slope of the Uinta Mountains. The State of Utah has used this information in their reports to U.S. Congress regarding the quality of waters of the State of Utah. Water samples have been analyzed for chemical, nutrient, and metals parameters on a quarterly annual basis up to July 2002 and on a monthly basis since July 2002. Since the start of the cooperative effort, the State of Utah has determined that the waters draining these watersheds fully meet the beneficial uses for which they are classified. In the most recent assessment of water quality, the State of Utah has determined that the waters within these watersheds that drain the East Fork Fire Salvage analysis area fully support its beneficial uses (Utah, State of. 2002).

To determine the effects of the fire, water quality samples were collected on Mill Creek just below the project area on May 27, 2003 during a storm event. These samples were analyzed for chemical, nutrient, and metals and the analysis results showed that state water quality standards were not exceeded. From this information it is expected that no impairment of beneficial uses will occur from the fire although temporary decreases in water quality may occur during short-term thunderstorm events.

☐ 3.4.12 Water Yield

Water yield can increase as a result of changes in vegetation. To estimate the increase, changes in the amount of vegetation were reviewed in the Upper Mill Creek to the confluence with the North Fork Mill Creek, West Fork Blacks Fork to the confluence with the East Fork Blacks Fork, and the East Fork Bear River to the confluence with the Hayden Fork. The increase in flows due to past harvest activities is minor because the small percentage of the watersheds that were harvested and most of the harvest took place 20 to 30 years ago and the stream channel has adjusted to these changes in flow. Most past harvest activities are greater than fifteen years old, the time when the increases in stream flows due to timber harvest begin to diminish. (See Map 2.6.11 and Table 3.9.4) Most of the harvest came from salvage of the Lily Lake Fire in the early 1980s. Table 3.4.2 displays the acres of disturbance since 1980 and the estimated water yield.

The main factor that would increase water flows is the conifer mortality resulting from the East Fork Fire in 2002. The assumptions made in estimating the increase in stream flow due to the fire is 1) RSAC remote sensing GIS maps of unburned, low, moderate, and high burn reflectance represent respective unburned, low, moderate, and high burn severity areas, 2) unburned and low severity burned areas did not cause mortality of conifers, and moderate and high burn severity areas are all conifer and result in 100 percent conifer mortality, 3) 100 percent conifer mortality results in initial water yield increase of 3 inches (Troendle and Nankervis 2000).

Table 3.4.6. Acres of Disturbance and Estimated Water Yield from Watersheds in the East Fork Fire. *Water yields are determined from the number of acres of past timber harvests and those from which the fire removed most or all of the vegetation (high and moderate burn reflectance).*

	Upper Mill Creek	West Fork Blacks Fork	East Fork Bear River
Burn Reflectance			
High	761ac	494ac	2,513ac
Moderate	716ac	568ac	1,368ac
Total	1,477ac	1,062ac	3,881ac
Estimated water yield from East Fork Fire	370 acre-feet	266 acre-feet	970 acre-feet
Timber Harvest and Fires prior to the East Fork Fire and After 1980			
1980-89	521 ac	227 ac	781 ac
1990-99			100 ac
2000-present		50 ac	
Harvest since 1980 (% of watershed)	7.5%	0.7%	7.1%
Total Watershed Area	6,866	31,691	12,448

A review of watershed research on water yield by Troendle and Nankervis (2000) has shown that studies have shown similar responses in stream flow from fire as in timber harvest. They identified several characteristics of water yield increase. The magnitude of the water increase in the snow dominated western U.S snow is similar to studies throughout the U.S. but the distribution or timing is reflective of the dependence upon snowmelt. Forest removal in the snow zone results in greater snowpack accumulation. Increases in water due in summer is reflected only at the hillslope level or during summer storm events and because of limited summer precipitation there is a lack of late-season stream flow. Since hillslopes are wetter, the response to spring snow melt is faster and changes in flow is seen on the rising limb of the runoff hydrograph and monthly flow changes is observed mainly in May and sometimes in June with no detectable changes during the remainder of the runoff season.

It is expected that stream flows will increase to some extent during the next 15 years, particularly during the time leading up to the spring peak flow, as a result of increased water yield from the East Fork Fire. The amount of increase is difficult to predict since during wet years the water yield increases are greater than during dry years. Research has found that increases in stream flow are not detectable when clear cut harvesting is less than 20-25 percent of a small watershed. Since the percent of area burned within the watersheds is low compared to the entire watershed it is unlikely that increased stream flow will be detectable or that channel instability will result from the increased flows.

3.5 Scenic Resources

3.5.1 Introduction

The scenic landscape character displays the total of all activities and resource values in the East Fork Fire Salvage project areas. In addition to the beauty of the natural scenery, past activities and developments, timber production, mining, and wildfire are reflected in the landscape and can leave lasting impressions on viewers.

3.5.2 Geographic Area Assessed

The area used for the scenic resource analysis is the area which lies within the analysis area boundary (see Appendix A, Map 3.5.1). This boundary is sufficient to cover all related scenic features of this landscape and to allow for proper analysis of direct, indirect, and cumulative scenic effects.

3.5.3 Methodology Used to Collect Data and Make Scientific Findings

The Wasatch Cache National Forest Plan provides a broad scale inventory that consists of existing use and proposed management activities that created part of descriptive baseline from which to measure scenic integrity. Working from the Revised Forest Plan baseline to project level required an inventory that identified existing landscape character, existing scenic attractiveness and landscape visibility to determine the relative sensitivity, and the degree of detail perceived in the landscape. Inventories of the existing scenic integrity provided a comparison of how intact the valued built environment is in comparison to the Forest Plan landscape character themes and the existing landscape character within the analysis area. The following inventory components were collected and updated using the Scenery Management System for the DEIS: landscape character, scenic attractiveness, scenic integrity, and landscape visibility.

Data for these components were compiled using GIS to display the inventory on maps during this analysis.

Photographs were taken from several locations throughout the analysis area from areas representative of critical viewing locations. These photos were used in conjunction with field study and computer analysis to determine potential scenic effects. GIS maps, photographs, and field notes are located in the Project File. Most of the information in this section was derived from a specialist report (Hatch 2003) on scenic resources.

3.5.4 Scenic Resource Issues

A Combined Public and Internal Issue Statements related to scenic resources was identified and displayed in figure 3.5.1 below.

Scenic Resource Issue

Timber salvage and road construction may have impacts on the area's natural beauty due to reductions in visual quality, impacts of litter and off road vehicle damage.

Figure 3.5.1. Scenic Resource Issues. *Internal and public issues pertaining to scenic resources were identified during scooping and the development of Alternatives.*

3.5.5 Regulatory Requirements, Guidance and Coordination

Scenic Resource Regulations

36 CFR 219.21 (f) (1982) states, " the visual resource shall be inventoried, and evaluated as an integrated part of evaluating alternatives ...[for] both the landscape's visual attractiveness and the public's visual expectation. Management prescriptions ...shall include visual quality objectives."

Agriculture Handbook 701, *Landscape Aesthetics: A Handbook for Scenery Management* describes the Scenery Management System (SMS), which is replacing VMS. Both the SMS and the VMS will provide guidance for the effects analysis of the scenic resource in the Post Burn project areas.

The Revised Forest Plan Wasatch-Cache National Forest provides overall direction for the scenery management on the forest. **Subgoal 6f:** Recognize and manage for the importance of scenic forest landscapes… (pg. 4-22) **Subgoal 6g:** Restore, maintain, or enhance landscape scenic integrity…" (pg. 4-22)

Guideline G60: Resource management activities should not be permitted to reduce

Scenic Integrity below objectives stated for Management Prescription Categories.
Guideline G61: For management activities viewable from Concern Level 1, Scenic Byways, and use areas, travelways and Scenic

Backways, apply the Landscape Character Theme in which the management activity occurs and apply a Scenic Integrity Objective of high.
Guideline G62: For management activities viewable from Concern Level 2 use areas and travelways, apply the Landscape Character Theme in which the management activity occurs and apply a Scenic Integrity Objective of at least moderate.

Figure 3.5.2. Regulatory Requirements, Guidance and Coordination regarding the Scenic Resource. *Several laws and regulations, as well as manual/handbook direction and Wasatch-Cache National Forest Revised Plan direction apply to managing scenic resources.*

Guidelines for meeting Scenic Integrity Objectives (SIOs) are described in Forest Service Handbook 701, Landscape Aesthetics A Handbook for Scenery Management. Figure 3.5.3 defines the Landscape Character Themes and SIOs assigned by the Wasatch-Cache Revised Forest Plan.

Natural Appearing Landscape Character Theme	**Landscape Character Description**		
	The existing landscape character has been influenced by both direct and indirect human activities, but appears natural to the majority of viewers. Natural elements such as native trees, shrubs, grasses, forbs, rock outcrops and streams or lakes dominate the views. While there is evidence of human influence from historic use, campgrounds, small organization camps, rustic structures and management activity, it *is* part of the *valued built environment in the* landscape to the majority of viewers.		
	SIO	**Landscape Integrity Description**	
	High	Landscapes where the valued landscape character "appears" intact. Deviations may be present but must repeat the form, line, color, texture, and pattern common to the landscape character so completely, and at such scale, that they are not evident.	
		Landscape Element	**Landscape Integrity Attributes**
		Land Form	Dams with vegetated faces. Roads where the geometry of road in cuts and fills would not be evident, but would appear to be part of the landscape.
		Vegetation	Mechanical treatment and fire use mimics natural appearing openings, lines, edges and form found in the surrounding landscape. Fuel breaks are mitigated to mimic natural appearing lines, forms and edges found in the existing landscape. Manage vegetation for properly functioning condition at landscape scale (see Revised Forest Plan Vegetation Landscape Structure and Pattern Types for Properly Functioning Condition Table).
		Water Form	Reservoirs that have minimum water levels maintained for conservation pools and canals that mimic natural appearing lines, forms and edges found in the existing landscape. Stock ponds that mimic natural appearing lines, forms and edges found in the existing landscape.
		Cultural Features	Campgrounds, group sites, organization camps, picnic areas, recreation cabins, and organizational sites follow architectural themes and harmonize with the surrounding landscape. Historic sites are maintained or enhanced to propagate their inherent values; Roadway guardrails integrate into the surrounding landscape; Bridges complement the surrounding landscape; Fences are subordinate to the landscape by use of color and blending with the historical cultural context of the communities; Parking lots, trailheads, restrooms are present. Architecture is thematic and borrows from the form, line, color and texture of the surrounding landscape; Parking lots, roads, and other amenities appear to be part of the natural appearing landscape by eliminating the geometry of the built feature upon the landscape. For example, road cuts do not slice through the landscape, but are shaped, contoured and constructed so that the landscape is only interrupted by the track of road.

Nat	**Landscape Character Description**

	The existing landscape character has been influenced by both direct and indirect human activities, but appears natural to the majority of viewers. Natural elements such as native trees, shrubs, grasses, forbs, rock outcrops and streams or lakes dominate the views. While there is evidence of human influence from historic use, campgrounds, small organization camps, rustic structures and management activity, it *is* part of the *valued built environment in the* landscape to the majority of viewers.		
	SIO	**Landscape Integrity Description**	
	Moderate	Noticeable deviations remain visually subordinate to the valued landscape character being viewed.	
		Landscape Element	**Landscape Integrity Attributes**
		Land Form	Dams, road cuts and fills with slope rounding and contouring with minimal vegetation of grasses etc.
		Vegetation	Mechanical treatments and fire use are subordinate to the surrounding landscape by repeating the form, line and edge found in the surrounding landscape. Fuel breaks are mitigated to mimic natural appearing lines, forms and edges found in the existing landscape.
		Water Form	Stock ponds, reservoirs, and canals.
		Cultural Features	Features Electronic Sites harmonize with the surrounding landscape. Oil fields repeat the form and line of adjacent landscapes and are compatible in color and texture. Mineral development sites are of such a scale that they are subordinate to, and borrow the form, line, color and texture from the surrounding landscape. Parking lots, roads, and other amenities appear to be part of the natural appearing landscape by eliminating the geometry of the built feature upon the landscape. For example, road cuts do not slice through the landscape, but are shaped, contoured and constructed so that the landscape is only interrupted by the track of road.

Natural Appearing Landscape Character Theme	**Landscape Character Description**		
	The existing landscape character has been influenced by both direct and indirect human activities, but appears natural to the majority of viewers. Natural elements such as native trees, shrubs, grasses, forbs, rock outcrops and streams or lakes dominate the views. While there is evidence of human influence from historic use, campgrounds, small organization camps, rustic structures and management activity, it *is* part of the *valued built environment in the* landscape to the majority of viewers.		
	SIO	**Landscape Integrity Description**	
	Low	Deviations dominate the landscape character being viewed. However, activities borrow from the form, line, color, texture and scale found in the landscape character being viewed that are compatible with the surroundings.	
		Landscape Element	**Landscape Integrity Attributes**
		Land Form	Should be contoured to fit the form, line, color and texture of the surrounding landscape.
		Vegetation	Openings in vegetation dominate, but pull from the forms, lines and texture of the surrounding landscape.
		Water Form	No water forms under this management.
		Cultural Features	Utility towers' and poles' scale are dominant, but the color integrates into the surrounding landscape.

Figure 3.5.3. SIOs assigned to Management Prescription (MPs) within the Analysis Area. *The SIOs assigned to the Analysis Area are High, Moderate, and Low.*

☐ 3.5.6 Existing Conditions

■ Landscape Character and Scenic Attractiveness

The existing Landscape Character is an overall visual and cultural impression of landscape attributes – the physical appearance and the cultural context of a landscape that gives it an identity and "sense of place". Landscape attractiveness measures the scenic importance of a landscape based on human perceptions of the intrinsic beauty of landform, water characteristics, vegetation pattern, and cultural land use.

The East Fork Analysis area is typical of Ecological Section M331E-Uinta Mountains (USDA Forest Service 1994) and Subsections M331E-2 High Uintas and M331E-3 North Slope Outwash (Neilson 1994) located in the Northwestern corner of Utah, next to the Southwestern border of Wyoming in the Uinta Mountains. The Landscapes in this area in general, consists of open sagebrush flats, aspen, mixed conifer, and pure coniferous forests, high jagged mountains with semi-circular basins, deep U-shaped river valleys, grassy meadows and alpine tundra, lakes, streams and wetlands. The post-fire overstory canopy has a diverse mosaic of charred tree stems and reddened conifer canopies interspersed with forested areas along streams as a result of the fire. A network of roads and trails criss-crossing the lower slopes provides access for motorized and non-motorized recreation and commercial use. Remnants of bygone tie-hack eras can be found in many parts of the landscape in sagging log cabins, wooden check dams, waist high and higher sawn off stumps and old road treads over grown with vegetation.

☐ *Proposed Project Areas*

Table 3.5.1 summarizes the Landscape Character Theme and Scenic Integrity Objectives for the proposed harvest units.

Table 3.5.1. Landscape Character Theme and Scenic Integrity Objectives for Proposed Units in the East Fork Fire. *Individual units may have more than one Landscape Character Theme and Scenic Integrity Objective, depending upon the location of the unit.*

Unit Number	Landscape Character Theme	Scenic Integrity Objective	Acres
2,4,6,18,19	Natural appearing	High	172
2,3,4,5,6,7,8,9,10, 11,12,13,14,15,16, 18,19,21,23,24	Natural appearing	Moderate	609
Total Acres			781

■ Landscape Visibility

The Scenery Management System uses the concept of analyzing landscape visibility from context of viewers, duration of view, degree of discernible detail, seasonal variations, and number of viewers. Concern level 1 represents primary travelways/use areas that have a high degree of importance with the public, concern level 2 represents viewers that have a moderate interest in scenery from travelways/use areas, and concern level 3 indicates low interest in scenery from travelways/use areas. This methodology assumes that from major vectors and concentrated use locations, the majority of the people who use an area would be able to view the scenery. The concern levels for the travelways/use areas for the East Fork Fire Salvage Project (see Table 3.5.2) were inventoried and mapped based on comments from District personnel and the public.

Table 3.5.2. Scenery Management System Concern Levels for Roads and Trails in the Analysis Area. *Concern levels reflect the degree of importance of the area's scenic quality when viewed by the public using the various roads and trails.*

Travel Route		Travel Route Name	Concern Level	Miles
Type	Number			
Roads	80058a-e, sr150	North Slope, Mirror Lake Hwy	1	14
Motorized trails	9801, d4,	Wolverine ATV		
Non-motorized Trails	8098, 8100, 8110,	Stillwater, East Fork Bear, West Fork Blacks Fork		
Roads	80059, 80061a-b, 80062, 80063a-b, 80067, 84058, 84061, 84062, 84067, 84078, 80120	East Fork Bear River, Mill Creek, Elizabeth Mt., West Fork Blacks Fork 4X4, Table Top, Burn, Mill Creek G.S., Section 20/4, Section 16, Fish Lake Timber, Lily Lake	2	27
Non-Motorized Trails	8063	West Fork Blacks Fork		
All other FS Roads			3	57
Private Roads			3	42
Total miles of Road in the Analysis Area				140

The seen area map was developed by spacing viewpoints at ½ mile intervals along concern level 1, 2, and 3 travel routes, that represent views into the analysis area within 4 miles. The seen area maps were generated using GIS technology and are located in the East Fork Analysis project file.

■ Existing Scenic Integrity

"Scenic integrity" compares the landscape with the baseline from the Revised Forest Plan and the landscape character of the surrounding landscape to determine the relationship of integrity in comparison with this described baseline. Often scenic integrity has to do with the size, scale, and location of past human activities such as timber harvest units and road building and how these past activities relate to the inherent landscape character (Figure 3.5.4).

☐ *Existing Scenic Integrity Levels*

The project areas has a variety of Scenic Integrity Levels ranging from areas of High and Very High scenic integrity to areas of Low scenic integrity. These existing scenic integrity levels were mapped by identifying uncharacteristic lines in the vegetation layer using GIS and ortho photos. A scenic integrity objectives GIS map was created, using historical data and roads layers. This map was used during the analysis of this project to study the relationship of the project area to the Revised Forest Plan direction and existing condition. This map is located in the EIS Project File.

Due to past management activities, not all areas within the East Fork Salvage EIS comply with the SIO assigned to these areas by the Revised Wasatch-Cache National Forest Plan. Areas not in compliance with the Forest Plan were inventoried and are identified in the project file.

Scenic Integrity Levels

Very High: These are landscapes where the valued landscape character "is" intact with only minute, if any, deviations. The existing landscape character and sense of place are expressed at the highest possible level.

High: Landscapes where the valued landscape character "appears" intact are said to have high scenic integrity. Deviations may be present but must repeat the form, line color, texture and pattern common to the landscape character so completely and at such scale that they are not evident.

Moderate: These are landscapes where the valued landscape character "appears slightly

altered". Noticeable deviations must remain visually subordinate to the landscape character being viewed.

Low: In these landscapes the valued landscape character "appears moderately altered." Deviations begin to dominate the valued landscape character being viewed but they borrow valued attributes such as size, shape, edge effect, and pattern of natural openings, vegetative type changes or architectural styles outside the landscape being viewed.

Figure 3.5.4. Scenic Integrity Levels. *Scenic integrity describes the relationship between the landscape and past activities.*

3.6 Heritage Resources

3.6.1 Introduction

Heritage resources include buildings, sites, areas, and objects having scientific, historic, or social values. They comprise an irreplaceable resource relating to past human life. Cultural resources are the physical remains of human activity (artifacts, ruins, burial mounds, rock are, etc.) and conceptual content or context (as a setting for legendary, historic or prehistoric events, as a sacred area of native peoples, etc.) of an area of prehistoric or historic occupation. As with other resources, heritage resources could be affected by activities proposed by this project. If appropriate measures were not taken to protect them from potential damage, these legacies could be lost forever.

3.6.2 Geographic Area Assessed

The geographic area assessed for cultural resources was the land within and immediately adjacent to the perimeter of the East Fork Fire and the watersheds affected by the fire.

3.6.3 Methodology Used to Collect Data and Make Scientific Findings

Since 1974, the Wasatch-Cache National Forest has conducted cultural resource inventories and compiled a database of recorded prehistoric and historic sites on the Forest. Heritage Program staff has also recorded the areas surveyed and the survey methods. The database is updated as more areas are surveyed and sites discovered.

Survey strategies on the Wasatch-Cache National Forest have evolved over time, but they generally consist of controlled partial surveys. Where there is a strong possibility of prehistoric or historic sites, the entire area receives pedestrian coverage. When an area warrants, occasional subsurface testing has also been performed. Survey methods are recorded in the survey report and field notes for each specific project.

In addition to examining previous heritage resource inventories, historic documents, maps, and records are also reviewed. All types of information from oral histories, popular literature, ex-Forest employee and current Forest employee information is obtained and used to help make decisions. Most of this section was derived from a specialist report (Eberlien 2003) on heritage resources.

3.6.4 Issues Specific to Heritage Resources

An Internal Issue Statement related to heritage resources was identified. It is summarized in Figure 3.6.1.

Heritage Resource Issue

Timber salvage and road construction carried out within the affected areas have the potential to impact recorded and/or unrecorded prehistoric and historic resources

Figure 3.6.1. Heritage Resources Issues. *Heritage resource issues were combined into a single issue.*

3.6.5 Regulatory Requirements, Guidance and Coordination

Heritage and tribal interests are regulated by federal laws that provide direction and guidance to the Forest Service in identifying, evaluating and protecting cultural resources. The Forest Plan tiers to these laws. Thus, Forest Plan guidance and regulation concerning cultural resources are in agreement with the federal regulatory acts listed in Figure 3.6.2.

Heritage Resource Regulations

National Historic Preservation Act of 1966, as amended (NHPA)

This is the "keystone" legislation of modern heritage resource management. All other heritage resource management laws and regulations support, clarify or expand on the NHPA.

Federal Regulations. 36 CFR 800, 36 CFR 63, Forest Service Manual 2360 (FSM 2360)

These regulations contain the basis of specific Forest Service heritage resource management practices. These laws, regulations and direction guide the Forest Service in identifying, evaluating and protecting heritage resources on public lands.

Figure 3.6.2. Cultural Resources Federal Regulations. *Federal regulations govern cultural resources.*

The Forest Service is required to assess the effect on heritage resources that are either determined to be eligible for inclusion in the National Register of Historic Places (NRHP) or heritage resources that are not yet evaluated for eligibility. Specific locations of historic properties are exempt from disclosure under the Freedom of Information Act pursuant to 5 U.S.C. 552(b)(5) (USDA, USFS 1999).

A number of federal regulatory acts increase the role of tribes in the decision-making process. They are listed in Figure 3.6.3.

Tribal Involvement

Archaeological Resources Protection Act of 1979.

This act requires tribal notification and consultations where requested in regard to

proposed removal of artifacts by permit from public lands.

Native American Graves Protection and Repatriation Act of 1990

This act recognizes Native American control of human remains and certain cultural objects

found on public lands and requiring consultation prior to authorized removal of such items.

National Historic Preservation Act of 1966, as amended in 1992

This act more explicitly incorporates tribal involvement into the Section 106 consultation process.

American Native American Religious Freedom Act (AIRFA)
This act establishes a federal policy to protect and preserve for American Native Americans their right of freedom to believe, express, and exercise [their] traditional religions (42 U.S.C. 1996).

Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA) as amended by the National Forest Management Act of 1974 (NFMA)

This act specifies that an interdisciplinary approach will be used in land and resource management planning on the National Forest System, providing for public involvement and coordination with State government and other agencies (including Tribal).

National Environmental Policy Act of 1969 (NEPA)

This act provides effective mechanisms for public and tribal involvement in Forest Service management of historic, cultural, and traditional resources. NEPA declares that it is Federal policy to preserve important historic, cultural, and natural aspects of our national heritage.

Figure 3.6.3. Acts Govern Tribal Involvement. *Federal regulations specify tribal involvement in decision-making.*

3.6.6 Previous Analysis

Numerous heritage resource inventories have been performed in the analysis area in the last 25 years (Table 3.6.1). Most of these surveys have been conducted for compliance work prior to project implementation. For the past 5 years, the WCNF has supported cultural resource surveys that focus on monitoring and documenting the tie hack cabins that still exist on the Evanston-Mountain View district. In addition to heritage resource surveys, oral histories have also been conducted with ex-tie hack loggers (King 1991). Most recently, condition assessments were conducted at known cultural resource sites within the fire perimeter as part of a Burned Area Emergency Rehabilitation (BAER) plan (Eberlien 2003). Heritage resource surveys have been conducted to ensure no prehistoric or historic sites are affected by the project.

Table 3.6.1. Previous Heritage Research Surveys in the East Fork Fire Projecct Area. *Several surveys have been completed within the analysis area since 1976.*

Project Name	Project Number	Author	Results
Boundary Creek Timber Sale	WS-76-12	Robert M. Clark	2 Sites
Lily Lake Timber Sale	WS-76-21	David Gillio	Negative
Lily Lake Salvage Sale	WS-81-141	Marilyn Mlazovsky	8 Sites
Lily Lake/Sage Draw Timber Sales	WS-83-201	Marilyn Mlazovsky	Negative
Cultural Resource Survey Tie Hack Camp #92	None	Marilyn Mlazovsky	1 Site
Christmas Creek Unit – Sohio	WS-84-231	Timothy Burchett	5 Sites
West Fork Blacks Timber Sale	WS-85-299	Marilyn Mlazovsky	5 Sites
Amoco Proposed Federal Unit A-1	WS-85-305	Hauck, F.R.	1 Site
Seismic Explorations	WS-01-620	Eric Hansen, Thad Stewart	4 Sites
West Fork Blacks Bridge	WS-02-624	Teneal Jensen	Negative
Darby Thrust Seismic	WS-02-637	Eric Hansen, Thad Stewart	4 Sites
East Fork BAER Monitoring	WS-02-643	Jennifer Eberlein	26 Sites (updates and new sites)
Darby Thrust II	WS-02-644	Eric Hansen, Thad Stewart	1 Site
Darby Thrust III	WS-02-649	Eric Hansen	2 Sites

Several articles and reports have also documented the general history of the tie-hack era of the District (Ayres 1980b, Colton 1967, Marshall 1965). In addition, district staff has also recorded sites within the scope of their general duties, not necessarily as formal cultural resource inventories (Asay n.d.). The site location information gathered by district employees has been very important in locating and recording sites for project inventories.

The history of the general area is also very important when determining effects to known sites. The information on the tie hack industry and how workers cut timber, built roads, and dammed rivers for floating ties have been very important not only for cultural resource effect analysis, but also for other resources such as fisheries habitat. General Summit County histories have also been helpful in determining the significance of prehistoric and historic sites (Hampshire et. al 1998).

☐ 3.6.7 Existing Conditions

■ American Indian Era Overview

American Indian land use in the High Uinta Mountains dates to 10,000 years before present when small bands of American Indians entered the post-glacial landscape of the Uinta Mountains. Throughout the ages, American Indians have seasonally exploited a wide range of plants, small and large game (elk, deer, moose) and the abundant lithic (stone) resources of the Uinta Mountains. With time, prehistoric groups grew larger and resource utilization intensified. After the introduction of the horse in the eighteenth century A.D., mobility increased,

leading to greatly increased trade and social interaction.

About 700 or 800 years ago, the people who lived in northern Utah, known as the Fremont, disappeared. Some suggest that the Fremont were driven out by the Shoshonean people. The Northern Shoshone inhabited a large portion of northern Utah including the North Slope of the Uinta Mountains (the Ute generally controlled the Southern Slope of the Uinta's) (Hampshire et al. 1998; Parry 2000).

Although American Indian's lived and used the resources of the Uinta Mountains, few American Indian (prehistoric) sites have been identified in this area. The paucity of identified sites most likely results from the fact that artifacts are not visible on the surface. They are either covered by leaf litter and duff or soil, not because sites are not located in the Uinta Mountains. Where the ground is exposed to the eye, such as above the treeline, American Indian sites are recognized more easily. Numerous prehistoric American Indian sites have been discovered above treeline on high-altitude survey projects as well as on the South Slope of the Uinta Mountains that is part of the Ashley National Forest (Madsen 1990; Malmstrom 1997; Eberlien 2002a; Loosle 2002). Only one American Indian lithic scatter (42 SM 1) site has been recorded within the East Fork Fire perimeter (Clark 1976e).

A common vision of American Indian history is that groups lived in complete harmony with nature and did not leave a trace of impact on the ground. This view is increasingly being questioned, especially on the role of American Indians and historic fire use (MacCleery 1994). American Indians used fire as an easy method to clear land, particularly when agriculture entered Native culture. Some predict that by 1500 A.D., millions of acres were being cleared for crop production (MacCleery 1994). Major ecosystems noted by early Euro-Americans, such as the prairies of the Midwest and savannahs of the South, were created and maintained through annual, low intensity burns by American Indians. These ecosystems are systematically lost as forests and woodlands naturally invade and replace these historic open grasslands

■ Euro-American Historic Overview

The earliest Euro-American people to visit Utah and the Uinta Mountains were the explorers and fur trappers of the early 19th century. William H. Ashley and Etienne Provost were the first documented white men to enter Summit County (Hampshire et al. 1998). Peter Skene Ogden, Jedediah Smith, and perhaps Jim Bridger were all located in the general vicinity of Summit County during 1824 to 1825. Explorers, trappers, and hunters continued to travel in the Uinta Mountains until the demand for pelts and the number of beavers declined in the 1840s.

Although the trappers, traders, and immigrant travelers of the early 1800s certainly influenced and changed the face of the Uinta Mountains, the next wave of immigrants altered the landscape forever. In 1847, the Mormon immigrants arrived in Utah and determined that the Salt Lake Valley would be their new home. By establishing Salt Lake City, Mormon leaders not only created a base for their members to rely on, but other travelers moving through Utah to California or the Northwest.

The settlement of Euro-Americans in northern Utah resulted in hostilities between the Mormon settlers and the Ute and Shoshone tribes that relied on the same resources that Mormons also needed. Early settlers of numerous Summit County towns such as Wanship, Henefer, Peoa and Kamas all had to contend with conflicts with large groups of Native peoples.

□ *Railroad and Logging*

The greatest effect on the North Slope of the Uinta Mountains came with the construction of the trans-continental railroad in 1869 and the subsequent need for railroad ties. Logging had occurred in the Uinta Mountains prior to the railroad need, however, it was on a much smaller scale. With the establishment of Fort Bridger, Wyoming in the 1850s, logging began on the lower elevations and at sporadic episodes over the next 15 years (Ayres 1980). Beginning in 1867, the Union Pacific railroad required numerous railroad ties for construction and the Uinta Mountains were the prime source of lumber along the windswept plains of Nebraska, Wyoming, and Nevada.

In addition to cutting over the timber stands of the Uinta Mountains, contractors established logging camps, known as tie hack camps, in the Uinta Mountains. The remains of these tie hack camps such as cabins, roads, flumes, and dams,

remain scattered across the North Slope of the Uinta Mountains today. Large commissaries (supply complexes) built to outfit the tie hackers were created at the mouth of the larger river valleys (i.e., Mill Creek, Black's Fork, etc.). Logging for railroad ties declined after the Wasatch National Forest was created in 1906.

Although demand dropped drastically following 1869, railroad ties were still needed to repair the line. In 1873, the Hilliard Flume and Lumber Company completed a 30-mile long flume along the Bear River to float ties, lumber, and other products to the Railroad point at Hilliard, Wyoming. The remains of this flume can still be seen today and its significance to the general history of the area is recognized since it is listed on the National Register of Historic Places.

A new wave of tie hackers came to the North Slope looking for work when the demand for railroad ties picked up during 1912 and the 1930s. Some of this demand may also stem from the fact that a tie hack job was at least some type of work during the Great Depression years. The Forest Service regulated this later era of logging in the Uintas (Ayres 1980, Baker and Hauge 1913, Colton 1967, King 1991).

Two towns, Mill City and Black's Fork, were created in response to the tie hack industry. After 1873, Mill City built up at the head of the Hilliard Flume northwest of Hayden Peak. During the 1880s, Mill City housed up to 500 workers and the logging company kept several barns and sheds. Black's Fork is located just south of the Wyoming state line and probably served as a commissary for the West Fork Black's Fork River valley workers. Black's Fork was probably one of the earlier commissaries established, during the 1870s. The population probably ranged from 50 to 100 people where food, blacksmith services, and other supplies could be found. Both Mill City and Black's Fork faded as towns when the demand for cross ties disappeared (Carr 1972).

With the creation of the Wasatch National Forest in 1903, government monitored timber sales were conducted in suitable areas of the Uinta Mountains. This process continues to this day.

From the numerous cultural resource surveys that have been conducted in the past, 25 sites have been recorded within the fire perimeter boundaries (Table 3.6.2). One site (42 SM 1) is a prehistoric lithic scatter while the rest date to the historic period. The majority of the historic sites are related to the tie hack logging industry described above. Sawmill sites likely date to the 1930s.

Table 3.6.2. Recorded Heritage Sites Within the East Fork Fire Project Area. *Twenty-five sites have been recorded within the fire perimeter.*

Site Number/ Name	Type	Site Number/Name	Type
42 SM 1	Lithic Scatter	42 SM 353	Tie Hack Cabin
42 SM 25	Tie Hack Cabin	42 SM 354	Tie Hack Cabin
42 SM 61	Tie Hack Cabin	42 SM 355	Tie Hack Cabin
42 SM 62	Tie Hack Cabin	42 SM 356	Tie Hack Cabin
42 SM 106	Sawmill	42 SM 364	Tie Hack Cabin
42 SM 107	Sawmill	42 SM 365	Tie Hack Cabin
42 SM 327	Tie Hack Cabin	42 SM 366	Tie Hack Cabin
42 SM 328	Tie Hack Cabin	42 SM 368	Tie Hack Cabin
42 SM 329	Tie Hack Cabin	42 SM 369	Tie Hack Cabin
42 SM 345	Tie Hack Cabin	42 SM 370	Sawmill
42 SM 350	Tie Hack Cabin	42 SM 371	Tie Hack Cabin
42 SM 351	Tie Hack Cabin	42 SM 372	Tie Hack Cabin
		42 SM 420	Sawmill

3.7 Roadless Resource

3.7.1 Introduction

Inventoried Roadless Areas (IRAs) within the project area boundary provide a perspective of the way the landscape may have appeared before human development.

At a national scale, Inventoried Roadless Areas have recently been highlighted for their values as biological strongholds; meeting an increasingly diverse need for watershed preservation, protection of habitat for sensitive, threatened, and endangered species, and for providing locations for non-motorized recreation (USDA Forest Service 36 CFR Part 294, January 5, 2000). Most of the information in this section is derived from a roadless resources specialist report (O'Dell 2003).

3.7.2 Geographic Area Assessed

The primary geographic area assessed for the inventoried roadless was the land within and immediately adjacent to the perimeter of the burned areas and the watersheds affected by the East Fork Fire (See Map 3.7.1, Appendix A).

Identification of Inventoried Roadless Areas within the Project

Inventoried roadless areas in the analysis area were identified by using information contained within the Forest Service Roadless Area Conservation, Draft Environmental Impact Statement Volume 2 (USDA Forest Service 2000), and the Wasatch-Cache National Forest Revised Forest Plan and Appendices (USDA Forest Service 2003).

The determination of which inventoried roadless areas warrant additional protection was completed under Forest Plan revision (USDA Forest Service 2003) 36 CFR 219.9 (b) (8)). Existing Management Prescription Category direction, as defined by the Forest Plan (USDA Forest Service 2003) was used to establish resource conditions and desires.

3.7.3 Issues Specific to Roadless Resources

No entries into roadless area are proposed in the East Fork Fire salvage project, therefore roadless was not a driving issue.

3.7.4 Regulatory Requirements, Guidance and Coordination

The Wasatch-Cache National Forest Revised Forest Plan allocated several management Prescription Categories (MPC) designations to the Inventoried Roadless Areas depending upon the determined value for meeting future wilderness and unroaded character. Some areas were allocated to MPC 1.5, recommended wilderness. Other areas were allocated to MPC designations that provide for development of road systems and management of vegetation.

3.7.5 Existing Conditions

Inventoried Roadless Areas

Roadless areas included in the 2002 roadless inventory are within both the analysis area and within the fire perimeter. Approximately 16,356 acres of the analysis area and 6,171 acres within the burn are roadless.

Within the burn, 2,429 acres are mapped in MPC 1.5. No roadless acres are proposed for treatment in the East Fork Fire Salvage project.

Land Acquisition

Section 25 in the West Fork of Blacks Fork drainage was recently purchased for inclusion into the National Forest. The question of the roaded status of this section has been raised, with the concern that if section 25 is roadless, it creates a roadless connection between Section 36

and 24, thereby extending roadless status to section 24.

Section 25 has been reviewed using aerial photographs, maps, and on-the-ground visit (USDA Forest Service 2003e). The existence of roads and past harvest units has been confirmed on the east side and west edge of the section. The southern edge of the section is considered roadless. A connecting corridor of roadless land less than ½ mile wide exists through the western 1/3 of the section between Section 24 and inventoried roadless land to the south of Section 25. Since this corridor is less than ½ mile wide, the peninsula of roadless land extending from the inventoried High Uintas Roadless area to the north through Sections 25 and 24 are not considered roadless under the protocol used to determine whether or not narrow peninsulas of unroaded land should be included in the roadless inventory (refer to Map 3.7.1).

3.8 Infrastructure and Improvements

3.8.1 Introduction

Between the 1950s and the 1990s, road building to access timber harvest areas accelerated. Some of the lower standard roads built during this period were intended to be temporary roads rather than become part of the Forest Service roads system. Others were built to provide long-term access for public recreation and vegetation management.

Today, the Project Area contains a number of Wasatch-Cache National Forest system roads ranging from smooth gravel-surfaced roads to rough primitive-surfaced roads. Main Forest system roads connect with county roads and paved highways to form a transportation system that provides access to the Wasatch-Cache National Forest from nearby towns and communities, and by highways from distant regions for a variety of uses. Most of the information in this section was derived from a specialist report on infrastructure (O'Dell 2003a).

Along with convenient travel routes, roads also provide management problems. They must be maintained in order to limit safety and environmental consequences. However, maintenance is costly and maintenance resources have been unable to keep up with needs. This section of the report presents information on the conditions of the transportation system.

3.8.2 Geographic Area Assessed

The analysis area referred to in this chapter is the watershed boundaries within which the East Fork fire occurred. The Analysis Area encompasses a larger area than the Project Area and includes roads that cross private lands wherever the forest has a right of way. This extended road coverage shows haul routes into the Project Area, as well as spatial relationships for road density and other cumulative effects analysis (See Map 3.7.1, Appendix A).

3.8.3 Methodology Used to Collect Data and Make Scientific Findings

Data on roads and trails was derived from GIS layers used in Forest Plan revision and the Mountain View – Evanston Ranger District Travel Management Plan. Information was updated with more current inventory data during project planning.

The road management information and geographic location were current up to the date of scanning. Obliterated and "impassable" roads were deleted from the base road cover for existing conditions. These calculations aid in the identification and spatial distribution in "percent of area" of a given density. Anomalies with high or low densities can be readily displayed or used to further refine road density problem areas.

☐ 3.8.4 Issues Specific to Infrastructure and Improvements

Public comments solicited during the Scoping phase of Alternative Development and interdisciplinary team discussions identified issues related to roads. A Combined Public and Internal Issue Statement is displayed below. (Figure 3.8.3).

Infrastructure Issues

Permanent or temporary road construction and improvements affect commercial uses, aesthetics and recreation opportunities, sometimes positively and sometimes negatively.

Figure 3.8.1. Roads Issues. *Road-related issues were identified by the Interdisciplinary Team during Scooping and Alternative development.*

☐ 3.8.5 Regulatory Requirements, Guidance and Coordination

The Wasatch-Cache National Forest Plan describes the goals, objectives, standards, management practices, and monitoring and evaluation requirements of the Forest Plan's management direction. Forest roads are a major component to consider with the implementation of management activities. The transportation system should be sized to meet resource and access needs yet have economic and environmental benefits. Some of the guides that are referenced are shown in Figure 3.8.2.

Forest Plan Road Management Guidelines

Goal 5: Provide a road and trail system that is safe, responsive to public and agency needs and desires, affordable and efficiently managed (p.4-21).

Subgoal 5c: Provide a variety of opportunities for motorized access while avoiding or reducing undesirable social and resource impacts (p.4-22).

Standard S17 All decommissioned roads/trails will be properly drained (p.4-45).)

Guideline G45: Access routes for heavy equipment should be selected to limit disturbance to riparian vegetation and to limit the number of stream crossings (p.4-46).

Figure 3.8.2. Wasatch-Cache National Forest Plan Guidelines for Roads. *The Forest Plan contains Goals, Standards and Guidelines relevant to Roads.*

There are other publications, in addition to the Forest Plan, that contains regulations and guidance pertaining to the Forest transportation system (Figure 3.8.3).

Road Guidance and Direction

36 CFR § 212 , et al. Administration of the Forest development Transportation System; Prohibitions; Use of Motor Vehicles Off Forest Service Roads; Final Rule; Forest Service Transportation; Final Administrative Policy; Notice. Summary: This final National Forest System Road Management rule revises regulations concerning the management, use, and maintenance of the National Forest Transportation System… (36CFR § 212, et al.)

Roads Analysis: Informing Decisions About Managing the National Forest Transportation System. (USDA Forest Service. 1999. Misc. Rep. FS-643. Washington D.C. 222 p). This document provides guidance and direction (with a statutory-flavor), to address the project transportation system and the existing and long-term road management objectives.

The Forest Service Manual 7700 – Transportation System; contains objectives, policies, responsibilities, and transportation analysis requirements. Subsection 7703.2 addresses management opportunities and provides guidelines for managing the forest transportation system by maintaining and reconstructing needed roads as well as the decommissioning of unneeded roads.

Soil and Water Conservation Measures (SWCM) contains the management practices that are included when implementing Forest management activities.

Figure 3.8.3. Additional Federal Guidance for Roads. *Additional guidance and regulation for Forest roads are provided by Federal publications.*

3.8.6 Existing Conditions

The Analysis Area contains approximately 98.4 miles of system roads (see Appendix A, Map 3.7.1). Table 3.8.1 displays miles of roads and trails by drainage. The current transportation system provides nearly complete access in developed portions of the project area. No major addition of roads to the transportation network is needed for future management in these portions of the project area remaining unroaded.

There are three functional classes that describe the way a forest service road serves forest resource needs. These are arterials, collectors, and local roads. Most of the transportation system contains local roads that were built to facilitate timber harvest and logging activities and are closed following post sale activities.

Arterials and collectors generally provide open road access throughout the Project Area for other forest activities, including public recreation. The location, standard, and use of these roads are different. Forest arterial roads are often determined by a demand for maximum mobility and travel efficiency, rather than specific resource management service.

Forest collector roads, on the other hand, are influenced by both long-term multi-resource service needs and travel efficiency. The collector road may be operated for either constant or intermittent service, depending on land use and resource management objectives for the area served by the facility.

Forest local roads are generally located at the end of the transportation system, and are usually controlled by a specific resource activity rather than travel efficiency. Forest Local Roads may be developed for either long-term or short-term service. (FSM 7710.51)

Administrative use roads are constructed roads that are not open to public use. They are gated roads that permit access needed for occasional management activities, but are open only for short duration periods of time, such as for fire, timber harvest, or other management activity.

The Forest Supervisor (USDA, Forest Service 2004) determined that the Wasatch-Cache National Forest Roads Analysis (2002) and subsequent environmental analysis are adequate to inform the decision being made in the East Fork Salvage EIS (FSM 7712.13) and that an additional roads analysis document is not needed at this time.

Road 80299 (1.3 miles long) has been identified as a road that would need a combination of partial relocation and removal and replacement of large fills over log culverts with fills over large metal culverts or would need to be decommissioned. It is on a poor location with steep road grades and two large fills over old log culverts. It is difficult to maintain drainage on the portions of the road with steep grades due to poor soils for construction of water bars or dips. About ½ mile of Motorized Trail 4301 is located in the bottom of a draw that has a seasonal water flow (See Map 4.6.1, Appendix A). The trail has intercepted the water in several places resulting in erosion and sedimentation.

Table 3.8.1. Miles of National Forest Roads and Motorized Trails within the Analysis Area. *Mileages were calculated from Forest Plan revision and Travel Plan GIS layers.*

Infrastructure in East Fork Analysis Area			
Drainage	**Watershed**	**Type of Infrastructure**	**Miles**
East Fork Bear River	Boundary Creek	Open Roads*	0.1
		Motorized Trails (10 feet)***	0
	Right Hand Fork	Open Roads*	0
	Left Hand Fork	Open Roads*	0
	East Fork Bear	Open Roads*	19.1
		Motorized Trails***	4.8
	East Fork Bear Total:		**24**
Mill Creek	Mill Creek	Open Roads*	13.8
		Motorized Trails***	1.1
	North Fork Mill Ck	Open Roads*	6.7
		Motorized Trails***	0
	McKenzie Creek	Open Roads*	7.4
		Motorized Trails***	0
	Christmas Tree	Open Roads*	6.2
		Motorized Trails***	0
	Deadman Creek	Open Roads*	11.4
		Motorized Trails***	0.1
	Mill Creek Total		**46.7**
Blacks Fork River	West Fork Blacks	Open Roads*	20.4
		Motorized Trails***	0.8
	Middle Fork Blacks	Open Roads*	0.3
		Motorized Trails***	0
	West Fork Blacks Total:		**21.5**
Admin Use		Administrative Use only*	**6.2**
	Analysis Area Total:		**98.4**

*Data from openroads.xls, adminuserds.xls and travel_management.jpg
*** From motorizedtrails.xls and travel_management.jpg

■ Road Density

The average road density on Forest Service lands within the Project Area boundary is 1.06 miles/mile^2 (miles of road per square mile of land). This calculation includes all Arterial, Collector, and Local road systems, and administrative use roads, regardless of their condition. The road density for all roads within the Analysis Area (private and National Forest) is 1.26 miles/mile^2. Table 3.8.2 displays road densities on National Forest System Lands within the Project Area boundary.

Table 3.8.2. Road Densities (miles/mile^2 (mi/mi^2)) within the East Fork Salvage Project Area. *Road density is calculated by dividing the miles of road in the analysis area by the total square mile area of the Analysis Area.*

Ownership	Acres	Square Miles	Miles of Roads	Density	Miles of Open Roads	Open Road Density
NF	59,335	92.7	98.4	1.06	92.2	0.99
All Lands	71,220	111.2	140	1.26	133.8	1.20

Most of the road system that serves the East Fork Salvage EIS Project Area is in good condition. Due to the roadwork done for fire suppression and after the fires by BAER (USDA Forest Service October 2002), there have been varying degrees of reconstruction and maintenance on the main Forest roads to reduce erosion and sedimentation. Roads that were opened and used for fire suppression activities have been re-closed with drainage features that meet BMPs.

■ **Access and Travel Management**

The Forest recently released the Mountain View and Evanston Ranger Districts Travel Plan, which identifies roads that are open to various types of motorized use. An "open" road or trail means a system route not restricted by a forest order as shown on the Forest Travel Map. An "open" road may not necessarily be drivable by all types of legal vehicles due to natural conditions such as vegetation or slides that may block the travel-way. Furthermore, roads that are legally restricted may be drivable (due to gate destruction or vegetation removal, or there never having been a restriction device). These roads are still considered restricted. The term "road closure" as used in the context of this document implied both road travel access restrictions changes and road treatment activities to improve water quality, wildlife, and other resources.

Within the Project Area, undeveloped primitive recreation campsites are widespread. Undeveloped primitive campsites exist on old roads along the creeks and appear to be used frequently. Summer field reconnaissance identified several roads as open unclassified roads. These roads are apparently used for seasonal recreation activities and access to primitive undeveloped camping, providing forest visitors an opportunity to enjoy the forest. Measures to protect riparian areas from further undeveloped primitive recreation encroachment could improve conditions and still allow recreation. As part of the travel plan revision effort, unclassified roads that currently provide recreation and trail opportunities were identified and mapped.

A spur of Road 80061a enters private land in Section 26, Mill Creek drainage. This spur road presently fords Mill Creek on private land, with steep approaches on either side of the stream. The private landowner plans to eliminate the approaches on both sides and close the ford. To maintain access to the Lym Lake area, another access route will be necessary. Road 80293 provides that access, but is presently closed to all motorized under the travel plan (refer to Map 3.7.1).

Opportunities for motorized recreation are found throughout the Project Area. These activities take place on designated roads and trails, since motorized off-route travel is prohibited under the new travel plan.

With more people using the National Forest, motorized vehicle recreational use has increased. The use is predominantly loop traffic or through traffic on main roads such as arterials and collectors, as well as local traffic on holidays and during hunting seasons. Road 80299 provides some access for hunters that want motorized access to the upper elevations of Deadman Mountain. There is alternative access on a motorized trail over the top of Deadman Mountain about 2 miles to the southeast of Road 80299. Road 80299 has one potential dispersed camp site near its terminus, but that site is wet for most of the year. It is a dead end road and, as such, it does not provide much recreational touring opportunity. It provides access to timber salvage units 4 and 5 and can serve that purpose in the short term with minor grading and drainage maintenance.

Seasonal peaks for road use occur during August and September. However, the fires have created large clearings, and may lead to increased illegal off-road use within the Project Area, especially within the fire perimeters. Illegal off-road use within the fire perimeter may cause additional soil disturbance, wildlife displacement, contribute to spread of noxious weeds, and damage to regeneration.

Currently there are approximately 6.8 miles of motorized trails in the Analysis Area (Table 3.8.1). In addition, there are about 37 miles of non-motorized trails. Trail 4301 (with ½ mile on a poor location) is a very popular ATV trail that makes a loop from the Bear River Snow Park, past Lily Lake, to the Wolverine Trailhead in the Stillwater drainage.

3.9 Vegetation and Forest Resources

3.9.1 Introduction

The vegetation component of the affected environment results from the interaction of various species within climate and site. Vegetation provides a critical component of hydrologic processes, habitat for animals, and human interactions with the ecosystem. The combination of climatic, geophysical, and soil factors form the habitat types that are indicative of the ecosystem. Forests in this ecosystem rarely reach their potential climax vegetation due to natural disturbances (e.g. fire, insects, disease, windstorms) and human-made disturbances (e.g. land clearing, timber harvest).

This section covers the vegetative resources found within the scope of the East Fork Salvage analysis. The vegetative information is confined to that necessary to provide a description of the environment potentially affected or created by the alternatives under consideration, the issues and concerns and the purpose and need. This section is a summary of more detailed analysis reports in the project file (O'Dell 2003b), which in turn are summaries of a variety of data and information sources maintained by the silviculturist (Jepsen 2004).

3.9.2 Geographic Area

The geographic area assessed was generally the watersheds in which the fire occurred (See map 3.9.1). All vegetative treatments proposed under the East Fork Salvage Project would occur within the actual burn perimeter.

3.9.3 Methodology Used to Collect Data and Make Scientific Findings

The methodology used for analyzing the various facets of the vegetation resource included classification of forest types by combining vegetation information and categories of fire severity.

The amount of mortality that would occur following the East Fork Fire was estimated using information from a report completed for the Moose Fire Project on the Flathead National Forest (Treschel, 2002). Probability of mortality was estimated using several parameters, including tree diameter, remaining live crown and extent of charring around the base of the tree. It is important to further recognize that two growing seasons will have passed before any potential salvage harvesting occurs.

Risk rating host stands to bark beetle predation is well documented in the scientific community. Fire weakened trees were assumed to be in low and moderate fire severities. Observations from annual aerial detection flights of bark beetle caused mortality within the analysis area were used to document pre-wildfire occurrences.

Determining evidence of beetle attacks sufficient to cause death of a tree by the presence of boring dust in bark crevices or at the base of the tree bole comes from Holsten, et al. (1999). Presence of boring dust offers reliable evidence of beetle presence, regardless of beetle species or host species. All beetles successfully attacking their hosts deposit boring dust as they enter the outer bark.

3.9.4 Specific Vegetation Issues

A Combined Public and Internal Issue Statement related to vegetation was identified and is summarized in Figure 3.9.1.

Vegetation Issue

Timber salvage and road construction could affect TES plant species. Timber salvage and logging equipment and other off-road vehicle use could spread noxious weed seeds into weed-free areas.

Figure 3.9.1. Vegetation Issue. *Internal and public issues pertaining to vegetation were were combined into a single issue.*

3.9.5 Regulatory Requirements, Guidance, and Coordination

The Wasatch-Cache National Forest Plan includes Forest-wide management goals:

Forest-wide Goal G3: Provide for sustained diversity of species at the genetic, populations, community and ecosystem levels. Maintain communities within their historic range of variation that sustains habitats for viable populations of species. Restore or maintain

hydrologic functions. Reduce potential for uncharacteristic high-intensity wildfires, and insect epidemics.
Subgoal 3e: Maintain or restore as mature and old age classes 40% of total conifer and 30% of total aspen cover types, well distributed across the landscape.
Subgoal 3f: Maintain or restore species composition, such that the species that occupy any given site are predominantly native species in the kind and amount that were historically distributed across the landscapes.
Subgoal 3i: Maintain viability of species-at-risk (including endangered, threatened and sensitive species and unique communities).
Subgoal 3j: Manage Forest Service sensitive species to prevent them from being classified as threatened or endangered and where possible provide for delisting as sensitive (FSM 2670).
Subgoal 3q: In revegetation projects establish a variety of native species (avoiding monocultures).
Subgoal 3s: Greatly reduce known infestations of noxious weeds and rigorously prevent their introduction and/or spread.

The Wasatch-Cache National Forest Plan includes Forest-wide Standards:

Standard S1: Allow no ground-based skidding and oil and gas surface occupancy on slopes greater than 40%.
Standard S13: At least 20 percent of each forested cover type by ecological section (McNab and Avers 1994) shall be maintained with old forest landscape structure with patch sizes of at least 10 acres. These

old forest areas are dynamic, changing location as disturbances occur.

The Wasatch-Cache National Forest Plan includes Forest-wide Guidelines:

Guideline G23: Avoid actions on the Forest that reduce the viability of any population of plant species classified as Threatened, Endangered, Sensitive or recommended sensitive. Use management actions to protect habitats of plant species at risk from adverse modification or destruction. For species that naturally occur in sites with some disturbance, maintain the appropriate level of disturbance.
Guideline G25: Integrated weed management should be used to maintain or restore habitats for threatened, endangered, proposed and sensitive plants and other native species of concern where they are threatened by noxious weeds or non-native plants. When treating noxious weeds comply with policy in Intermountain Region's Forest Service Manual 2080, Supplement #R4 2000-2001-1 (Appendix III).
Guideline G4.4-1: Timber harvest, vegetation/fuel treatment, road construction, prescribed fire and wildland fire use are allowed to mimic historic conditions, to restore ecosystem functioning, and to protect property in the wildland urban interface, and are designed to be compatible with motorized recreation, but must not detract from the recreation setting over the long-term.
Guideline G5.1-1: Timber harvest, vegetation/fuel treatment, prescribed fire and wildland fire use are allowed to maintain or restore proper functioning conditions, for hazardous fuel reduction, to protect property in the wildland urban interface, and to provide for commodity and non commodity outputs and services.
Guideline G65: The choice of silvicultural system should be one that allows emulation of the pattern (including size), timing, and frequency of natural disturbances found in the landscape being treated (For emphasis, FSH 2409.26).
Guideline G67: Timber cutting on other than suitable lands may occur for such purposes as salvage, fuels management, insect and disease mitigation, protection or enhancement of biodiversity or wildlife habitat, or to perform research or administrative studies or scenic-resource management consistent with other management direction.
Guideline G68: When trees are to be harvested on other than suitable lands, exceptions to the five-year restocking standard are appropriate as documented in project decisions when the harvest meets one of the following criteria:

- For permanent openings that serve specific management direction
- Where provided for in specific management practices and prescriptions
- Where it is desirable to delay the onset of regeneration of crown closure to meet specific desired conditions and management objectives

Figure 3.9.2. Forest Plan Goals, Standards and Guides Relevant to the Vegetation Resource.

3.9.6 Relevant Analysis

A landscape analysis was recently completed prior to the fire for the West Fork of the Bear River on the Evanston Ranger District. This analysis covers an area several miles southwest of the fire.

■ Findings from the Landscape Analysis of the West Fork of the Bear River

Fire control has not significantly changed vegetation patterns, but has resulted in larger contiguous areas that are in older age classes and later successional stages. Fires are often related to patterns in adjacent vegetation. Lacking wind, fires in the spruce-fir will be small creating a mosaic of small even-aged groups and considerable stand heterogeneity. Fires in lodgepole pine will tend to be larger, stand

replacing disturbances that create larger, homogeneous stands.

☐ 3.9.7 Existing Conditions

■ Vegetative Composition, Structure, and Function

The shift in forest structure and composition resulting from the fire is reflected most noticeably by the amount of high burn reflectance (refer to Table 3.9.1). Areas burned at this magnitude would essentially reset succession to the grass, brush, and seedling structural stage. Moderate burn selectively killed trees, but did not reset succession to the early stages. Composition of the post-burn stand would be primarily that of species in the vicinity in the pre-fire condition.

Table 3.9.1. Burn Reflectance by Vegetation Type within the East Fork Salvage Project Area. .

Burn Reflectance Within Burn Perimeter - All Lands				
	High	**Moderate**	**Low**	**Unburned**
Cover Type	**Acres**	**Acres**	**Acres**	**Acres**
Mixed Conifer	1,877	1,353	1,384	1,416
Aspen/Conifer	282	186	153	395
Wet Meadow	64	52	121	428
Sage/Grass	94	189	515	305
Aspen	8	32	29	200
Lodgepole Pine	1,283	715	570	538
Spruce-fir	526	583	650	603
Total	**4,134**	**3,110**	**3,422**	**3,885**

Burn reflectance is classified from the digital burn severity map (see Appendix A, Map 1.1.2). that was produced from Landsat imagery during the fire. It indicates the varying heat produced by the fire, but does not necessarily indicate the degree of severity of damage to forest soils. The degree of severity depends upon additional factors, including duration of the fire in a particular area.

Unburned reflectance generally were areas that did not burn. These were usually wet meadows or patches of forest that did not have heavy fuels or were on wetter aspects or sites or protected from the flame front by meadows or old timber harvest units. There were, however, some conifer stands that experienced ground fires that did not show a reflectance and were classified as unburned.

Low reflectance fires occurred where duff and ground vegetation were lightly burned, many areas of unburned ground vegetation remain throughout the stand, and less than 20 percent of the dominant and co-dominant overstory trees were killed. Approximately 3,422 acres of the burn were classified as low reflectance.

Moderate reflectance fires occurred in the transition areas between the unburned and high severity burns, often forming a boundary around the high severity areas. In these stands, the fire killed from 20 to 60 percent of the overstory trees, but often did not burn the needles. The result is often a mosaic of large islands of green trees and large overstory individual trees. Moderate reflectance burn covered approximately 3,110 acres of the fire.

High reflectance fires occurred where the duff and tops of the ground vegetation was almost all consumed, leaving few unburned areas, and from 90 to 100 percent of the trees were killed. Usually, these stands are easily identified on aerial photos because all fine twigs and needles were consumed on standing trees or the crowns were completely scorched. Approximately 4,134 acres were classified as high reflectance. Approximately 40% of the high reflectance burn acres (1,653 acres) were classified as severely

burned to the extent that hydrophobic soil conditions were created by the fire (USDA Forest Service BAER, 2002).

☐ ***Historic Conditions***

Aspen (including mixed aspen and conifer)
Aspen stands on the North Slope of the Uinta Mountains are generally either stable (those that are able to reproduce under their own canopies) or seral (stands which occupy sites following disturbance, and are gradually replaced by other more tolerant species). Stable aspen is located on lower elevation, drier sites where competition from conifers is limited.

Seral aspen requires periodic disturbance to perpetuate itself. In the absence of disturbance, aspen will be replaced by conifers (Bartos, 2000). Historically, fires most likely began in the sagebrush and burned up into aspen stands where the cooler temperatures and more moisture would stop the fires advance. These fires would have removed invading small conifers and removed the conifer seed source from the aspen stands, thus maintaining relatively large aspen stands on the landscape (USDA Forest Service, 2002).

Lodgepole pine
Lodgepole pine is also a disturbance species, seeding in heavily following fires or other disturbance. Wadleigh (1997) estimated that stand replacing fires in the lodgepole type occurred every 106 years, while fire occurred somewhere in the study area every 31 years. The majority of stands that experienced stand replacing fires exhibit lodgepole pine as the dominant species (Wadleigh, 1997). Because of the dense stand conditions of the species, fires that reach into the crown can be pushed by winds and cover hundreds or thousands of acres very quickly. This gave rise to large even-aged stands of almost pure lodgepole pine.
Most lodgepole pine stands in the analysis area historically would not have reached very old ages because of the susceptibility of the species to mountain pine beetles. By the time lodgepole stands have reached 150 years or more, they generally are have developed other characteristics that leave them vulnerable to insects, such as average diameters in excess of 8" and basal areas in excess of 120 sq. ft. per acre (Samman and Logan, 2000). Beetle-killed trees would have increased fuel loadings as they fell, eventually providing the conditions for a stand replacing fire.

Spruce-fir
In contrast to aspen and lodgepole pine, the spruce-fir community is not dependent upon stand replacing fires. These species do not tolerate the hot dry conditions following large scale wildfire. Spruce-fir stands would have been subjected to stand replacing fires after many decades during which the fuel concentrations would have increased as a result of insects and disease. However, stand replacing fires would have been followed by aspen or lodgepole in most cases, with spruce and fir not gaining a footing until a "nurse crop" of intolerant trees had developed.

On the other hand, more frequent, non-lethal fires would have benefited spruce and fir, by creating small openings for seedling establishment. This periodic regeneration would have given rise to a multi-storied, uneven-aged stand conditions.

Mixed Conifer
Mixed conifer stands historically occurred on the landscape, primarily as a result of non-lethal fires. Wadleigh (1997) found that of 29 stands that experienced non-lethal fires, 20 had a mixed species overstory of lodgepole pine, Englemann spruce, and subalpine fir. The species composition would have changed over time based on presence or absence of stand replacing fire. In the absence of lethal fire, spruce and fir would have become the dominant species, while the shorter lived lodgepole gradually was replaced. However, with lethal fire, lodgepole would have a competitive advantage, and would dominate the site for several decades.

☐ ***Existing Conditions***

Aspen (including mixed aspen and conifer)
Aspen and aspen/conifer stands occupy the lowest elevations within the analysis area. Together, they represent approximately 11 percent of the analysis area (8012 acres). Most of these acres (7016) are mixed aspen and conifer in which conifers make up close to half the canopy cover. Aspen stands within the analysis area are generally seral, gradually giving way to conifers over several decades without disturbance such as fire or insects.

Of the 996 acres of relatively pure aspen within the analysis, only 268 acres were within the burn perimeter. Of those within the burn perimeter, the majority (192 acres) were not burned at all. This probably was due to the lower fuels and higher density of aspen trees within the stands, which limited the rate of spread and prevented the fire from moving through the tree crowns.

Aspen regeneration within the analysis area is limited to those areas that have been harvested or burned within the past 10-20 years. The Lily Lake Fire in 1980 covered approximately 3500 acres, which is currently well stocked with aspen and conifer species.

Where aspen clones existed prior to the fire, aspen sprouting is prolific. Sprouts began to appear within a few weeks of the fire and have continued to increase in numbers and size during the 2003 growing season.

Lodgepole pine

Lodgepole pine represents only 8 percent of the analysis area acreage, but 23 percent of the burned acres. Reforestation of burned lodgepole stands from naturally dispersed seed will depend upon the distance from a seed source. Acres that received a low intensity burn are expected to reforest rapidly due to the presence of serotinous cones and surviving seed producing trees. Lodgepole pine is a prolific seed producer, with good seed crops produced every 1 to 3 years Fowells, 1965). A study of the 1988 Yellowstone fire indicated that post-burn reforestation is related to the burn severity and proximity to a seed wall. In severely burned stands, the fire consumed the seed bearing cones in the trees and on the ground, leaving reforestation dependent upon adjacent live trees. Where the distance to a live seed source was great, reforestation was delayed, and the resultant stand would be more open-grown that the pre-fire stand (Ellis,et al, 1994).

Lodgepole pine stands in the unburned portion of the analysis area tend toward the mature and old age classes. Stands between 80 and 150 years old are considered mature; those older than 150 are considered old (Revised Forest Plan, App. B, page B1-3). Eighty-seven percent of the lodgepole stands within the analysis area are in these classes. Out of 90 stands with exam data available within the analysis area, only 8 were less than 80 years old, 10 were older than 150 years, with the remainder between 80 and 150. The oldest stand recorded was 260 years; that stand was burned over by the East Fork Fire.

Spruce-fir

Spruce-fir forests are the second largest forest type in the analysis area (14,698 acres). The fire burned over approximately 17 percent of the spruce-fir within the analysis area (2,448 acres). Spruce stands on private land have been harvested since the 1960s, which removed much of the larger trees and retained the seedling/sapling spruce and subalpine fir on the site. On National Forest lands, the spruce-fir type is primarily located on higher elevation, unroaded areas and has not been harvested or subjected to major burns in the last 80-100 years (Wadleigh, 1994). Prior to the fire, the stands were primarily mature and old, with individual trees ranging in age up to 250 years. Spruce was the dominant overstory species, but the regeneration within the understory was primarily fir, indicating the relative differences in shade tolerance of the two species.

Approximately one-half of the burned spruce-fir acres received a moderate or high intensity burn, resulting in extensive mortality of both overstory and understory trees.

Natural regeneration of spruce will require many years to reoccupy the high reflectance burn area, because of the destruction of seed sources and the extreme post-fire site conditions (blackened soil, lack of shade, high elevation). Seed dissemination by wind may occur up to one-eighth of a mile from a seed source; however, survival in strong sunlight is less than earlier seral species such as lodgepole pine (Fowells, 1965). Englemann spruce also produces good seed crops less frequently than does lodgepole pine (2 to 6 year intervals). Where clones existed prior to the fire, aspen sprouting is occurring currently. Areas adjacent to seed sources for lodgepole pine may also reseed fairly rapidly. However, for much of the area, reforestation will take 2 to 5 decades to adequately stock the site without planting.

Spruce-fir in the unburned portion of the analysis area is almost exclusively in the old class (greater than 150 years).

Mixed Conifer

Mixed Conifer stands comprise the largest forest type within the analysis area (19,510 acres) as well as the largest number of acres burned (5,303

acres). Generally, the mixed conifer within the burn perimeter consists of Englemann spruce, lodgepole pine and subalpine fir. The stands within the project area tend to be dominated by spruce and fir and represent a transition from the spruce and fir dominated forests at higher elevations to the lower elevation forests dominated by lodgepole pine, aspen and aspen/conifer.

Natural regeneration within the mixed conifer type will vary depending upon the fire intensity and composition of the pre-fire stands. In the moderate and low intensity burns, lodgepole pine regeneration can be expected to proceed relatively rapidly. In contrast, stands comprised heavily of spruce and fir, and those that received high reflectance burns, will be dependent upon adjacent seed sources of seral species for regeneration. As with the other forest types in the project area, the presence of pre-fire aspen clones will enhance reforestation through sprouting.

As was the case with the lodgepole and spruce-fir, the unburned mixed conifer stands are primarily in the mature and old classes. The ages of the stands vary, depending upon whether the overstory is dominated by spruce or lodgepole, but the majority exceeds 100 years. The understory trees are primarily subalpine fir; Wadleigh (1997) found fir to be the most prevalent regenerating species in 75% of the stands sampled.

Table 3.9.2 Summarizes the cover types in the analysis area and those affected by the fire.

Table 3.9.2. Vegetation Types for the East Fork Salvage Analysis

Forest Vegetation Types				
	Analysis Area		Within Burn Perimeter	
Cover Type	Acres	Percent	Acres	Percent
Mixed Conifer	19,510	27	5,303	37
Aspen/Conifer	7,016	10	837	6
Wet Meadow	2,989	4	616	4
Sage/Grass	4,090	6	1,044	7
Aspen	996	1	268	2
Lodgepole pine	5,384	8	3,270	23
Spruce-fir	14,698	21	2,448	17
Barren	15,661	22	478	3
Aspen/lodgepole	703	1	0	0
Water	167	0	0	0
Total	71,213	100	14,265	100

■ Harvest Activity

Intensive past timber harvesting has occurred throughout much of the analysis area over the last 100 years. Tie hack harvesting began first, followed by selective timber harvest and then regeneration harvest more recently. Regeneration harvests are displayed on Map 2.6.11, Appendix A and in Tables 3.9.3 and 3.9.4.

☐ *Private Lands*

Private lands comprise 4,536 acres, or 31 percent of the burned acres. Harvesting on the private lands in the analysis has occurred periodically throughout the last 100 years. The major harvesting was tie-hacking in the 1920s and 1930s which selectively harvested much of the private lands in the Mill Creek and Blacks Fork drainages. More recent logging has occurred since the 1950s, with the peak during the decade 1971-1980. A total of 1774 acres of private lands have been harvested in the analysis area. This harvesting was primarily overstory removal of spruce and lodgepole pine, which left seedling and saplings on site. Most of the advanced regeneration was subalpine fir. Table 3.9.3 displays the acres harvested by decade.

Table 3.9.3. Past Logging on Private Lands

Past Private Land Logging by Treatment Type Within the East Fork Fire Analysis Area							
Activity	Acres Treated by Decade						
	1951-1960	1961-1970	1971-1980	1981-1990	1991-2000	2001+	Total
Overstory Removal	124	293	1086	221	0	50	1774

☐ ***National Forest Land***

Harvesting within the analysis area has occurred since the late 1800s. Ties for the railroad were harvested from Mill Creek and Blacks Fork drainages prior to World War II. More recent harvest dates back to the 1950s, with the peak occurring on National Forest lands in the 1980s, with salvage of the Lily Lake Burn. A total of 4140 acres within the analysis area have been harvested since 1951; 3800 acres were from salvage operations on the Lily Lake Burn. The last large timber sale entry was in West Fork Blacks Fork in the late 1980s. Table 3.9.4 displays the acres harvested by decade from National Forest Lands.

Table 3.9.4. Past Logging on National Forest Lands

Past NF Logging by Treatment Type Within the East Fork Fire Analysis Area							
Activity	Acres Treated by Decade						
	1951-1960	1961-1970	1971-1980	1981-1990	1991-2000	2001+	Total
Salvage				3700	100		3800
Regeneration Harvest	93	285	736	227			1341

■ **Insect Activity**

Most short-term insect effects from the East Fork Fire on the Wasatch-Cache National Forest will result from bark beetle (spruce beetle, *Dendroctonus rufipennis,* and mountain pine beetle *Dendroctonus ponderosae)* responses to Englemann spruce and lodgepole pine that have been weakened, but not killed by the fire. These conditions will be present in the areas of low and moderate burn reflectance.

Timely salvage of downed, damaged, or severely weakened trees is a primary means of preventing beetle outbreaks (Samman and Logan, 2000). Such activity must be accomplished either before beetles attack it initially, or before they emerge the following spring. Outbreak prevention is best accomplished by reducing hazard associated with one or more of the risk conditions (host size, age, occurrence, and stand density). Alternatives include commercial thinnings or any of the several regenerative methods, which will help meet stand and site resource objectives (Samman and Logan, 2000).

Suppression activities have proven successful in the short-term, but generally do not modify the stand conditions that provide susceptibility and therefore do not reduce the probability of future outbreaks (Bentz and Munson, 2000).

When beetle populations are low, individual trees or small groups of trees are infested and killed. Endemic level mortality can invigorate plant communities; open canopies let in more light and allow rain to reach the forest floor, and insects produce very large amount of nutrient rich material that fall as litter (Schowalter and Withgott, 2001). Large scale outbreaks are usually triggered by large-scale disturbances, such as a windthrow event or wildfire, creating fire-weakened trees. Populations increase rapidly in these weakened trees. Emerging populations then attack and kill standing green trees. Patches as large as several hundred acres can be attacked and killed in one year (Holsten et al. 1999, Samman and Logan 2000).

Bark beetles are host-specific, and predation plays a role in forest succession. When beetle populations are low or in forests containing minor amounts of host species, the beetle will attack the larger-diameter host trees, particularly those weakened by other agents, effectively weeding out the mature trees. On spruce-fir habitat types in a seral condition where there is a majority of lodgepole pine or aspen, and minor amounts of spruce, the effect of spruce beetle would be to remove the spruce and maintain the other seral species. If spruce is the dominant tree species, the loss of scattered small groups or individual mature spruce would create openings. And in spruce-fir and mixed conifer stands where subalpine fir is present in the understory, the spruce beetle would create openings for the more shade-tolerant species to grow, pushing the forest to a faster climax condition. The effects of beetles in mixed stands would not result in loss of the stand, but the selective removal of the host species, thus changing the overall stand composition.

Mortality caused by bark beetles may also create high fuel loadings that may contribute to more intense fires. Stand replacing fires allow new seedlings to become established, and tend to favor seral species and reset forest succession (Samman and Logan, 2000).

A spruce beetle outbreak originated on the Evanston District with a windthrow event in 1995, in the area of Humpy Creek to the west of the East Fork Fire. The procedures discussed by Bentz and Munson (2000) were implemented and successfully reduced the population.

Prior to the wildfires, mountain pine beetle and Western Balsam bark beetle were causing endemic levels of tree mortality in the large areas of moderate and high risk stands of lodgepole pine and spruce-fir, probably aggravated by the continuing drought. Risk of continued predation will continue without the added effects of the East Fork fire.

There is a risk that live Engelmann spruce and lodgepole pine greater than 8 inches diameter, both within and outside of the fire perimeter, will be killed by bark beetles.

■ Non-forest vegetation

The effects of the East Fork fire on non-forest vegetation were very limited. The fire burned around most of the meadow complexes, which were still relatively wet at the time of the burn. The primary botanical concerns for the East Fork Fire Salvage timber sale are Threatened, Endangered and Sensitive species (TES) populations, and noxious weed introduction.

□ *Threatened, Endangered and Sensitive Species*

Endangered Species Act considerations are not an issue, as there is no documented endangered, threatened, or sensitive plant species populations within any of the identified harvest units or the East Fork fire area. Potentially effected species at risk, identified within the analysis area (but not in the fire perimeter or in any harvest unit), are presented in Table 3.9.5.

Table 3.9.5. Potential At-Risk Species within the East Fork Fire Analysis Area

Botanical Name	Common Name	Status	Habitat
Penstemon uintahensis	Uintah Beardtongue	WCNF Watch List	Spruce-fir and alpine tundra at 10,498-12,516 feet elev.
Parrya rydbergii	Naked Stemmed Wallflower	WCNF Watch List	Perennial found in alpine tundra – rock and talus at high elev.
Draba globosa	Rockcress draba	FS Sensitive	Perennial in alpine tundra, talus or alpine meadows
Ivesia utahensis	Utah Ivesia	WCNF Recommended Sensitive	Alpine tundra and krummholz, often in talus at 10,496-11808 feet elev.

Botanical Name	Common Name	Status	Habitat
Papaver radicatum	Alpine poppy	WCNF Watch List	Talus slopes and rock at 10596-12007 feet elev.
Cirsium eatonii var. murdockii	Murdocks thistle	WC NF Watch List	Talus slopes and rock stripes at 10597 - 12007 feet.

Likely sites were surveyed in 2002 and 2003. No populations of any of the above mentioned plants are known to occur in any harvest unit or within the fire perimeter. *Draba globosa, Cirsium eatonii* var. *murdockii* and *Penstemon uintahensis* have the highest potential for having habitat in or near the harvest units. The potential for impacting these species through harvesting trees is minimal. The highest elevation of the fire is 10,500 feet which is marginal for all three species. The majority of the Spruce-fir communities that are in the proposed harvest units are inclusions within a mixed conifer type. The best potential spruce-fir habitat is in Unit 20 which is approximately 4 acres in size and 10,500 feet in elevation. The preferred habitat, for *C. eatonii var. murdockii* and *D. globosa*, is in rock stripes, talus and alpine communities. The potential Spruce-Fir habitat, for *P. uintahensis,* that did exist was reduced in seral stage by the fire.

The majority of the harvest units are below 10,500 feet, where there is limited potential habitat for any rare plant species. No habitat exists, in or near any harvest unit, for *Papaver radicatum* ssp. Kluanense, *Ivesia utahensis or Parrya rydbergii.*

☐ ***Noxious weeds***

The transportation into the fire area of weed seeds has the potential to increase noxious weed populations that do not exist there presently. Transport on vehicles, clothing or animals are all mechanisms for noxious weed dispersal into new habitats. For this reason noxious weed invasions, due to the fire, suppression activities, and timber harvest are of primary concern.

Cardaria draba (White top), *Carduus nutans* (Musk thistle), *Cirsium arvense* (Canada thistle), *Isatis tinctora* (Dyers woad) have all been found growing within the East Fork analysis area. Of these, only Musk thistle and Canada thistle have been recorded near any of the proposed harvest units. Both of these thistles disperse seed primarily by wind. The movement of harvesting equipment and vehicles in and around the harvest units and between units will have minimal effect on the introduction of these weeds to new sites due to their presence within the fire perimeter and the primary mode of seed dispersal.

■ 3.10 Fire and Fuels

☐ 3.10.1 Introduction

Fire as a disturbance process is an integral part of the concept of ecosystems. It affects the composition, structure and pattern of vegetation on the landscape. Disturbance is necessary to maintain diversity of living things and process. The land manager faces a complex challenge in managing fire to achieve beneficial effect and avoid unwanted results (Brown 2000).

☐ 3.10.2 Geographic Area

The area analyzed includes the entire East Fork Bear River, Mill Creek, and West Fork Blacks Fork drainages upstream from the lowest National Forest ownership. The fire encompassed only portions of these drainages. There are areas within the fire perimeter that had varying degrees of burn intensity and tree mortality and areas that did not burn at all.

☐ 3.10.3 Methodology Used to Collect Data and Make Scientific Findings

Fire history records for the Wasatch-Cache National Forest were used to investigate the number of fires in the past century and amount of early summer fires that have occurred.

Stand examination data from the TSMRS (Timber Stand Management Record System) database for the Forest collected in the field prior to the fire and the Forest Vegetation database obtained from LANDSAT imagery were used to

classify fire groups and stand conditions within the fire perimeter.

Fire effects on the current condition were also analyzed by investigating fire research literature and the Forest Service Fire Effects Information System (FEIS 2001). An important source of information for the Uinta Mountains is a general technical report titled "Fire Ecology of Forests and Woodlands in Utah" by Bradley et.al. (1992). Most of the information in this section is derived from a report on fire and fuels (Johnson 2003)

Fire history studies for the north slope of the Uinta Mountains (Wadleigh 1997), and fire history of the West Fork Bear River drainage (Wadleigh, 1994) were used in this analysis to describe fire history for the area. The NIFMID (National Interagency Fire Management Integrated Database) database in Kansas City, Kansas, was queried for fire history data on the Wasatch-Cache National Forest. The database is the storage site for all Forest Service individual fire reports. Reports include date, acres and cause of fires.

Definitions for fire and fuel terms were taken from the Glossary of Wildland Fire Terminology (National Wildfire Coordinating Group 1996) and the draft Firemon (Fire Monitoring) Guide Landscape Assessment 2001 (Keane et al 2001). Figure 3.10.1 displays the definitions of key fire and fuel terms used in this EIS.

Fire and Fuels Definitions

Fire risk – the chance of fire starting as determined by the presence and activity of causative agents (environmental conditions and ignition source).

Fire intensity – The magnitude of heat produced by fire; an empirical measure that gauges the fire's status during combustion. This is commonly defined in reference to the fire line intensity, which equals energy output per length of fire front per unit time (from Firemon 2002 web site).

Fire hazard – A fuel complex defined by volume, type condition, arrangement and location, that determine the degree of ease of ignition and of resistance to control (from Glossary of Wildland Fire Terminology 1996).

Burn or fire severity – The degree of environmental change (or vegetation mortality) caused by fire, or the results of fire (Firemon 2002). Maps of the severities were derived from unsupervised classification of October 2000, Landsat 30-meter satellite imagery. Low severity is 1 to 20 percent mortality, moderate is 20 to 60 percent mortality, moderate-high is 60 to 90 percent mortality and high severity is 90 to 100 percent mortality.

Fireline intensity – The rate of heat release per unit time per unit length of fire front.

Figure 3.10.1. Definitions of Fire and Fuel Terminology. *Key fire and fuel terms, as defined in the Glossary of Wildland Fire Terminology and the draft Firemon (Fire Monitoring) Guide Assessment, are used in this EIS.*

3.10.4 Specific Fire and Fuels Issues

A Combined Public and Internal Issue Statements related to fire and fuels was identified and is displayed in Figure 3.10.1.

Fire and Fuels Issues

Future fires could result in high intensity reburns with high resistance to control where heavy fuel loading occurs from logging slash and after fire-killed trees fall.

Figure 3.10.2. Fire and Fuels Issues. *Internal and public issues pertaining to fire and fuels were identified during scoping and the development of Alternatives.*

3.10.5 Regulatory Requirements, Guidance and Coordination

Fire and Fuels Regulations

The Revised Wasatch-Cache National Forest Plan (USDA, 2003):

Includes a desired condition for fire management:

Fire—both prescribed and wildland—is used as a tool to enhance ecosystem resiliency and to maintain desired fuel levels. Fire plays its natural role where appropriate and desirable, but is actively suppressed where necessary to protect life, investments, and valuable natural resources. Effects of wildland fire are acceptable, and fire operates within historical (within the last 500 years) fire regimes appropriate to the vegetation type.

Includes a Forest-wide management goal:

Goal #4, Fire and Fuels Management: Wildland fire use and prescribed fire provide for ecosystem maintenance and restoration consistent with land uses and historic fire regimes. Fire suppression provides for public and firefighter safety and protection of other federal, state and private property and natural resources. Fuels are managed to reduce risk of property damage and uncharacteristic fires.

Includes Forest-wide subgoals:

4a: Increase the active use of fire to return fire dependent ecosystems to proper functioning and to reduce hazardous fuels.
4b: Increase public understanding and support of the active use of fire to improve watershed and habitat conditions and reduce fuels.
4c: Take timely actions to restore proper functioning of ecosystems after wildfire.
4d: Reduce hazardous fuels (prescribed fire, silvicultural and mechanical treatments) with emphasis on interface communities (wildland/urban) and increase proactive participation of communities at risk.

Includes Forest-wide guidelines:

Guideline G14: Manage vegetation for properly functioning condition at the landscape scale. Desired structure and pattern for cover types of the Wasatch-Cache National Forest (from USDA Forest Service 1996) are as follows except in the Wildland Urban Interface (defined

in Glossary), where vegetation structure and pattern should be managed to reduce threat of severe fire to property and human safety.
Guideline G5.1-1: Timber harvest, vegetation/fuel treatment, prescribed fire and wildland fire use are allowed to maintain or restore proper functioning conditions, for hazardous fuel reduction, to protect property in the wildland urban interface, and to provide for commodity and non commodity outputs and services.

36 CFR 219.27 lists several requirements in **Section (a) Resource Protection** that pertain to fire management. All management prescriptions shall:
1) conserve soil and water resources and not allow significant or permanent impairment of the productivity of the land,
2) be consistent with the relative resource values involved, minimize serious or long-lasting hazards from flood, wind, wildfire, erosion, other natural physical forces unless these are specifically excepted,
3) be consistent with maintaining air quality at a level adequate for the protection and use of National Forest System resources, and that meets or exceeds applicable Federal, state and/or local standards or regulations

National Fire Plan was developed in August 2000, at the direction of President Clinton, in cooperation with the Department of the Interior. It contains 5 main points: Firefighting, Rehabilitation and Restoration, Hazardous Fuel Reduction, Community Assistance, and Accountability

Cohesive Strategy Report, released in April 2000, provides a strategic plan to reduce wildfire risk and restore forest health in the Interior West. It is based on findings from the U.S. General Accounting Office (GAO) Report, Western National Forests: A Cohesive Strategy is Needed to Address Catastrophic Wildfire Threats (GAO/RCED-99-65). The strategy is to restore and maintain health in fire-adapted ecosystems across the interior West by: 1) Improving resilience and sustainability of forests and grasslands at risk. 2) Conserving species and biodiversity. 3) Reducing wildfire costs, losses and damages. 4) Ensuring public and firefighter safety.

At the national level, it establishes agency-wide objectives that address treatment expectations, geographic priorities, management direction and performance accountability, and a preliminary 15-year treatment schedule and budget strategy to accomplish treatment objectives.

Figure 3.10.3. Fire and Fuels Regulations. *Federal guidance from several sources pertain to fire and fuels.*

3.10.6 Existing Conditions

Historical Conditions

Fire has been visiting the landscape of the Wasatch-Cache National Forest for eons. It is likely that human ignitions are also a part of the evolution. Most accounts of fires ignited by American Indians relate to the purposeful burning to establish or keep mosaics, resource diversity, environmental stability, predictability, and the maintenance of ecotones. These purposeful fires by almost every American Indian tribe differ from natural fires by the seasonality of burning, frequency of burning certain areas, and the intensity of the fire. For those Indian tribes that used fire in ecosystems tended to burn in the late spring just before new growth appears, while in areas that are drier fires tended to be set during the late summer or early

fall since the main growth of plants and grasses occurs in the winter. The modification of the American continent by fire at the hands of Asian immigrants (now called American Indians, Native Americans, or First Nations/People) was the result of repeated, controlled, surface burns on a cycle of one to three years, broken by occasional holocausts from escape fires and periodic conflagrations during times of drought. Even under ideal circumstances, accidents occurred: signal fires escaped and campfires spread, with the result that valuable range was untimely scorched, buffalo driven away, and villages threatened. Burned corpses on the prairie were far from rare. So extensive were the cumulative effects of these modifications that it may be said that the general consequence of the Indian occupation of the New World was to replace forested land with grassland or savannah, or, where the forest persisted, to open it up and free it from underbrush. Most of the impenetrable woods encountered by explorers were in bogs or swamps from which fire was excluded; naturally drained landscape was nearly everywhere burned. It is uncertain whether or not use of fire by Native Americans had much effect on the north slope of the Uinta Mountains, but likely that there was at least some effect. The effect on the landscapes within the analysis area could have been to increase fire frequency with a resulting slight decrease in the size and intensity of stand replacement fires since fire starts by lightning are not as common on this landscape as on others (See Map 2.6.14, Appendix A). Wadleigh (1997) reported that documented fires on the Evanston R.D. showed 21 years out of 44 with reported lightning ignitions and a fire frequency of .84 lightning ignitions per year (37 fires in 44 years). Some of these fires could have become large stand replacing fires but many would have gone out due to rain or lack of fuels before they reached this stage.

Fire in the western United States was a common occurrence and often noted by a variety of observers. In 1889, Major John Wesley Powell traveled through Montana and the Pacific Northwest and testified to Congress in 1891 that, "…Fire in an ordinary year passes over the ground and burns the leaves and cones, etc., only. But there come critical years, five, ten, fifteen, or twenty years apart, critical seasons of drought, when there is no rain for several months, and the fire starts and sweeps everything away" (Powell 1891 *in* Arno 2001).

After extensive fires in the west in 1910, the Forest Service, state and private landowners, began in earnest to suppress wildfires to protect natural resources and property. Stationary lookouts with communications were established and aerial reconnaissance was initiated. The Forest Service instituted the "10 A.M." policy; which stated that the objective in wildland firefighting was to contain all fires by 10 AM on the day after detection. Aircraft increased initial attack effectiveness in remote areas in the following decades. Roads were constructed on much of the land, enabling fire suppression resources to access many areas. This resulted in reductions in the number of acres burned from the 1920s through the 1970s. Smokey Bear was established as a fire prevention icon in the 1950s and became a successful public information campaign.

Lightning was historically the cause of most fires on the Wasatch-Cache National Forest. Human caused fires have increased over time due to the increased human presence in the Forest.

The Wasatch-cache Revised Forest Plan on Page 2-25 (2003) describes fire regimes and condition classes on the Wasatch-Cache National Forest. The ecosystems of the Wasatch-Cache fall within a variety of fire regimes as displayed in Table 3.10.1. The term fire regime is used to describe the role fire plays in an ecosystem. It considers fire frequency, seasonality, intensity, duration, and scale, as well as regularity or variability. Condition classes are defined by the degree of departure from historical fire regimes resulting in alterations of key ecosystem components such as species composition, structural stage, stand age, and canopy closure. Condition Class 1 describes a vegetation type where the disturbance regime is largely intact and functioning. Class 2 describes a vegetation type where moderate alterations to the historic disturbance are clearly evident, such as one or more missed fire return intervals. Class 3 describes a vegetation type where the disturbance regime has been significantly altered. Tables 3.10.1 and 3.10.2 describe and categorize the fire regime and condition class of vegetation types that comprise 5% or more land cover in the East Fork Fire Salvage analysis area. According to statistics, the number of large fires recorded on the Wasatch-Cache National Forest appears to be increasing - - 90% of the fires > 100 acres have occurred since 1980. Three of

these fires occurred in the East Fork Fire analysis area. On a Forest-wide basis there are no vegetation types that are considered to be in Condition Class 1. However, the large acreages burned in this analysis area over the last 25 years in combination with past timber harvesting have returned a large portion (34%, Table 3.10.6) of the forested vegetation types within the East Fork Fire Salvage analysis area to a Condition Class 1.

Table 3.10.1 Fire Regime Definitions

Fire Regime Group	Frequency (Fire Return Interval)	Severity
III	35-100+ Years	Mixed Severity
IV	35-100+ Years	Stand Replacement Severity
V	>200 Years	Stand Replacement Severity

Table 3.10.2 Forest Cover Types on the East Fork Fire Analysis Area by Fire Regime and Condition Class

Vegetation Type	Acres	% of Forested Area	Fire Regime	Condition Class*
Aspen/Conifer	8,010	17	III, IV	3
Lodgepole Pine	5,384	11	IV, V	2
Mixed Conifer	19,510	41	III, V	2
Spruce/Fir	14,698	31	V	2

* Prior to recent fires and timber harvest.

☐ ***Recent Fire History and Existing Conditions in the East Fork Fire Analysis Area.***

The forested types in this area have historically been affected by mixed severity fires and stand replacement fires with a fairly long (100+ years) fire return interval for stand replacing fires (Wadleigh, 1997). The highest percentage of acres burned in the East Fork Fire were subject to stand replacement fire (53% of the forested cover types had high and moderate burn reflectance under Table 3.10.4), while 22% of the forested cover type acres had a substantial surviving forest cover component and 25% of the acres remained unburned within the fire perimeter (See Map 1.1.2, Appendix A).

The percentage of aspen/conifer (62%, Table 3.10.5) and lodgepole pine (53%) cover types experiencing disturbance (primarily fire) within this analysis area is much larger than that of the other cover types. This percentage is not out of line with what might be expected given the fire return intervals predicted for these cover types. However, almost all of this disturbance is due to the East Fork Fire and the Lily Lake Fire that occurred in the past 23 years (See Map 2.6.14, Appendix A). Much of the rest of the unburned acreage in these cover types would be expected to experience fire in the near future due to the 100+ age of the remaining unburned acres in these types.

Mixed conifer (32%) and spruce/fir (12%) cover types have experienced smaller percentages of acres disturbed. These cover types are in fire regime groups III and V, with most of the spruce/fir type in Bradley Fire Group 12, (fire regime group V). The percentage of acres disturbed in Bradley Fire Group 12 is probably in line with historical expectations due to the extended fire return intervals associated with these cover types. The continuing buildup of fuels in mixed conifer cover types in Bradley Fire Groups 10 and 11 (Fire Regime Groups III and V) may result in abnormally severe effects from future fires. Fire effects were severe in the mixed conifer cover type in many places within the East Fork Fire due to heavy fuel loading and ladder fuels.

Table 3.10.3. Burn Reflectance by Ownership Within East Fork Fire Perimeter

Burn Reflectance	National Forest (Acres)	Private (Acres)	State (Acres)	TOTAL (Acres)
Unburned	2,674	939	316	3,929
Low	2,312	943	95	3,350
Moderate	1,834	961	53	2,848
High	2,814	1,166	97	4,077
Total	9,634	4,009	473	14,204

Table 3.10.4 Burn Reflectance* of Forest Types Within East Fork Fire Perimeter

Cover Type	High		Moderate		Low		Unburned	
	Acres	%	Acres	%	Acres	%	Acres	%
Aspen/Conifer	290	23	218	17	182	14	595	46
Lodgepole Pine	1,283	41	715	23	570	18	538	17
Mixed Conifer	1,877	31	1,353	22	1,384	23	1,416	23
Spruce/Fir	526	22	583	25	650	28	603	26
Total	3,976	31	2,869	22	2,786	22	3,152	25

*Burn reflectance was mapped by RSAC (Remote Sensing Application Center) from Landsat imagery. The map allowed for digital analysis in GIS (Geographic Information System) and a general overview of the most severely impacted areas within the fire perimeter. High burn reflectance generally occurred in areas where the fire consumed all of the tree crowns. Moderate reflectance occurred where continuous ground fire occurred and most of the tree crowns were at least scorched. Low burn reflectance occurred where ground fire may have been discontinuous and scorching or torching of tree crowns was patchy.

Table 3.10.5 Forest Types within Analysis Area Affected by Past Harvest Units and Wildfires

	Past Harvest	Past Wild Fire	East Fork Fire		Total Burned or Harvested	Total Vegetation Type Acres	Percent Burned or Harvested
			Mature Forest	Harvest Units Burned			
Aspen/Conifer	347	3,891*	683	7	4,928	8,010	62
Lodgepole Pine	98	204	2,367	201	2,870	5,384	53
Mixed Conifer	1,685	38	3,955	659	6,337	19,510	32
Spruce/Fir	8	66	1,501	258	1,833	14,698	12
Total Forest Types	2,138	4,199	8,506	1,125	15,968	47,602	33
Meadows/Barren**	0	201	1,035	0	1,236	23,610	5
Total:	2,138	4,400	9,541	1,125	17,204	71,212	24

* Most of the Lily Lake Burn was also salvage harveted.
** About 8% of the area within wildfires was classified as Meadows, Sage/Grass, and Barren ground.

Table 3.10.6 Forest Types in the Analysis Area by Fire Regime and Condition Class

Vegetation Type	Pre-Disturbance*		Post-2002		Bradley Fire Group	Fire Regime Group	Condition Class
	Acres	%	Acres	%			
Aspen/Conifer	8,010	17	3,082	6	10,11	III, IV	3
Lodgepole Pine	5,384	11	2,514	5	10	IV, V	2
Mixed Conifer	19,510	41	13,173	28	10,11	III, V	2
Spruce/Fir	14,698	31	12,865	27	10,11,12	V	2
Total Forest Types	47,602		31,634				
Total Forest Types in C.C. 1**			15,968	34	10,11,12	III,IV,V	1

* Acres in each vegetation type prior to fires larger than 10 acres that have occurred since 1900 or timber regeneration harvest.
**Assumes that previously burned acres and acres of past timber regeneration harvest have returned to condition class 1.

All fires less than 10 acres within the project area are listed by decade and Fire Group (FG) in Table 3.10.7. Of the 35 fires recorded in this analysis area, only 5 have been lightning caused. The rest were due to human causes. The potential for future human-caused fires will continue to increase as the population in and around the Wasatch-Cache National Forest increases. Six of the 14 small fires listed in the 1960's were human caused and occurred during the hunting season on October 12, 1964. Most fires in the analysis area occur in late June and July although there are frequent small fires during the hunting season in October that are due to unattended campfires. The majority of acres burned have been during late June and early July (Tables 3.10.8 and 3.10.9). Without fire suppression, the acreage burned would have been larger. When combined with burning by Native Americans, fire was not absent from the north slope of the Uinta Mountains starting early in the summer.

Table 3.10.7. Number of Fires Smaller Than Ten Acres Within the Analysis Area by Decade. There are small inclusions of Fire Group 11 within the prevalent matrix of fire group 10. The analysis area contains a component of Fire Group 12, but no fire starts were recorded in this group.

	Decade							
Fire Group	**2000+**	**1990s**	**1980s**	**1970s**	**1960s**	**1950s**	**1940s**	**Total**
10 and 11	3	4	4	0	14	3	1	29

Table 3.10.8. Date, Acres, Fire Group (FG) and cause of Fires Larger Than Ten Acres Within the Analysis Area.

Fire Name	Date	Acres	FG	Cause
Boundary Creek	7/15/1918	186	10	Lightning?
1964	10/11/1964	55	10	Equipment Use
Lily Lake	6/15/1980	3,912	10,11	Campfire
North Fork Mill	8/29/1988	44	10	Campfire
Boy Scout	6/25/1994	222	10	Lightning
East Fork	6/28/2002	10,275	10,11,12	Campfire
Total		14,694		

Table 3.10.9 Number of Fires and Acres Burned by Month of Ignition *Based on records from 1947 to the present.*

	Months				
	June	July	August	September	October
Number of Fires	9	10	6	1	9
Acres Burned	14,410	196	45	1	56

The portion of the East Fork Salvage analysis area that might have burned based on fire regime cycles is difficult to determine, since most of the area is covered by vegetation types that have mixed severity or stand replacement severity fire regimes that have cycles that may exceed 200 years. It is quite possible that the acres burned in mixed severity or stand replacement over the last 100 years are within the range of what might have occurred historically without human interference. However, prior to the Lily Lake burn of 1980 and the East Fork Fire of 2002, it is possible or even likely that the acres burned were much less than what might have occurred prior to European settlement. Evidence of large wildfires from the 1800's is abundant in the large stands of lodgepole pine between 100 and 150 years old. Some of these fires were probably caused by early settlers, but many also originated as lightning strikes.

The earliest recorded fire in the East Fork Fire analysis area occurred in Boundary Creek in 1918, and burned about 186 acres. Largely

unsuccessful efforts were made by the Forest Service to plant lodgepole pine seedlings within the burn area. Another fire on the north side of Boundary Creek burned about 55 acres in 1964. The Lily Lake Fire started on June 15, 1980 and burned 3,000 acres on the first day and another 900 acres before it was contained several days later. The human caused North Fork Fire burned 60 acres on the Forest Boundary near Mill Creek Guard station in 1988. The Boy Scout Fire, started by a late June lightning strike, burned 222 acres in 1994. The East Fork Fire was apparently human caused and started on June 28, 2002. It burned about 10,275 acres within a 14,272 acre perimeter before it was essentially contained about 1 week later.

The 3 largest fires (East Fork, Lily Lake, and Boy Scout) all occurred in late June / early July. They burned a total of about 14,400 acres (20% of the 71,228 acres and 29% of the forested acres in the analysis area). They all started on the west side of the East Fork of the Blacks Fork. The East Fork and Lily Lake fires jumped across a wide riparian area along the East Fork of the Bear River and were carried from the southwest toward the northeast by strong prevailing winds. The Boy Scout fire remained on the west side of the East Fork and moved in a northwest to southeast direction with up-canyon winds. The Lily Lake and Boy Scout Fires burned almost all of the forest within their perimeters. They had fairly continuous forest in their paths. The East Fork Fire burned at higher elevations with a number of large interspersed meadows. Patches of forest within this fire did not burn.

There were three spot fires in 1944, 1947, and 1976, two spot fires in 1940, 1966, 1967, 1972 and 1975, one each in 1954, 1955, 1962, 1968, 1969, and 1974, with four spot fires in 1946 and 1973 and 5 fires in 1953. The Alpine Fire had three spot fires in 1960, two fires in 1963 and 1970, one fire in 1967, 1974 and 1976 with seven in 1973. These spots were based on old fire reports. All were suppressed. The fire reports were not started until 1947 on the Wasatch-Cache National Forest. Therefore, probably many other spot fires in the 1920s, 1930s, 1940's and before were suppressed and not recorded.

Prior to the initiation of the Forest Service fire suppression policy in 1910, spot fires had the potential to grow much larger, given the fuel conditions and evidence of size and intensity of previous fires in the area. Information on fire frequencies and severity in these habitat types also supports that conclusion. Fire cycles have probably been missed since fire suppression has been implemented, allowing fuels and stand conditions to progress to a higher fire risk status (increased ground fuels, ladder fuels and stand density). Increased fire risk has potential to increase the fire intensity and severity from a ground fire to a crown fire due to ladder fuels.

The East Fork Fire affected about 10,275 acres in a variety of vegetation types on National Forest, private and state lands. The fire severity (fire effects on the overstory vegetation) was mapped for the East Fork Fire (See Map 1.1.2, Appendix A). The results, shown in Table 3.10.4, give a general idea of the impacts of the fire.

Prior to the Lily Lake and East Fork Fires, all of the vegetation components in the Fire Regime Groups in the analysis area had probably deviated from the natural fire-free interval. This aided in fueling the size of the East Fork Fire. The East Fork Fire burned enough acres in vegetation components of Fire Regime Group V to return these components within this analysis area to a more historically natural fire cycle. The Lily Lake and East Fork fires also burned substantial acres in Fire Regime Groups III and IV and have returned the vegetation components to a more historically natural fire cycle. The build up of fuels over 90 years in conjunction with the drought, ignition source, and wind driven fire behavior combined to create the amount of high severity burn in the East Fork Fire.

Stand replacing fires are normal in the forest vegetation types that were burned by the East Fork Fire. The extent of effects on soils may have been higher than normal on some sites due to the heavy concentrations of down woody fuel buildup on these sites. Some reports have suggested the reduction in low and mixed severity fires due to fire suppression in the past century has created more continuous fuels and larger patch sizes than existed previously (Arno et al. 1993).

☐ ***Unburned Area within the Fire Perimeter***

Many acres were not burned or burned at patchy, low intensities within the fire perimeter. These acres still contain fuels but did not burn (or burned lightly) due to variable weather and fuel

continuity. Many areas where past harvesting and subsequent fuel treatments were done only had patchy spot fires in down woody fuel pockets within their perimeters. Other areas where fuel treatments were not done following partial timber harvest burned with similar extent and intensity to areas that had not been harvested.

☐ ***Fire Suppression Impacts***

Many of the impacts from fire suppression are displayed in Appendix A, Map 2.6.13 showing dozer line construction, etc. These were rehabilitated and discussed under the watershed and soils sections. Retardant is also a part of fire suppression and efforts were made to determine the number and location of drops that affected water resources. Aerial retardant was used extensively on this fire due to threats to private property during the early days of the fire. Three retardant drops affected streams and springs with the worst one occurring in Boundary Creek (BAER Report, 2002). A retardant drop also contaminated a beaver pond in the Mill Creek drainage. This pond was immediately flushed to remove the contaminants. No fish kills were observed from these incidents.

☐ ***Fuels***

Forest fuel is combustible material or organic matter that could burn if ignited (Brown 1983). Fire behavior is the manner in which a fire reacts to the influences of fuel, weather and topography (Glossary of Wildland Fire Terminology 1996). Fuels contribute to the rate of spread of a fire, the intensity of the fire, how long a fire is held over in an area, flame length, and the size of the burned area (Rothermal 1983). Removal of fuels helps to reduce or retard wildfire spread and severity (Pollet and Omi 1999).

Fuels are broken into 3 categories: fine fuels (such as grass or forbs), small woody fuels less than three inches in diameter, and large woody fuels greater than three inches in diameter. Fine fuels carry the ignition. Small woody fuels can lose their moisture faster, start easier, and burn more readily (Agee 1993) influencing a fire's rate of spread and intensity. Large woody fuels contribute to development of large fires and high fire intensity (Brown et al. 2001). Fire hazard and resistance to control are highest when large woody fuels exceed 25 to 30 tons per acre with small woody fuels of five tons per acre or more (Brown et al. 2001).

Fire behavior is affected by fuel characteristics such as forest density, species composition, amount of surface fuel, arrangement of fuels, and fuel moisture content (Rothermel 1983). Fuels are the only element affecting fire behavior that can be controlled. Fuel management modifies fire behavior, ameliorates fire effects, and reduces fire suppression costs and danger (DeBano et al. 1998). Fuel management includes: reducing the loading of available fuels, converting fuels to those with a lower flammability, or isolating or breaking up large continuous bodies of fuels (DeBano et al. 1998).

Samples of fuel loadings for the fire groups (from Fischer and Bradley) are summarized in Table 3.10.10.

Table 3.10.10. Average Fuel Loadings (Tons per Acre) for Fire Groups 10 and 11 (Fischer and Bradley 1987)

		Size Class (inches)							
Fire Group	**Duff Depth**	**> 0.25" (T/ac)**	**0.25 - 1" (T/ac)**	**1 - 3" (T/ace)**	**3 - 6" (T/ac)**	**6 - 10" (T/ac)**	**10 - 20" (T/ac)**	**20+" (T/ac)**	**Total (T/ac)**
10	0.17	0.53	0.57	1.00	4.10	6.23	2.30	14.60	**29.5**
11	3.01	0.50	1.58	2.09	3.58	6.17	5.71	3.86	**26.5**

In the high and moderate severity burned areas, a fuel loading increase in the 8 to 20 inch diameter size class is expected over the next two decades. The fuel loading could range well above 30 tons per acre depending on existing stand densities. These large fuels contribute to large fires and high intensity fires. Fuels greater than 30 tons per acre create high fire hazard and resistance to control.

The potential exists for severe fires to reoccur after dead trees fall and fine fuels develop. Vegetation growth will produce fine fuels with leafy shrubs and conifer needles and the litter

produced by both. This increase in fire risk will put regeneration that has since established at risk of burning in future wildfires. With seed sources reduced on these severely burned sites and few funds available for planting, the long-term viability of these forests is at risk. Future fires with such high fuel loads also have the potential to inflict soil impacts more severe than the historic range of variability. The duration of fire could be longer and the intensity higher than historically occurred in these soil types.

Reducing the amount of standing dead would alleviate the accumulation of high levels of large fuels in the next few decades. The reduction would help to protect the regenerated stands, soil and water resources and nearby private property from uncharacteristically severe wildfire in the future.

Some stands within the East Fork Fire Perimeter had fuel treatments prior to the fire. Most notable are stands in Section 24, T2N, R10E, and Sections 18, 22, 24, and 30, T2N, R11E where machine piling or prescribed burning had been done to treat fuels created by timber harvest. In general, these stands were occupied by sapling size lodgepole pine and served as fuel breaks, reducing the rate of spread and intensity of the fire. Small pockets of fuels within these units burned as spot fires from embers, but most of the young lodgepole pine survived. An exception was in the West Fork Blacks Fork. The wind driven fire burned through an old timber harvest unit, killing most of the lodgepole pine saplings.

☐ ***Fire Starts as Part of Risk***

In addition to fuels, the potential for ignition is part of the definition of fire risk. Past fires from 1947 to 2000 are displayed in Appendix A, Map 2.6.14. Human caused fires often occur near roads. The lower elevation roaded portions of this analysis area also tend to have the largest areas of continuous heavy fuels. Roadless and Wilderness areas at the upper elevations are generally dissected by barren ridges and wet meadows. There will undoubtedly be future lightning and human caused fire starts in this analysis area and potential for large fires dependent on fuel conditions.

☐ ***Fire Ecology and Fuel Loads of Fire Groups 10, 11, and 12.***

The grouping of habitat types into fire groups was developed by forest researchers Ann Bradley, Nonan Noste, and William Fischer in *Fire Ecology of Forests and Woodlands in Utah* (Bradley, et.al. 1992). Low severity fire is defined as having minimal impact on the site. Moderate severity fires burn surface fuels and occasionally torch individual or groups of over story trees. Severe fires burn through the over story and constitute stand replacement.

Fire groups developed by Fisher and Bradley (1987) relate to the National Fire Regimes as listed in Table 3.10.11. The National Fire Regimes were created as part of the Cohesive Strategy described in Figure 3.10.3.

Table 3.10.11. Historical Natural Fire Regimes and Fire Groups

National Historical Fire Regimes			
Fire Regime	**Frequency (Fire Return Interval)**	**Severity**	**Fire Groups**
I	0-35 years - high frequency	Low severity	2 and 4
II	0-35 years - high frequency	Stand replacement severity	Minimal presence on Wasatch-Cache National Forest
III	35-100+ years - moderate frequency	Mixed severity	5 and 6
IV	35-100+ years - moderate frequency	Stand replacement severity	7, 8, 9 & 11
V	Greater than 200 years - low frequency	Stand replacement severity	10

Fire Group 10, Dry, Lower Subalpine Habitat types:

Vegetation

Fire Group 10 contains the bulk of subalpine habitat types, those that are neither very moist nor very cold (these habitat types are discussed in Fire Groups Eleven and Twelve, respectively). Climax species are subalpine fir and Engelmann spruce. Forest composition in subalpine forests varies with elevation, exposure, and latitude. Lodgepole pine and aspen are the most important seral species in the Uintas and dominate many sites.

Undergrowth cover is often sparse in near-climax or climax stands beneath a dense overstory of spruce and fir. Seral stands, particularly those dominated by aspen, may be relatively rich in herbaceous cover. Commonly occurring shrubs include *Acer glabrum, Amelanchier alnifolia, Juniperus communis, Loniscera utahensis, Mahonea repens, Pachistima myrsinites, Rosa nutkana, R. woodsii, Symphoricarpos oreophilus, and Vaccinium scoparium*. Graminoids are *Bromus ciliatus, Calamagrostis rubescens, Carex geyeri, C. Rossii, Poa scunda, Stipa lettermannii, and Trisetum spicatum*. Forbs include *Achillea millefolium, Aquiclegia caerulea, Arnica cordifolia, Aster engelmannii, Fragaria spp., Geranium richardonii, G. viscosisimum, Lahtryrus lanzwertii, Pedicularis racemosa, Pyrola secunda, Swertia radiate, Thalictrum fendleri*, and *Viola adunca*.

Forest Fuels

The most applicable fuels information available comes from studies carried out in neighboring States. Downed and dead woody fuel loadings on lower subalpine habitat types in Montana and northern Idaho averaged between 20 and 25 tons/acre. Loads ranging between 1 to 80 tons per acre were inventoried in Engelmann spruce-subalpine fir cover types in Montana. The heaviest downed woody fuel loads in Utah forests can be expected in Fire Group Ten, particularly on sites where lodgepole pine is the seral species. Live and standing dead fuel can contribute significantly to overall fire hazard. Dense spruce and fir understory trees along with low-hanging moss-covered live and dead branches of overstory trees form effective fuel ladders to the overstory crowns. Dead subalpine fir and Engelmann spruce trees have significant amounts of fine fuels in lateral twigs, which often 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 overstory crowns during dry weather.

Clagg (1975) looked at fuels in subalpine forest of Rocky Mountain National Park and the Roosevelt National Forest in Colorado. The large number of standing snags left after a fire declined through the first 74 years. New smaller snags began to replace large older snags as the new conifer canopy closed and new snags developed from competition induced mortality. By about age 200, there were a large number of snags again but they were dominated by smaller size classes. By about age 250, large snags again dominate the forest until the next fire. He concluded that fuels in these subalpine stands could be considered hazardous only during extended drought or periods of strong winds.

In this same study, 99% of the total downed woody fuel loading was accounted for by 1,000 hour time lag fuels (greater than 3 inches or 7.62 cm in diameter). Fuels ranged from 10 to 37 tons per acre (22.4 to 82.9 metric tons per hectare). Sound fuel loading remained fairly constant over time with rotten fuels increasing as stands matured. Fine fuels, important for fire spread, were discontinuous and not very abundant.

A combination of deep duff and large amounts of dead, rotten fuel can result in hot, smoldering surface fires during unusually dry conditions. When a dense understory exists, fire can easily spread to the crowns and destroy the stand. Even if surface fires do not crown, there is a good chance the overstory spruce and subalpine fir will be killed by cambium heating. Roots of shallow-rooted spruce or fir may be killed or injured by duff fires, leaving them susceptible to insects, disease, or windthrow.

Because of the predominantly cold, moist conditions in subalpine forests, even those stands having relatively heavy fuel loads may not experience fires for many decades or centuries.

Role of Fire

A fire history study in the Engelmann spruce – subalpine fir zone of the Utah State University Experimental Forest showed a decreased fire interval during settlement and a greatly increased interval during the fire suppression era (Wadleigh-Anhold 1988). The difference was attributed to logging, livestock, and other activity by settlers of the Cache Valley. These earlier fires, according to Wadleigh-Anhold favored lodgepole pine and aspen but the less frequent fires of the suppression era are favoring the more tolerant subalpine fir which is regenerating in all types.

Specific fire history information for other Utah subalpine forest is lacking. Historically, lightning fires in lower subalpine habitat types were probably less frequent than those in other, drier fire groups. In the Northern Rocky Mountains, fire intervals of 50 to 130 years have been estimated for subalpine fir habitat types (Arno 1980). In Central and Southern Rocky Mountain subalpine forests, relatively few acres appear to have burned during the last 300 to 400 years (Alexander 1987).

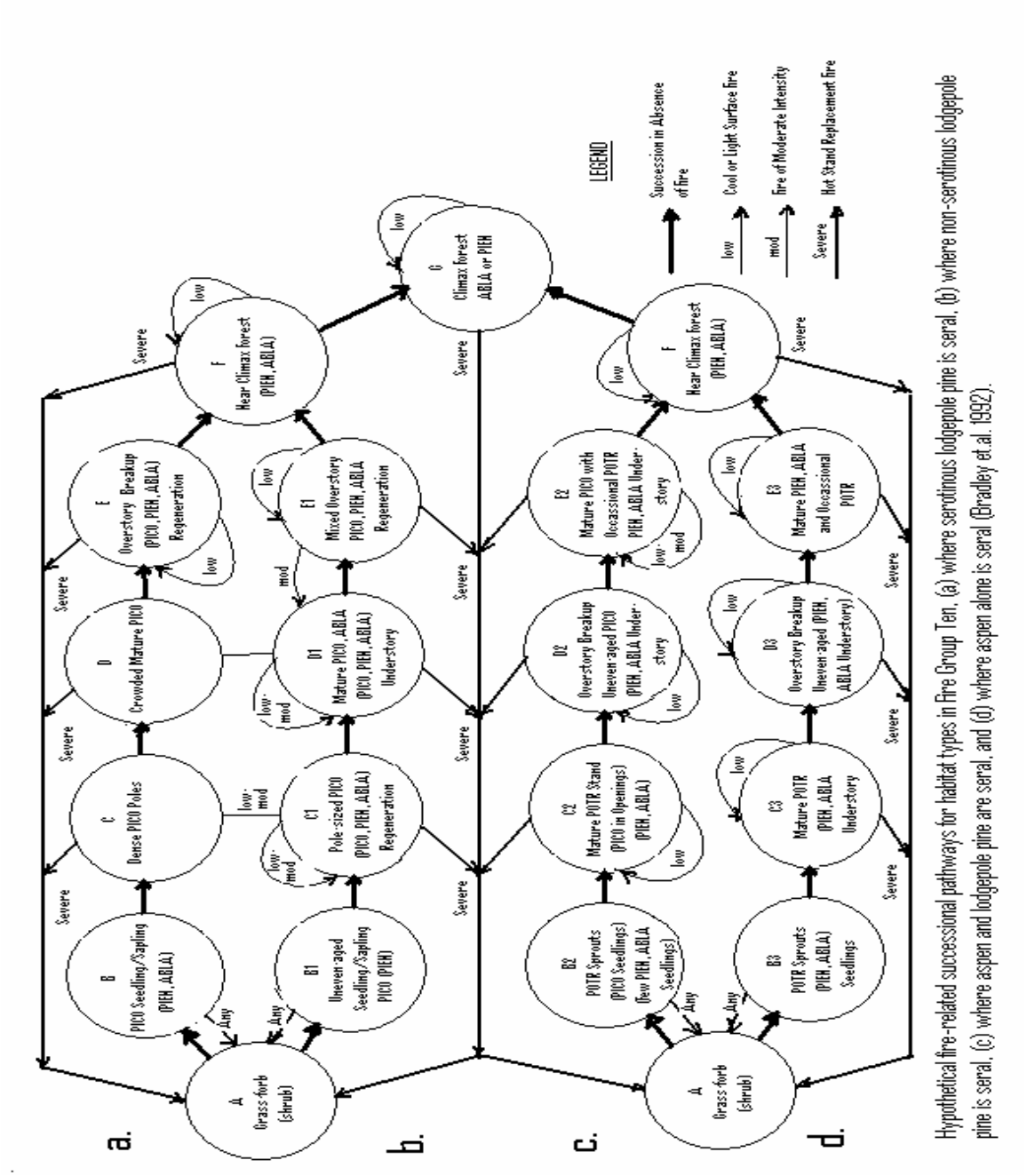
In subalpine fir forests, fire led to dominance by one or more of the potential seral species, opened otherwise dense stands, and created a mosaic of different age and species compositions. Where lodgepole pine or aspen occurred, higher frequency of fires favored long-term dominance by these species. As conifers replaced aspen, stands became increasingly susceptible to fire as succulent forbs were succeeded by woody fuel and litter (Pfister 1972).

Subalpine forests in the Uintas are typically dominated by lodgepole pine rather than aspen. Here, the conifer-to-conifer succession shortens the period of fuel build-up and the interval between fires (Pfister 1972).

Forest Succession

Which seral species are involved in succession on subalpine fir-spruce dominated sites depends on habitat type, geographic location, and availability of seed or other reproductive means (for example, aspen roots). Pfister (1972) described the structural and successional characteristics of Utah subalpine forests. In general, succession after fire or other disturbance proceeds more slowly on less favorable sites, and seral species retain dominance for long periods. Where spruce is a major component of early seral stands, it tends to dominate late successional and climax stands. It is long-lived (300+ years) and often of large stature (40 inches in diameter and 100 feet tall in old growth stands. Some consider it a co-climax, rather than a persistent seral species, although it appears to be unable to regenerate in its own litter. On harsh sites, aspen acts as a nurse tree for conifer regeneration. Figure 3.10.4 on the following page displays hypothetical fire-related pathways for habitat types in Fire Group Ten, the most common fire group in the vicinity of the East Fork Fire and the analysis area.

Figure 3.10.4 Hypothetical Successional Pathways for Fire Group 10.



Hypothetical fire-related successional pathways for habitat types in Fire Group Ten. (a) where serotinous lodgepole pine is seral, (b) where non-serotinous lodgepole pine is seral, (c) where aspen and lodgepole pine are seral, and (d) where aspen alone is seral (Bradley et.al. 1992).

Succession With Lodgepole Pine:

On sites where lodgepole pine is the sole or dominant seral species, after a stand replacing fire an initial herb/shrub community establishes on the site (A). Fires of any severity maintain this state. Where lodgepole pine (PICO) is serotinous, this stage is quickly followed by a dense stand of even-aged seedlings and saplings (B). Lodgepole pine with non-serotinous cones may also reestablish relatively rapidly when there is an adequate outside seed source. Non-serotinous stands are often less dense, and the seedlings may invade over a period of several years, giving the stand an uneven-aged character. A more open stand (B1) may include Engelmannn spruce (PIEN). Subalpine fir (ABLA) is not usually present at this stage. If pine regeneration is dense, other conifer seedlings are probably crowded out (C). Low to moderate fire may open the stand and permit regeneration of fir and spruce as well as more pine (C1). Without fire, a dense pole stand becomes a crowded mature stand of pine (D). Stem density is somewhat reduced by competition-induced mortality. The understory in the pole or mature state is sparse. Low to moderate fire in the mature state can open the stand and permit further development of a mixed species understory. The stand eventually breaks up due to disease, decadence, or beetle kill (E). Fir and spruce are able to invade openings. Stands with a dying lodgepole pine overstory and fir-spruce understory are susceptible to severe fire because of their typically heavy live and dead fuel loads. Severe fires recycle the stand. If no fire occurs during breakup, the stand is dominated by climax fir and spruce (G).

Moderate fires in mixed stands (E1) kill most of the tolerant conifers but may spare some of the lodgepole pine. The overstory is then again made up of scattered lodgepole pine (D1). At near-climax or climax (F, G), a severe fire returns the stand to an herb/shrub state. Low-severity surface fires reduce fuels and expose mineral soil for regeneration. If a lodgepole pine seed source is not available, a severe fire initiates a successional process in which spruce and fir alone dominate seral stands (see Fire Group Twelve). Fire ordinarily occurs before this condition is reached.

Succession with Lodgepole Pine and Aspen

Where aspen (POTR) and lodgepole pine occur together in a stand, aspen sprouts and lodgepole pine seedlings may both become established in an herb/shrub field after fire (B2). Aspen grows quickly, however, and soon overtops lodgepole pine. Pine seedlings tend to be restricted to openings where there are no suckering aspen roots (C2). Spruce and subalpine fir regeneration may occur beneath the aspen or lodgepole pine canopy. Low-severity fires open the stand, favoring lodgepole pine seedling establishment, or possible aspen regeneration if enough aspen stems are killed to stimulate sprouting. Without fire, the aspen overstory eventually breaks up (D2). A mixed conifer stand develops with lodgepole pine in the overstory and spruce and fir in the understory (E2). Low to moderate severity fires maintain this stand and all species regenerate in the openings. Aspen survives in occasional patches. As the stand approaches climax conditions, lodgepole pine drops out of the stand (F). Severe fires at near-climax or climax return the stand to the shrub/herb state.

Succession With Aspen Only

Where aspen is present, it usually sprouts after a short herb stage (A2). Resprouting shrubs and aspen may both appear the first growing season after fire. Any fire can kill sprouts. Spruce and fir seedlings are shade tolerant and able to establish beneath a canopy of aspen in any stage of development (B3 through E3). Seedlings may be smothered in aspen leaf litter, however, slowing their invasion into the stand. A low-severity surface fire may kill most conifer regeneration, but it can also damage aspen stems. If only scattered stems are killed, suckering may not be stimulated. An influx of conifers in the understory may occur in the gaps.

Moderate to severe fires return the site to herbs in any successional stage. The site is quickly repopulated by aspen suckers. Spruce and fir reestablish in openings. Without fire, the conifer understory continues its development and eventually replaces the shorter lived aspen, which is unable to propagate successfully in the shade (D3). Severe fires in the mature conifer stand cause a return to the herb stage. If remnant aspen are left, some resprouting may occur. Where most or all aspen stems are dead or decadent, fire does not cause sufficient suckering for regeneration because the root system is also weakened. Without fire, conifer density will continue to increase over time (E3, F). Conifers

may become dominant on many sites in 200 to 400 years. In areas of optimum growth, such as central Utah, it may take well over 1,000 years for aspen stands to convert to climax conifers. Climax stands old enough to be pure spruce and fir are rare. If fire occurs in one of these sites, lack of pine or aspen will mean the climax dominants also dominate seral stages.

Succession Following the East Fork Fire

Lodgepole pine is the seral species that is present throughout almost all of Fire Group 10 in this analysis area including the areas burned. It is predominant in some patches. Aspen is present as a seral species in much of the lower elevations of the East Fork of the Bear River and in scattered small to medium size patches at lower elevations within the rest of the burned area and in the analysis area outside of the burned area (although there is a large aspen patch at 10,000 feet in elevation in the East Fork Bear drainage). It is predominant in only a few small patches. It is interesting that the almost pure aspen patches within the burned area only burned along the outer edges. Where there was a mixture of aspen and conifers, the fire tended to burn through the entire patch. The Lily Lake fire in 1980 resulted in extensive regeneration of aspen where it was a component of the forest prior to the burn. Patches of aspen and individual aspen were scattered throughout the lower elevations of the Lily Lake fire, but appear from 1967 aerial photographs and stand examinations prior to 1980 to have been declining as they were replaced by subalpine fir and overtopped by lodgepole pine. Engelmann spruce can be a seral species in this fire group where conditions are favorable. It is well represented in some fairly large patches that burned with high intensity in some portions of Mill Creek and the West Fork of the Blacks Fork. Favorable conditions for spruce regeneration exist where mineral soil is exposed, there is a seed source, and there are shaded micro-sites. Many edges of the larger burn patches and areas where the fire burned at moderate intensity provide these conditions. The interior of the larger patches where all of the overstory burned provide neither adequate seed nor micro-site shade. In areas where the fire burned at low intensity, it tended to jump from one spruce to another, burning a small circle in the litter layer around the base of the tree. This behavior did not provide an adequate mineral soil seedbed for spruce regeneration although some spruce regeneration might be expected on soils exposed by windthrow and firelines.

Table 3.10.12. Bradley Fire Groups and Natural Fire Regimes

Fire Group	Frequency (Fire Return Interval)	Severity
10	50-130 years estimated for Northern Rockies. Rare occurrences in Central and Southern Rockies. Conifer-to-conifer succession in lodgepole pine shortens the frequency	Mixed severity, depending on presence of lodgepole pine, fuels, wind, and drought
11	Infrequent	Small low-severity fires and larger high-severity fires driven from adjacent drier sites by wind.
12	Infrequent, 50-300 years	Small moderate-severity fires and larger high-severity fires driven from lower elevations by wind.

Fire Group 11, Moist to Wet Subalpine Habitat Types:

Vegetation

Fire Group 11 (Bradley et al, 1992) is composed of subalpine habitat types occurring in seasonally moist or wet conditions, or where soils are subirrigated and water tables remain high year-round. Subalpine forest habitat types generally found adjacent to riparian areas, on moist benches, or as stands associated with late-melting, high-elevation snowbanks are included in this grouping. Engelmann spruce is often a persistent seral species, the climax dominant, or a climax codominant with subalpine fir in Fire Group Eleven. The undergrowth in these moist habitat types is often lush.

Forest Fuels

Fuels in moist subalpine fir forests resemble those described for Fire Group Ten. The large 1,000 hour fuels make up the bulk of the fuel loading. The potential for spruce to reach large diameters on these sites may result in a greater average diameter of the large woody fuels. There may be much rotten material and duff on the forest floor. In colder, higher elevation habitat types, the proportion of sound to rotten woody fuel may be greater because of slow decomposition rates. Fire Group Eleven stands are susceptible to severe fires when droughts occur. Stands may be killed by either surface fires or by crown fires that encroach from surrounding stands. Thin bark and shallow roots make spruce especially susceptible to mortality from hot surface fires that consume organic layers around the trees.

Role of Fire

Little is known about the fire history of Fire Group Eleven sites in Utah. In general, fire is an infrequent disturbance on moist or wet sites. Although they do not occur as often as they do on drier sites, fires may be more severe because of higher fuel loads resulting from greater site productivity. Low-severity smoldering fires of restricted area probably occur most often. Severe burns can result during extremely dry conditions when severe fires spread from adjacent upland sites. Crane (1982) reported estimates of 325-335 years, with a variance of 50 years as the fire-return interval of three moist spruce habitat types on the Shoshone National Forest, Wyoming. Romme and Knight (1981) found intervals of 300 to 400 years between fires in drainage bottoms compared to 300 years for drier upland sites of the Medicine Bow National Forest in southwestern Wyoming.

Forest Succession

Fires of moderate severity are less common than either low severity or stand replacement fires because of the moisture regime. Severe fires destroy the stand. Following a stand replacement fire, the initial herb stage is quickly followed by a stand of resprouting shrubs, and aspen if it is present. Conifer and cottonwood seedling establishment may also occur on some sites, with faster growing aspen and lodgepole pine overtopping spruce and subalpine fir. Mature stands can contain an overstory of aspen and lodgepole pine with a multi-aged understory of spruce and fir. In the near climax stand, the seral, intolerant species are gradually replaced by spruce and fir. Low severity fires perpetuate the stand and severe fires recycle the stand.

Fire Group 12, Cold, Upper Subalpine Habitat Types:

Vegetation

Fire Group 12 (Bradley et al, 1992) is composed of cold, high-elevation or timberline portions of subalpine fir and Engelmann spruce habitat types. These forests often occur well above 10,000 feet. Climax subalpine fir and Engelmann spruce are usually the only seral species. Trees may not cover extensive areas. Patches of conifers mingle with subalpine meadows. On exposed ridges, trees may form krummholz. The undergrowth is not particularly diverse. In these harsh environments, most increase of forested area is due to layering by subalpine fir rather than seedling establishment.

Forest Fuels

Moist conditions and discontinuous fine fuels keep fire hazard low in upper subalpine forests. The greatest fire danger occurs when wind drives fire into the high country form lower, more fire-prone stands. Fuels in this type are similar to those described for Fire Group Ten. Surface fires may kill the trees by heating the cambium or root tissues in krummholz. Most fires spread through the crowns because of short stature of trees.

Role of Fire

In Utah, summer lightning is generally accompanied by rain, making fire spread unlikely. Timberline stands are frequently discontinuous, separated by talus, rocky cliffs, or expanses of herbaceous vegetation. Billings (1969) studied fire in the high-elevation “ribbon forests” of the Medicine Bow Mountains in southern Wyoming, where ribbons of trees alternate with expanses of moist meadow vegetation. Fires appeared to be relatively common, but local in extent. There appeared to be little cross-correlation between fires occurring between neighboring patches of trees. Succession after ground fires may return the stand to its prefire condition in relatively few years. After crown fires, site conditions are no

longer ameliorated by the presence of trees, and a return to the forested state may be extremely slow. Fire has its greatest impact when occasional large, high severity fires invade from lower elevation forests during severe fire conditions.

Forest Succession

Fire may initiate succession, but it is unlikely that it has a role in maintaining it. Physical disruption by snow and wind, rock slides, and talus slippage are more important recyclers of high, unproductive sites than fire. Conifers may establish in the shelter of snags, logs, or shrubs. One hundred years or more may pass before conifers dominate the site. It may take another 100 years before a mature forest develops. Stand and fuel conditions will probably not support a fire of any consequence during this time. It may take two or three centuries to reach climax status. In Utah, Engelmann spruce tends to dominate the highest elevation climax stands. Because of the lack of different seral species, low-severity fires at all stages tend to change the age structure rather than the species composition in most high elevation stands.

☐ ***Fire Occurrence in the East Fork Fire Perimeter in the Next Several Decades***

It will take over 30 years for a duff layer to become established in areas that burned with moderate to high severity (Brown et al. 2001). Fine fuels will increase as shrubs and grasses resprout and new seedlings become established. Snags will begin to fall, with the majority being on the ground in the next 10 to 30 years.

Fire hazard and resistance to control reach high ratings when large woody fuels exceed 25 to 30 tons per acre in combination with small, woody fuels of five tons/acre or more (Brown et al. 2001).

Because of the dry climate, the large fuels remaining in the burned area will decay slowly, and likely remain on the landscape until it burns again. A reburn results when fall-down of the old burned forest contributes significantly to the fire behavior and fire effects of the next fire (Brown 2001). The possibility of a reburn is small on any one site, but it is high over the landscape. Accumulations of large woody fuels can hold a smoldering fire on a site for extended periods (Brown 2001). Heat from the large fuels in direct contact with the ground could have severe effects on soils. Potential for spotting and crown fires is greater where large woody fuels have accumulated (Brown et al. 2001). A severe fire occurrence in the next several decades would depend on amount of fuels present, vegetation development, point of ignition, and weather. Effects of a reburn under high to extreme burning conditions in the areas that burned at a moderate to high severity in 2002 follows, based on Brown's paper.

0 to 10 years after East Fork fire – Severe fire is unlikely because large woody fuels would still be accumulating and there would not be enough decay to support prolonged smoldering combustion.

10 to 30 years after the fire – Most of the large woody fuels would have fallen down, with some decay to support prolonged burning. A duff layer would not be well established. High severity burn would primarily occur where large woody material was lying on or close to the ground. High severity burn could be substantial where a large portion of the soil surface was directly overlain by large woody pieces.

30 to 60 years after the fire – Large woody fuels would have considerable rot; a duff layer may be established depending on the amount of overstory conifer. More severe burning is possible, depending on extent of soil coverage by large woody pieces. If a conifer overstory is present, crowning and burnout of the duff could amplify the burn severity.

As previously noted, observations of large fires on the north slope of the Uinta Mountains indicates that they are usually dependent on strong winds during droughty conditions and fuel ladders that allow crown fires and long range spotting. The East Fork Fire did not readily spread into the old Boy Scout Fire perimeter (8 years old) or the Lily Lake Fire perimeter (22 years old). Many of the fire killed trees in the Boy Scout Fire were still standing and did not contribute to fuel loading. Extensive salvage and firewood removal from the Lily Lake Fire during a period of about 10 years following the fire removed most of the large down woody material that would have developed after the burn. Extensive reburning of burned areas within the East Fork Fire is unlikely until a conifer overstory with an understory fuel ladder develops.

3.11 Wildlife

3.11.1 Introduction

The following discussion covers wildlife species-at-risk and management indicator species as described in the Final Environmental Impact Statement for the Wasatch-Cache National Forest Revised Forest Plan, big game habitat, snag habitat, forest land birds, and fragmentation. Species-at-risk include: species federally listed as threatened, endangered, candidate, or proposed for listing and Forest Service sensitive species. Most of the following information is contained in the East Fork Fire Salvage wildlife technical report (Jaureguie 2004).

3.11.2 Geographic Area

Endangered and Threatened Species

For bald eagle, the geographic area assessed is the project analysis area, which includes approximately 71,000 acres. This area is a suitable size for analysis because it is larger than the home range for these species. The geographic area assessed for other species may differ because of habitat needs. The Lynx Conservation Strategy and Assessment specifies that lynx habitat be analyzed using Lynx Analysis Units (LAUs), therefore LAUs are the analysis area for lynx .

Sensitive Species and other Species-at-Risk

For wildlife effects analysis, the geographic area depends on the species and issue. Habitat conditions for most sensitive species are assessed in the project area. The project area is about 71,000 acres, which is larger than the home ranges of most of the species covered in this report No geographic area is designated for species not considered present in the project area.

Management Indicator Species

The geographic area assessed for goshawk, beaver and snowshoe hare is the project analysis area and the Wasatch-Cache National Forest. The project area is larger than the average home range for these species.

Big Game

Big game habitat is assessed using road density within the project analysis area. The project analysis area falls entirely within the North Slope Herd Unit. Herd unit boundaries are determined by the State of Utah.

Snag Habitat

The issue of snag habitat and its use by a variety of wildlife species is assessed using calculations of snag densities across the burned area. Snag density needs are described in Guideline G16 of the Forest Plan.

At the project scale, a portion of the snag associated species issue can be considered by looking at specific species' requirements within the project area. The geographic scope for snag associated bird species will be the burned area within the analysis area because it is larger than the home range of many of the species discussed in this report.

3.11.3 Methodology Used to Collect Data and Make Scientific Findings

The process for conducting biological evaluations and assessments is outlined in Forest Service Manual 2672.43. This process consists of a pre-field review, field reconnaissance and surveys, and analysis of potential impacts.

The pre-field review includes checking records and maps to determine if listed species or their habitat may be present. Species occurrence records from the Ranger Districts and Utah Department of Natural Resources (UDWR) were checked for records of these species in the project area. The wildlife biologist was involved in the project planning, and important wildlife habitat areas were designated and no activities were planned for those areas. These locations are described in the species sections.

A review of potential habitat was conducted using maps and aerial photographs and for the project area. If there is no habitat in the project area, then no further analysis is needed.

At the next level, habitat may be present, but no activities are planned for any of that habitat, thus

the project will have no impact on that habitat and no further analysis is needed.

If potential habitat was present or indicated in old records and activities were being considered for that area, then a field reconnaissance is conducted to check for specific habitat features. Walk through checks are done for most of the proposed sites.

If the field reconnaissance shows that suitable habitat is present and activities are planned for the area, then surveys are usually conducted for those species to determine habitat use. For example, goshawk call surveys are done to see if a pair is nesting in what appears to be suitable habitat. There are also routine surveys that are done for primarily big game species. UDWR provides information from aerial and harvest surveys.

3.11.4 Specific Wildlife Issues

Combined Public and Internal Issue Statements pertaining to wildlife were identified and are summarized in Figure 3.11.1.

Wildlife Issues

Timber salvage units and roads could disrupt natural ecosystem processes, fragment large undisturbed areas, increase poaching and cause barriers to wildlife movement.

Salvage of fire-killed timber could adversely affect habitat for large and small wildlife species including avians that use this habitat for foraging, breeding, or hiding cover.

Removal of fire-killed stands of dead trees could adversely affect habitat for listed sensitive, threatened, and endangered species including denning habitat for Canada lynx.

New roads may facilitate snowmobile and other human uses in the winter that facilitates movement by competing carnivores to the detriment of lynx.

Figure 3.11.1. Wildlife Issues. *Key internal and public issues pertaining to wildlife were identified during the scoping process.*

3.11.5 Regulatory Requirements, Guidance and Coordination Specific to Wildlife

There are a number of state and federal regulatory guidelines relating to the wildlife resource on National Forest lands. Figure 3.11.2 includes regulatory and management directives that govern Forest Service activities.

Federal and Utah Regulations Affecting the Wildlife Resource

The Endangered Species Act (ESA, PL 93-205), Forest Service Manuals 2670.11, 2670.21 and 2670.31 directions, all require that the Wasatch-Cache National Forest consult with the Fish and Wildlife Service on endangered, threatened, and proposed species. Formal consultation with the U. S. Fish and Wildlife Service was required for Canada lynx on this project at the time the Draft EIS was published (50 CFR 402.14). The Forest Service Manual defines sensitive species as those plant and animal species identified by the Regional Forester for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers, density or habitat capability that would reduce a species' existing distribution [FSM 2670.5(19)].

Conservation Agreement and Strategy for Canada Lynx

"The Lynx Conservation Assessment and Strategy (LCAS) was developed to provide a consistent and effective approach to conserve Canada lynx (*Lynx canadensis*) on federal lands in the conterminous United States." The assessment covers lynx ecology and risk factors, and the strategy covers conservation measures, inventory, monitoring, and research needs. On March 1, 2000, the "Canada Lynx Conservation Agreement" (CA) between the five Regions of the Forest Service that contain lynx habitat and the US Fish and Wildlife Service was signed, in which both agencies agreed that the assessment and strategy was acceptable and would be followed. In accordance with the CA the Wasatch-Cache will manage lynx and lynx habitat consistent with the

LCAS and the lynx Science Report. Some standards and guidelines from the LCAS have been adopted as itemized standards and guidelines for this Forest Plan. Other LCAS standards and guidelines are not necessarily itemized in the plan because they are covered by other management and planning direction or would be evaluated at the project level in coordination with the Fish and Wildlife Service. However, the Plan conclusively adopts the entire CA and LCAS wherever applicable to Forest planning processes.

Utah Northern Goshawk Project
The Utah Northern Goshawk (*Accipiter gentiles*) project amended present Forest Plans to incorporate management recommendations made in, "The Northern Goshawk in Utah: Habitat Assessment and Management Recommendations" (Graham et al. 1999, USDA Forest Service 2000).

Migratory Bird Treaty Act
Established a Federal prohibition, unless permitted by regulations, to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention . . . for the protection of migratory birds . . . or any part, nest, or egg of any such bird." (16 U.S.C. 703)

Executive Order 13186
(1) support the conservation intent of the migratory bird conventions by integrating bird conservation principles, measure, and practices into agency activities and by avoiding or minimizing, to the extent practicable adverse impacts on migratory bird resources when conducting agency actions. (4) Design migratory bird habitat and population conservation principles, measures, and practices, into agency plans and planning processes (natural resource, land management, and environmental quality planning, including, but not limited to, forest and rangeland planning, coastal management planning, watershed planning, etc.) as practicable, and coordinate with other agencies and nonfederal partners in planning efforts.

Figure 3.11.2. Federal Regulations and Species Specific Conservation Agreement.

In addition to the federal and state regulations above, the Wasatch-Cache National Forest Management Plan lists management goals, standards and guidelines related to the Forest wildlife resources and activity in riparian areas. See Figure 3.11.3.

Wasatch-Cache National Forest Plan Wildlife Guidance

Forest Plan Goal:

Goal 3: Provide for sustained diversity of species at the genetic, populations, community and ecosystem levels. Maintain communities within their historic range of variation that sustains habitats for viable populations of species. Restore or maintain hydrological function. . (p. 4-18)

Forest Plan Standards:

Standard S8: In Lynx Analysis Units with current habitat at 30% or more in unsuitable condition, allow no vegetation management activities that would result in a further increase of unsuitable conditions.
Standard S9: Timber management projects shall not change more than 15 percent of lynx habitat within a Lynx Analysis Unit to an unsuitable condition.
Standard S12: Prohibit forest vegetation treatments within active northern goshawk nest areas (approximately 30 acres) during the active nesting period.
Standard S13: At least 20 percent of each forested cover type by ecological section (McNab and Avers 1994) shall be maintained with old forest landscape structure with patch sizes of at least 10 acres. These old forest areas are dynamic, changing location as disturbances occur.

Forest Plan Guidelines:

Guideline G15: In goshawk habitat design all management activities to maintain, restore, or protect desired goshawk and goshawk prey habitats including foraging, nesting and movement.
Guideline G16: When treating vegetation in the following cover types, maintain or restore snag and woody debris habitat components at the stand level (where they are available distributed over each treated 10 acres). If the minimum number of snags is unavailable, green trees should be substituted. If the minimum size is unavailable, then use largest trees available on site.
Guideline G17: Where snags or coarse woody debris are below the desired range, the felling of snags and transport of felled snags or coarse wood off-site including firewood gathering will not be allowed, except to reduce hazards to humans or property along roads, trails, and in or adjacent to developed facilities.
Guideline G18: In Lynx Analysis Units design all management activities to maintain, restore,

or protect desired lynx and lynx prey habitats including foraging, denning and movement.
Guideline G19: In Lynx Analysis Units with less than 10% denning habitat well-distributed, retain disturbance areas smaller than 5 acres with tree mortality that could contribute to denning habitat.
Guideline G20: In Lynx Analysis Units maintain or restore (defer action) denning habitat in patches larger than 5 acres comprising at least 10% of habitat.
Guideline G21: For projects that may affect Forest Service Sensitive species, develop conservation measures and strategies to maintain, improve and/or minimize impacts to species and their habitats. Short-term deviations may be allowed as long as the action maintains or improves the habitat in the long term.

Guideline G26: Protect key big game calving, fawning and lambing habitat and provide security in summer concentration areas.
Guideline G29: No disruptive management activities are allowed in elk calving areas, elk spring use areas, and bighorn sheep lambing areas from May 1 through June 30.
Guideline G30: Avoid disruptive management activities (not public recreation activities) on deer, elk, mountain goat and bighorn sheep winter range from November 15 through April 30.
Guideline G44: When constructing and reconstructing roads, trails, and facilities minimize potential effects on habitat of species at risk and key big game winter and spring ranges.
Guideline G73: Delay livestock use in post-fire and post-harvest created forest openings until successful regeneration of the shrub and tree components occurs (aspen trees reach an average height of 6 feet).*

Figure 3.11.3. Forest Plan Goals, Standards, and Guidelines. *The Wasatch-Cache Forest Plan*

* **Guideline G73:** Grazing is continuing on the allotments that overlap the East Fork Fire. Permitting grazing in the East Fork Fire area this year (2003) should not negatively affect the successful regeneration of the shrub and tree components (Zobell, 2003). This opinion is based on the following rationale:

1. The vast majority of the fire burned in tree dominated areas that are classified as non-range types due to steepeness of slope and/or lack of forage; these areas were not primary grazing areas before the fire and they are not primary grazing areas after the fire; there is no reason for livestock to prefer the steep and blackened tree areas when adjacent unburned, green meadows are nearby.

2. The permittees have been instructed to not deliberately graze the burned areas; there will be some unintentional grazing in the burned areas from drifting or trailing livestock, but the adverse impacts to tree and shrub regeneration from this is expected to be minimal.

3. Past experience with the nearby Lily Lake fire shows that succesful aspen and conifer regeneration was attained with livestock grazing, ie the allotments were not closed due the fire, but the permittees followed Forest Service direction not to graze the burned area immediatley after the fire; in fact, tempoary increases in grazing permits were eventually given due the increased forage production within the Lily Lake fire area.

3. Past experience with several mechanical aspen regeneration projects and some small fire aspen regeneration projects were successful with livestock grazing on the Mountain Ranger District; no grazing reductions were necessary to regenerate the aspen.

4. There are portions of four allotments within the East Fork Fire; each allotment is grazed under a deferrred rotation system; these systems will provide for the limited grazing within the fire area; no portion of the fire areas will receive season-long use by livestock; any use in the "black" will be short term and therefore adverse impacts to shrub and tree reneration will be minimized.

5. The East Fork Bear River Allotment has a deferred entry date from 7/1 to 7/13; the permittee is also not planning on grazing his full numbers; the overall reduced cattle grazing on this allotment should reduce potential adverse grazing impacts if some cattle stray into the "black" areas.

Photo point monitoring and general observations of Interdisciplinary Team members indicated there was very little browsing of aspen by sheep or cattle during the grazing seasons of 2002 and 2003. Wildlife browsed about ½ of the leader growth during the winter of 2002 and 2003, but leader growth was very good during the summer of 2003 and it does not appear that browsing will prevent aspen from progressing to maturity in a reasonable time frame. Therefore, subject to continued monitoring, grazing is expected to

continue in future years in the East Fork Fire Salvage analysis area.

☐ 3.11.6 Existing Conditions

■ Threatened and Endangered

The U.S. Fish and Wildlife Service determined that the following listed wildlife species may be present in the East Fork Salvage Project Area. (USFWS 2003) (See Table 3.11.1).

Table 3.11.1. Federally Listed Species Which May be Present in the East Fork Salvage Project Area

Common Name	Scientific Name	ESA Status
Bald eagle	*Haliaeetus leucocephalus*	Threatened
Lynx	*Lynx canadensis*	Threatened
Black-footed ferret	*Mustela nigripes*	Endangered
Western yellow-billed cuckoo	*Coccyzus americanus*	Candidate

☐ *Bald Eagle*

In Northern Utah, bald eagles are usually found near large rivers or lakes because they primarily feed on fish. Bald eagles are typically a wintering species in Utah with only a few breeding pairs known. Eagles migrate into the area from Canada and will winter in lower elevations off National Forest lands area as long as the rivers stay relatively free of ice. Eagles can occur at higher densities during the winter because breeding pairs are not defending territories. If the rivers do freeze over, then most of the eagles move down stream to find open water.

The statewide bald eagle population is increasing. In recent years four pair have again begun nesting in Utah (USDI USFWS 2002b). No eagle nests have been found on the Wasatch-Cache National Forest. Because of the high elevations, bald eagles do not use the North Slope of the Uinta Mountains during the winter. Eagles can be seen occasionally at lower elevations below the National Forest.

☐ *Lynx*

Lynx are a wide-ranging species that use a home range area of 5 to 147 square miles. A study in Montana found an average home range of 17 square miles (Ruediger et al. 2000). Lynx feed mainly on snowshoe hares but also feed on other small prey such as red squirrels, grouse and ground squirrels (Ruediger et al. 2000). They generally inhabit higher elevation lodgepole pine and spruce-fir forest types, using younger stands for foraging and older stands for denning.

Trapping, increased road access, fire suppression and timber harvesting have all had impacts on lynx populations. Fire suppression may have reduced areas that have high populations of snowshoe hares, because hares tend to favor younger stands of lodgepole pine that would grow following a stand replacement fire. Clearcuts that left no foraging or denning habitat also reduced lynx habitat. Twenty to thirty years later, those same clearcuts have become foraging habitat.

According to historical records from Utah Division of Wildlife Resources (UDWR), the Mill Creek area of LAU 35 had a high density of lynx documented. Recent lynx surveys conducted by the Forest Service and by researchers from Brigham Young University in the area did not confirm any lynx in the Uinta Mountains.

The following excerpt from the Federal Register (Federal Register 2003) describes current knowledge of the existence of lynx in Utah: "There are only 10 verified records of lynx in Utah since 1916 (McKay 1991; McKelvey et al 2000b). Nearly all the reliable lynx reports are from the Unita Mountain Range along the Wyoming border (McKay, 1991). Four of the records correlate to the cyclic highs of the 1960s and 1970s. Recent DNA results documented the presence of a lynx in Utah (McKelvey in litt. 2003). There is no evidence of lynx reproduction in Utah. We conclude that lynx that occur in Utah are dispersers rather than residents, because most of the few existing records correspond to cyclic population highs, there is no evidence of reproduction, and boreal forest habitat in Utah is remote and far from source lynx populations."

Note: The one DNA finding referred to was from the Manti-LaSal NF. It is thought to be a wanderer from the Colorado reintroduction and

has not been detected since even though efforts have been made.

Lynx Analysis Units (LAUs) have been designated on the Wasatch-Cache National Forest following the guidelines in the Canada Lynx Conservation Assessment and Strategy (LCAS) (Ruediger et al. 2000). LAUs are areas of lynx habitat that approximate the area an individual lynx would use. Lynx habitat was mapped on the Wasatch-Cache National Forest using the Forest's Vegetation Type map. The two LAUs that the fire impacted are the Bear River (35) and the Black's Fork (34) LAUs.

Foraging Habitat

Wildfire, logging, wind throw or disease can create young stands of trees. Overall, stands 15 to 30 years old probably provide the best foraging habitat for lynx (Ruediger et al. 2000). Younger stands may have low prey populations because of limited cover. Prey populations may also decline as the stands get older. Hares were four to five times more abundant in 20 year old lodgepole pine stands than in 43 to 80 year old stands and nine times more abundant than in stands greater than 100 years old (Koehler and Brittell 1990).

The fire did burn some foraging habitat, making it unsuitable. The LCAS does not provide a specific standard for a desired amount of foraging habitat.

Before fire suppression, stand replacing fires were probably the source of most early successional habitat (Losensky 1997). After fire suppression, timber harvest became the new source for creating foraging habitat. The most productive foraging habitat in the analysis area is stands that were clearcut in the 1960s. Lynx foraging habitat is only a temporary stage in forest succession, and the quality of that foraging habitat will continue to decline as these stands age.

Denning Habitat

Females select dense, mature forest habitat that contains large woody debris, such as fallen trees or upturned stumps to provide security and cover for the kittens (Koehler and Aubry 1994). Denning habitat is typically found in older, mature forests (Ruediger et al. 2000). The entire stand does not have to be mature forest in order to contain denning habitat.

Denning habitat should comprise at least 10 percent of an LAU (Ruediger et al. 2000). Denning habitat that burned at high to moderate severity may not be very suitable until foraging habitat recovers in the area. If an entire older stand burned at high severity, then it would not be considered denning habitat. If only part of an older stand burned at high severity, then it may provide potential denning habitat. Overall, denning habitat exceeds the recommended 10 percent in both of the LAUs following the fire.

Unsuitable Habitat

The LCAS defines lynx habitat in unsuitable condition as areas that are in early successional stages in which vegetation has not developed sufficiently to support snowshoe hares during all seasons. Within the project area, stands that are 20 years old or less are considered unsuitable habitat for the purposes of this analysis. The LCAS provides standards for unsuitable habitat: 1) management actions will not change more than 15 percent of lynx habitat to an unsuitable condition within a 10-year period and 2) if more than 30 percent of lynx habitat within a LAU is currently in unsuitable condition, no further reduction of suitable conditions shall occur as a result of vegetation management activities by federal agencies.

These LAUs had from .5 to 1.6 percent unsuitable habitat before the fire. Refer to Tables 3.11.11 and 3.11.12. The fire burned at a variety of severities, and areas that burned at high and moderate severity are considered unsuitable habitat. Areas that burned at low severity still provide suitable lynx habitat.

Table 3.11.2. Acres that the East Fork Fire burned in each LAU

LAU	Total Acres	Acres Burned	Percent of LAU Burned
Bear River 35	62,390	11,574	18%
Black's Fork 34	42,433	2,557	6%

Table 3.11.3. Percent of Unsuitable Lynx Habitat after the Fires *The fire increased the number of unsuitable lynx habitat acres within the analysis area.*

LAU	Total Acres	Total Acres Potential Suitable	Pre-Fire Unsuitable (acres)	Pre-Fire Percent Unsuitable	Acres of LAU within High/Mod Burn Severity	Post-Fire Percent Unsuitable
Bear River #35	62,390	47,289	249	0.5%	5,871 (12.4%)	12.9%
Black's Fork #34	42,433	27,817	444	1.6%	1,066 (3.8%)	5.4%

The LAUs now have 5 to 13 percent of the habitat as unsuitable following the fire. The LCAS states that if more than 30 percent of lynx habitat within a LAU is currently in unsuitable condition, no further reduction of suitable conditions shall occur as a result of vegetation management activities by federal agencies. Neither of the LAUs exceeds the standard of 30 percent unsuitable habitat. The LCAS also recommends that management actions shall not change more than 15 percent of lynx habitat within a LAU to an unsuitable condition within a 10-year period. This unsuitable habitat will be excellent foraging habitat in 15 - 20 years.

Open Road Density

Koehler and Brittell (1990) recommend keeping roads to a minimum in lynx habitat and closing them after timber harvest is complete. Ruediger et al. (2000) recommend keeping road densities below two miles/square mile. The existing open road densities for Lynx Analysis Units (LAUs) in the analysis area are less than one mile/square mile. Refer to Table 3.11.14. Both of the LAUs meet the recommendations for open road density.

Table 3.11.4. Open Road Density by LAU

LAU	Total Acres	Square miles	Open roads (miles)	Open road density (miles/square mile)
Bear River 35	62,390	97.5	91.3	0.94
Blacks Fork 34	42,433	66.3	62.0	0.93

☐ ***Black-footed ferret***
This species was historically found in SW Wyoming and in Rich and Summit Counties in Utah , along the Wyoming border. The Forest Service manages little or no habitat for the species in Wyoming. The project area does not contain any potential black-footed ferret habitat.

☐ ***Western yellow-billed cuckoo***
This species is rare in Utah. In northern Utah it has been found in Weber, Salt Lake and Utah counties. It breeds in riparian zones in streamside or cultivated trees and willows in lower valleys and canyons. All Utah Natural Heritage sites are at or below the National Forest boundaries. Utah is the far western edge of this species' breeding range. The project area is above the elevation of potential cuckoo habitat.

☐ ***Gray wolf***
Gray wolves are not presently known to occupy the north slope of the Uinta Mountains. Up until 2002, the last verified gray wolf taken within the State of Utah was in 1930. During the past several years, sightings of wolf-like animals have occurred in Utah. Many of these have been identified as wolf-dog hybrids (Utah DWR 2003). In 2002, a wolf from a Yellowstone National Park pack was captured near the town of Morgan in northern Utah, southeast of Ogden. The animal was returned to Grand Teton National Park where it later rejoined its pack. In

Utah, the gray wolf is not part of the US Fish and Wildlife Service (FWS) experimental recovery effort being conducted in Wyoming, Idaho, and Montana. There has not been a breeding pair or a pack identified in Utah to date, only a dispersing animal. If wolves from the federal recovery areas enter Utah, they will receive protection under the Endangered Species Act. Managing the forest at or toward properly functioning condition (PFA) will provide cover for wolves and habitat for prey species. Wolves are not currently included in the list of threatened or endangered species for any county in Utah by the Utah Field Office of the Fish and Wildlife Service.

■ Forest Service Sensitive Species

The following species are listed as sensitive on the Wasatch-Cache National Forest (USFS 1999) and may be present or suitable habitat may occur in the project area (Table 3.11.16).

Table 3.11.5. Sensitive Species Which May be Present or May Have Suitable Habitat in the Project Area

Common Name	Scientific Name	Presence
Peregrine falcon	*Falco peregrinus*	Not likely
Northern goshawk	*Accipiter gentilis*	Known
Boreal owl	*Aegolius funereus*	Not Likely
Flammulated owl	*Otus flammeolus*	Not Likely
Great gray owl	*Srtix nebulosa*	Not Likely
Townsend's big-eared bat	*Plecotus townsendi*	Not Likely
Three-toed woodpecker	*Picoides tridactytus*	Known
Wolverine	*Gulo gulo*	Not Likely

Table 3.11.6. Sensitive Species with No Suitable Habitat in the Project Area

Common Name	Scientific Name	Habitat Unsuitable Because
Sharp-tailed grouse	*Tympanuchus phasianellus*	Inhabits grasslands and sage steppe, no habitat in project area.
Spotted bat	*Euderma maculatum*	Inhabits arid country and may utilize caves and buildings. Found in S. Utah.
Sage grouse	***Centrocercus urophasianus***	Inhabits sage steppe, no habitat in project area.
Pygmy rabbit	***Sylvilagus idahoensis***	Inhabits sage steppe, no habitat in project area.

Sensitive species with no suitable habitat in the East Fork Salvage Project Area will not be discussed further.

☐ *Peregrine Falcon*

Peregrine falcons once inhabited a wide variety of habitats across North America, with nest sites on cliffs as a common denominator. They were probably never very common because of their fierce territoriality. As long as there is an abundant source of other birds for prey, peregrines use a variety of habitats. Pesticides, more than habitat changes, reduced the peregrine falcon population.

There are no known active peregrine falcon nests on the North Slope of the Uinta Mountains. No peregrine sightings have been recorded.

☐ *Northern goshawk*

Goshawks are present throughout northern Utah and the Uinta Mountains. There are fourteen known nesting territories on the Evanston Ranger District, including two known nesting territories in the East Fork Bear River drainange in the East Fork Salvage project area. Goshawks have also been seen in the Mill Creek drainage of the project area.

During the past year, suitable habitat has been surveyed for goshawks within the project area boundary, and covered about 1400 acres. Within the project area, all likely goshawk habitat was selected using post fire aerial photo interpretation. These areas were selected and surveyed using the taped call method outlined in Kennedy and Stahlecker (1993). No new goshawks were located within the project area using this survey method.

Goshawks often nest in mature, old growth forests, and have a home range of 3,000 to 9,000 acres. They hunt under the forest canopy and typically do not use large openings. The nest stand is usually about 30 acres of large trees with a fairly open understory. The post fledging area (PFA) surrounds the nest stand and is about 420 acres (Reynolds et al. 1992). The PFA contains a mix of forest types including small openings, dense patches of trees and a variety of understory conditions. The rest of the home range is a foraging area. These hawks feed on small prey such as squirrels, hares, woodpeckers, grouse and jays. These birds do not appear to forage effectively in large, cleared areas during nesting season, and large trees are important nest sites (Reynolds et al. 1992).

Potential goshawk habitat includes old growth, and mature stands at lower and mid elevations of the Uinta Mountains. This is where the nests and the majority of goshawk sightings have been made on the Wasatch-Cache National Forest. Most of the goshawk nests that have been located are within lodgepole pine and aspen stands.

Goshawks are unlikely to use any of the moderate and high burn severity areas for nesting because canopy closure no longer exists. In high severity burned areas, all of the needles and most of the small branches were consumed in the fire and little evidence remains of any understory vegetation. In the moderate severity burns, some dead needles may remain on some trees and some scattered live trees may be present. These areas will probably also not be high quality foraging habitat for many years. Low intensity burned areas likely still provide suitable goshawk habitat. No birds were found during the taped call surveys, and walk through surveys showed that most of the potential habitat within the fire perimeter is low quality.

☐ ***Boreal owl***

Boreal owl habitat consists of stands of spruce-fir found at higher elevations with a relatively high density of large diameter trees and a multi-layered canopy (USFS 1992). The understory is typically open, with a few shrubs or small clumps of regenerating trees. Nests are located in cavities excavated by large woodpeckers, typically in trees that range in size from 13-44 inches dbh.

There has been only one documented boreal owl on the Evanston and Mountain View Ranger Districts after significant survey efforts. There have been documented boreal owl responses to taped call surveys in other areas of the Uinta Mountains, but no nests have been located. Boreal owls typically occur at low densities. They are considered nomadic and will move long distances in search of prey. They are not likely to find suitable habitat within the stands with moderate and high burn intensities. No boreal owls responded to taped call surveys within the project area during 2003 winter surveys.

☐ ***Flammulated owl***

These owls are found in low elevation areas with mature ponderosa pine, a low stand density and moderately open canopy (USFS 1992). The understory is typically very open, largely covered with grasses and a few shrubs or small clumps of regenerating trees. Flammulated owls show a preference for foraging in old growth ponderosa pine and avoiding young, denser stands of Douglas-fir. Fire suppression in ponderosa pine stands has led to dense Douglas-fir understories that make foraging difficult for these owls. Flammulated owls also appear to avoid clearcuts and intensively cutover areas, but they will use thinned or selectively logged stands.

There is very little flammulated owl habitat in the Uinta Mountains. They have been found using aspen and mixed conifer stands in other areas of the Forest, but are not likely to be present in the project area. Taped call surveys on the Evanston Ranger District have not found any locations with flammulated owls.

☐ ***Great gray owl***

Great gray owls typically use mixed conifer and hardwood forests usually bordering small openings or meadows. Semi-open areas near dense conifer forests, where small rodents are abundant, are optimal roosting and nesting

habitat for great gray owls. These birds most often utilize a large diameter broken-topped tree to nest in. In Utah these owls are considered occasional visitors and may only occur during years of low prey densities in Northern regions.

There has been only one reported sighting of a great gray owl on the Evanston and Mountain View Ranger Districts, although this sighting was not confirmed. Significant survey efforts on the two districts over several years resulted in no responses or sightings of great gray owls.

☐ ***Townsend's big-eared bat***

Big-eared bats depend on very limited sites such as caves and abandoned mines for hibernating and rearing young. During the summer, bachelor males use a variety of habitats such as cliffs and buildings. These bats are very sensitive to disturbance during the hibernation and maternity periods. There is only one account of big-eared bats roosting in a tree cavity. Most research has found these bats using caves, mines, buildings and bridges (ID State Cons Effort 1995). The probability of these bats using tree cavities is quite low; therefore caves, mines and abandoned buildings are considered the most important habitat component in this analysis. The fire salvage area does not contain any known caves, mines or abandoned buildings.

☐ ***Three-toed woodpecker***

Three-toed woodpeckers are found across North America in northern coniferous and mixed forest types up to 10,000 feet. Nests may be found in spruce, lodgepole or aspen trees. These birds forage for insects on a variety of dead and dying trees. Fire-killed trees are a major food source and forest fires may lead to local increases in woodpecker numbers 3-5 years following the event. Outbreaks of beetles that kill trees also cause woodpecker densities to increase significantly in any given area.

Three-toed woodpeckers are found in many areas on the Wasatch-Cache National Forest, especially across the Uinta Mountains. Hundreds of three-toed woodpeckers have been documented during surveys over the last 10 years. Many three-toed woodpeckers were located within the project area during surveys conducted the summer of 2003.

The East Fork Salvage project area provides suitable habitat for three-toed woodpeckers. Without including the non-forested acres within the analysis area, there are about 12,265 acres of potential three-toed woodpecker habitat within the project area. Table 3.11.7 displays the potential habitat using snag densities as calculated in Table 3.11.7 and Map 3.11.2 in Appendix A.

Table 3.11.7. Acres of potential Three-toed woodpecker habitat following the East Fork Fire

Three-toed woodpecker Habitat	Acres
Total potential snag habitat	12,265
Low to moderate snag density (0-60 snags/acre)	4,586
Moderate snag density (50+ snags/acre)	2,057
High snag density (100+ snags/acre)	5,622

☐ ***Wolverine***

Wolverines are solitary animals that are essentially a wilderness mammal. They have very large home ranges and prefer remote habitats away from human disturbances. Wolverines appear to be territorial and occur at very low densities even in the best habitats.

Typically wolverine habitat is found at higher altitudes during the summer and mid elevations during winter. Natal den sites in Idaho have been located in subalpine cirques on north facing slopes (Copeland 1996). Wolverines are primarily scavengers and forage on carcasses of ungulates. They may hunt for small mammals and will also eat fruits, berries and insects when other prey is unavailable (Hash 1987). Wolverines are mainly active at night.

There have been occasional unconfirmed observations of wolverine or their tracks in recent years in the Uinta Mountains. Wolverine is considered scarce or rare in the Intermountain Region of the Forest Service.

■ **Other Species-at-risk / Species of Concern**

Appendix B2 of the Final EIS for the Wasatch-Cache Forest Plan lists other species-at-risk (SAR) whose viability may be a concern. The following wildlife species and their habitat are to be considered in management decisions that may affect their habitat, in addition to those Federally listed, candidate and proposed species, and the Forest Service sensitive species. Other species-at-risk are included because of their ranking as

species of concern by State Natural Heritage programs, the Nature Conservancy, or Partners in Flight. These species are catorgorized by the habitats they use. Refer to Appendix B2 of the Final EIS for the Wasatch-Cache Forest Plan. Table 3.11.6 below displays a list of other species at risk with no suitable habitat. This list was revised on March 4, 2004 following publication of a new State Sensitive Species List on December 18, 2003. The Partners in Flight list is included in the project files.

Table 3.11.8. Other Species-At-Risk with No Suitable Habitat in the Project Area

Species	Primary Habitat Association	Potential for habitat to be affected by fire salvage
Black rosy finch	Alpine	No – habitat not present
Black swift	Waterfalls /canyons	No – habitat not present
Brewer's sparrow	Sage Steppe	No – habitat not present
Broad – tailed humming bird	Riparian /Aspen/ Mountain Shrub	No – no salvage in riparian/pure aspen or mountain shrub
Gray catbird	Lowland Riparian	No – habitat not present
Sage sparrow	Sage steppe	No – habitat not present
Virginia's warbler	Mountain Shrub	No- salvage not occurring in shrub habitats
William-son's sapsucker	Conifer /Aspen	Yes
Fringed myotis	Caves and Mountain Shrub	No – habitat not present
Pine marten	Conifer	Yes

The proposed salvage of fire-killed trees has the potential to impact the following species and their primary habitats.

Williamson's sapsucker – This species is an uncommon summer resident in Utah, but occurs throughout most of the mountainous areas. They have been found in montane riparian woodlands as well as coniferous forests and aspen-conifer mixes. This species drills holes in trees to extract sap and the insects it attracts. A potential threat to sapsucker habitat is from a loss of snags for nesting cavities.

Pine Marten – This species is found in the Uinta Mountains and throughout boreal forests in North America. Across the range of pine marten, it is believed to be in decline due to loss of habitat and over-trapping. It relies on conifer forests at higher elevations using old growth structure for primary denning and foraging sites. Loss of the components of old growth forest structure would be a concern for pine marten habitat.

■ Terrestrial Management Indicator Species

Management indicator species (MIS) are used to assess the effects of management activities on a range of species. The Wasatch-Cache Forest Plan lists the following three terrestrial species as management indicator species. In addition to these wildlife species, The Forest Plan lists both Bonneville and Colorado cutthroat trout as management indicator species. A discussion of these species can be found in Section 3.12.7 of this document.

□ *Snowshoe hare*

Snowshoe hare was selected as a representative species in pole/sapling aspen, conifer, and mixed conifer. They are predominately associated with forests that have a well-developed understory that provides protection from predation and supplies them with food. Baseline monitoring transects have been established in the analysis area of the East Fork Fire and are described in the East Fork Fire Salvage wildlife technical report (Jauregui 2004).

Studies to determine densities of snowshoe hare in the Uinta Mountains began as part of a lynx/forest carnivore research project led by researchers from Brigham Young University. Plots measuring the number of snowshoe hare pellets have been established across a wide area in the Uinta Mountains. Hare density estimates to date range from 0.05 hares/hectare to 0.9 hares/hectare (Table 3.11.9; Bunnel 2003). These plots were taken in mature timber stands and included only a few younger sapling/pole stands preferred by snowshoe hare.

Bunnell's work on the Uinta Mountains from 2001 through 2003 (Table 3.11.9 and Figure 3.11.4) shows an average of .33 hares per hectare over the three-year period. Wolfe's work on the

Bear River Range in Northern Utah from 1973 through 1978 (Wolfe, et.al. 1982 and Ruggiero et.al., 1999) showed .36 hares per hectare. These studies are representations of populations in the Forest during their respective time periods and although they only two points on time, they are our best indication that snowshoe hare have been stable across the Forest over this period of time. Continued monitoring across the Forest in the future will provide more data to better assess populations and viability of the snowshoe hare.

Table 3.11.9. Snowshoe Hare Densities– Uinta Mountains (Kamas, Mt. View, and Evanston Districts). (Bunnell 2003)

Area	2001	2002	2003
Kamas District			
-Mud Flat	0.29	0.3	0.43
Evanston District			
-East Blacks	0.39	0.1	0.11
-Stillwater	0.68	0.89	0.55
Mt. View District			
-Upper Burnt	0.18	0.1	0.29
-Upper Smith	0.58	0.59	0.21
-Lower Smith	0.47	0.11	0.45
-Lower Henry Fork	0.33	0.28	0.23
-Mid Beaver	0.06	0.13	0.22
Average	0.37	0.31	0.31

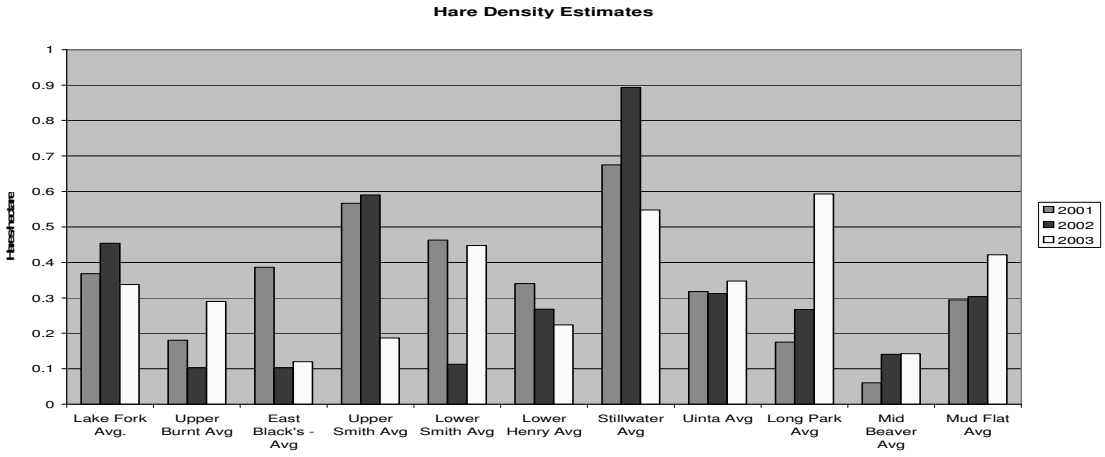


Figure 3.11.4. Snowshoe Hare Densities– Uinta Mountains (Kamas, Mt. View, and Evanston Districts). (Bunnell 2003)

Salvage sale units contain no snowshoe hare habitat because the fire destroyed that habitat Stands of sapling size aspen and conifer are not included for salvage in any alternative therefore the salvage activities would have no effects on potential remaining snowshoe hare habitat. These fire-killed stands would regenerate in 15-20 years to a size class of trees that can provide for snowshoe hare foraging and would in turn provide an increase in foraging opportunities for predators that feed on snowshoe hare. The salvage sale will not have any effect on the reestablishment of that habitat throughout the fire area.

Forest Plan monitoring of snowshoe hare densities will continue and build off of the work begun by the previous research. Currently there are approximately 600 monitoring plots that have been have been established across the Kamas, Evanston, and Mountain View Ranger Districts. These plots cover a variety of vegetation types and age classes preferred by snowshoe hare. The plots have been swept clean of existing pellets and will be read in 2004 and in subsequent years on a schedule being prepared for Forest Plan monitoring, to determine a trend in density of snowshoe hare across the Forest.

☐ ***Beaver***

Beaver was selected as a management indicator of riparian vegetative conditions. Beaver occur

throughout most of North America and are fairly common in Utah. They are found in permanent slow moving streams, ponds, small lakes, and reservoirs. The Uinta Mountains are classed as "substantial value" habitat for beavers. Baseline surveys have been established in the analysis area of the East Fork Fire and are described in the East Fork Fire Salvage wildlife technical report (Jaureguie 2004).

Large landscape fires affect wildlife species in different ways. Some species may benefit from vegetative successional change, while other may be negatively affected by the loss of cover. Beavers benefit both positively and negatively from large fires. The successional change of vegetation is beneficial to beavers providing forage and some materials for dam construction. Negative effects from fire are from the loss of vegetative cover for exploring or dispersing individuals. The loss of cover increases the possibility of predation while away from the pond and/or water. Spring run off from burned areas may potentially increase the likelihood of dam failure (breach) and filling of ponds by sediment.

A project level inventory and monitoring was conducted with aerial photos. This inventory was not intended to determine any trend outside of the project area. The analysis was conducted to evaluate the effects of the fire on known beaver activity within the Mill Creek Drainage.

The Mill Creek Drainage within the East Fork Fire perimeter was the only drainage selected for project level analysis. The drainage was selected 1) Because a majority of the salvage activities are occurring within the drainage and 2) beaver activity is readily noticeable within the drainage. The use of photos from: 1969, 1981, 1992, and 2002 were analyzed to assess changes in use within the drainage and adjacent tributaries. This method is somewhat subjective because it requires photo interpretation that may vary between interpreters and may be influenced by the quality of the photo.

It is evident from analysis of the photos that beaver activity within the area has been stable or increasing (i.e. greater number of visible ponds and in some cases size of ponds) over the past years. From the photo analysis (1969-2002) two areas (sections 7&29) of the drainage have shown concentrated beaver activity. These areas have remand static or have increased in the number of dams/ponds over the years.

There are 3 ponds not visible from photos that were constructed in a narrow section of the stream. It was anticipated that ponds found in this area of the drainage would breach spring following the fire due to the increased water flow. A visual examination of the ponds indicates that water flow was high causing the dams to breach.

At the present time the Forest has only one year of baseline information for beaver populations on the Forest (See Table 3.11.10). Currently there is not enough Forest Plan Monitoring data on beaver to indicate a trend for populations. However, in the Utah Furbearer Harvest Report, 1998-99 (Wolfe and Maxfield 2000) it indicates that statewide the number of trappers increased by 36% but the harvest per trapper decreased 25% from the previous season but was still 6% above the long term-average. Figure 5 (Beaver Harvest in Utah 1983-99) indicates a high in 1988 and low in 1993 and an upward trend throughout the state following the low. The Harvest Report states "The past several years declines in fur prices has probably been the single most important factor affecting the overall fur harvest and trapper effort over the past five years. Prices have been very low over the past seven years. This results in a much reduced interest and lower numbers of pelts taken and sold. In the long term little change is expected in trapper efforts".

Based on the aerial photo analysis and the Utah Furbearer Harvest Report it is felt that beaver both State wide and in this area of the Uinta Mountains are stable if not showing a slight increase in trend.

The beaver monitoring protocol was designed and initiated in the first year of Plan implementation. Monitoring was conducted to identify active beaver colonies within randomly located Sections (1sq mile) across the Forest. Where beaver habitat is present we can estimate beaver per mile of stream also with this method we can determine beaver per acre across the Forest.

Continued future Forest monitoring will add to the initial Forest baseline data and aid in population trends analysis.

Table 3.11.10. Forest-Wide Beaver Monitoring (Jauregui 2004)

District	# of Sections	# surveyed 2003	Sections w/active dams	Sections w/old activity, no new activity	Sections w/no activity
1 (Salt Lake)	22	15	0	4	11
3 (Kamas)	15	5	1 (3 dams)	4	0
4 (Evanston)	10	7	4 (7 dams)	3	0
5 (Mt.View)	12	3	0	3	0
6 (Ogden)	17	0	--	--	--
7 (Logan)	32	0	--	--	--
Total	108	30	5 (10 dams)	14	11

☐ ***Northern goshawk***

The goshawk uses a wide variety of forest habitats. The Wasatch-Cache Forest Plan lists goshawk as a management indicator of mature stands of aspen, conifer, and mixed conifer forests. Goshawks typically nest in mature and old growth forest stands, but goshawks utilize all forest types for foraging. In addition to being a management indicator species, the goshawk is also a Forest Service Sensitive Species (refer to previous discussion).

The Conservation Strategy and Agreement for the Management of Northern Goshawk Habitat in Utah concluded that goshawk populations in Utah were viable. This conclusion was based on the findings of Graham et al. (1999) that good quality habitat is well distributed and connected throughout the state, the absence of evidence of a population decline on National Forest System lands since 1991, and conclusions of the U.S Fish and Wildlife Service in their decision to not list the northern goshawk under the Endangered Species Act. Goshawk is ranked globally as a G5 and it is relatively abundant and widespread throughout its range (NatureServe Explorer 2004).

Surveys of the burned area have been completed in those stands which may still provide suitable goshawk habitat. Much of the area that was within the high burn intensity category does not provide suitable goshawk habitat. Within the salvage sale analysis area there are two known nesting territories in the East Fork Bear River drainage. Goshawks have also been seen in the Mill Creek drainage of the analysis area.

The Wasatch-Cache National Forest has been monitoring goshawks since the Utah Forest Plan Amendment in 1999 by monitoring territory occupancy (USDA 1999-2003). Territory occupancy Forest wide averaged 37% and averaged 27% on a District level with no strong negative or positive trend over time. (Table 3.11.11). Table 3.11.12 displays information regarding the status of goshawk nesting territories across the Evanston and Mountain View Ranger Districts. Given the range-wide trend and monitoring on the Forest the trend for goshawk is considered stable.

Table 3.11.11. Goshawk Territories – Forest-wide.

Year	1999	2000	2001	2002	2003
Number of territories	29	31	34	35	45
Territories monitored	20	31	23	33	41
Active Territories	7	7	11	14	16
Monitored territories active (%)	35	23	48	42	39

Table 3.11.12. Goshawk Territories – Mountain View and Evanston Ranger District

	1999	2000	2001	2002	2003
Number of territories	21	22	22	22	25
Territories monitored	12	20	18	20	24
Active territories	4	2	6	6	7
Monitored territories active (%)	33	10	33	30	29

The Forest has also identified two management

indicator communities. These are sagebrush and oak/maple, neither of which occurs on the project area.

■ Big Game Habitat

Elk, moose, and mule deer occupy the analysis area. Big horn sheep and mountain goat habitat is not present in the vicinity of the fire and will not be affected by proposed actions. Moose habitat is not substantially affected by the fire or proposed actions and mule deer have similar habitat requirements to those of elk so the following discussion relates to elk and mule deer.

The East Fork Salvage project area falls within the North Slope Herd Unit boundary. Important habitat objectives for this unit include maintaining current big game habitat and maintaining or enhancing elk/big game security. Utah State herd objectives for this herd unit are displayed in Table 3.11.13.

Table 3.11.13. Herd Unit Objectives

	Elk	Deer
Long Term Population Objective	5300	300
Population Estimate Post Season 2002	4500	120
Male to Female Ratio Objective	15-20:100	Not Set
3 Year Average Male to Female Ratio 2000-2001-2002	16:100	N/A

Both wildfires and prescribed burns can improve browse and forage by returning nutrients to the soil, encouraging sprouting and bringing the shrubs down to browsing height. If the fires are high severity, then forage may recover more slowly during the first few years.

Past road construction, timber harvest and increased numbers of hunters have combined to reduce the number of bull elk that survive the hunting season. The concept of elk security was created to address bull survival. Studies are beginning to show that elk security may be one of the most important habitat factors in managing hunted elk populations. Security cover is not a natural habitat requirement for elk, but it allows bull elk to survive the hunting season and helps maintain desired bull to cow ratios. Elk security consists of areas of hiding cover greater than 250 acres and more than ½ mile from any road open during hunting season (Hillis et al. 1991). Rough topography can also contribute to elk security, even if hiding cover is somewhat limited.

The fire may have reduced elk security habitat. The areas that burned at high and moderate severity no longer provide hiding cover but they still meet the criteria for distance from open roads. Even though these areas lost hiding cover in the fire, they will provide security again when the hiding cover grows back. Cover regrowth may take from 15 to 30 years depending on sources of seeds and sprouts, and planting. Areas that lost hiding cover during the fires but still meet the criteria for distance from open roads will be considered low quality elk security.

Elk security habitat within the Mill Creek drainage is impacted by the extensive road network associated with the intermingled sections of private land. Access to private land must be maintained.

Road access and cover areas are two components of elk security that can be managed. Studies in Idaho have shown that bull elk survival decreases as road densities increase (Leptich and Zager 1991; Unsworth and Kuck 1991). Leptich and Zager (1991) found that bull mortality was approximately 62 percent in an area with 4.5 miles/square mile of open roads compared with about 31 percent mortality in an area with 1.0 miles/square mile of open roads. Open road densities are about 1.0 miles/square mile within in the analysis area. There are 92.2 miles of open roads and motorized trails within the 59,335 acres of National Forest within the analysis area with an open road density of about 1.0 miles/square mile. There are 163.8 miles of open roads and motorized trails within the 71,220 acres of all ownerships within the analysis area. Open road densities are about 1.5 miles/square mile for all ownerships.

■ Snag Habitat

Due to the East Fork Fire, the number of snags throughout the project area is high. About 6,937 acres of the project area burned at moderate to high intensities, killing 30-100 percent of all trees. The low intensity burned areas also have elevated snag numbers.

■ Forest land birds

Forest land birds refer to both neotropical migrants and resident land birds. Neotropical migrants are those birds that migrate to Central and South America each year. No neotropical migrants are listed as endangered or threatened on the Wasatch-Cache National Forest.

The resident land birds stay in the same area year around or only move short distances. The other listed bird species include the bald eagle, which is listed as threatened, the northern goshawk and three-toed woodpecker, which are sensitive species. A three-toed woodpecker may stay in the same territory all year while a goshawk may move to lower elevations or moderate distances where prey is more available during the winter.

Hutto and Young (1999) state that the habitat data suggests some bird species are restricted to fairly specific habitats. For example, three-toed woodpeckers appear to be closely tied to bug-killed or post fire habitat. Three-toed woodpecker habitat is discussed in detail under the sensitive species section. Other bird species such as the brown creeper and winter wren are associated with relatively uncut, older forests (Hutto and Young 1999). Old growth or mature forest associated species such as goshawk is discussed in its own section in this report.

Migratory bird conventions impose substantive obligations on the United States for the conservation of migratory birds and their habitats, and through the Migratory Bird Treaty Act (Act), the United States has implemented these migratory bird conventions with respect to the United States. Executive Order 13186 directs Executive departments and agencies to take certain actions to further implement the Act.

In the Wasatch-Cache Revised Forest a list of species was established “Species-at-Risk”. This list recognized species whose habitat was important for a whole or portion of their lifecycle. For migratory bird species status from the Utah Partners in Flight (PIF) was considered.

The Utah Partners in Flight Avian Conservation Strategy 2.0 has listed 231 species of breeding bird species in Utah. Of these a priority species list of 24 has been developed for those that have been prioritized for conservation efforts. These 24 priority species utilize at least 18 priority habitats within Utah from which additional species may benefit from conservation actions.

Of the 24 priority species listed 13 occur within the Utah Mountains a physiographic region that occupies 23% of the lands in Utah. This ecoregion is made up primarily of the Wasatch and Uinta mountain ranges and their associated valleys. Elevations range from 1360 m (4,462 ft) in the Salt Lake Valley at the edge of the ecoregion to 4090 m (13,320 ft) on King’s Peak.

Most of the states forested habitat occurs within this ecoregion with shrubsteppe, desert shrub and grasslands at low elevations that have not been converted to agriculture. Oak, mountain shrub, and pinyon-juniper dominate low to middle elevations. Deciduous forest such as aspen are distributed throughout the Utah Mountains and are more extensive in the Northern half. High elevation forest includes Ponderosa, lodgepole pine (primarily in the Uintas), mixed conifer, spruce-fir, and sub-alpine fir.

Of the 13 priority species known to occur within the Utah Mountains only the Three-toed woodpecker has habitat in sub-alpine conifer/lodge this species is addressed in the Sensitive Species section. Two species (red-naped sapsucker and Williamson sapsucker) could have primary, secondary, and/or winter habitats associated with those found within the fire perimeter; however these species occur only on PIF’s Concern List.

Table 3.11.14. Partners in Flight Species with habitat within East Fork Fire

Priority list	Utah Mountains	Primary breeding	Secondary breeding	Winter habitat
Red-naped sapsucker	X	Aspen	Mixed conifer	Mountain riparian
Williamson's sapsucker*	X	Sub-alpine conifer	Aspen	Migrant

* addressed in the species-at-risk section

The Red-naped sapsucker is found south and west of the Rocky Mountains. This species is mostly dependant on aspen for nesting and occurs in most forested habitat types if these trees are present (MBCP 1.0). Feeding mostly on sap, pine pitch, cambium it provides cavities and nesting opportunities for other wildlife species within its habitat. Red-naped sapsuckers' do not reuse nest cavities but will utilize the same tree in following years. The decline of aspen and recruitment of young aspen is a concern; however with the reinitiation of fire into the ecosystem, some recovery and reestablishment of aspen stands is expected.

The Williamson's sapsucker can be found in coniferous mountain forest of western North America. Williamson's rely on mature and old-growth mixed conifer as well as aspen stands during breeding season. Nesting trees are limited to large diameter trees and snags and will nest in both live and dead trees. This species bores holes in trees to drink sap and eats various insects, berries, and cambium.

Field guides (Peterson, Smithsonian) show these species as utilizing the region in which the Wasatch-Cache National Forest occurs as summer breeding habitat. The level of analysis will be on a forest wide level and consider all available habitats for these two species.

■ Fragmentation

Fragmentation occurs when an expanse of habitat is broken into two or more patches separated by different types of habitat (Wilcove et al. 1986). Both natural processes and human activities can fragment habitat. Fire, windstorms, and insect and disease outbreaks are all natural processes that fragment vegetation in this area. Timber harvest, road construction, and subdivisions are some of the human activities that also cause fragmentation (refer to Table 3.11.14).

Fragmentation is a description of a particular type of habitat alteration. In some areas, fragmenting forest habitat can be detrimental to some wildlife species. As areas of continuous forest habitat are reduced, the remaining areas may not have enough food or cover to support that species. Predation and competition from other species may also increase. The end result of habitat fragmentation could be the loss of a species in that fragmented habitat.

Fragmentation is not automatically detrimental to all wildlife species. Natural processes such as wildfire and insect outbreaks fragment large areas of forest, and species in those areas are adapted to those events. For example, the most productive habitat for snowshoe hares, the main prey of lynx, is younger forest stands. These younger stands may result from wildfire. Fire history studies on the Wasatch-Cache National Forest show that the forest has experienced fires ranging from frequent, low severity underburns, to large stand replacing fires (Wadleigh 1997). These fires produced a variety of habitats and fragmented the forest cover.

There are no generally accepted methods of measuring fragmentation and no recommendations for levels of fragmentation in specific habitats. Within the East Fork Salvage project area, the main causes of fragmentation have been timber harvest and road construction and wildfire. These both produce a change in habitat mainly through a loss of cover. Roads are a linear loss of cover but open roads have the additional factors of motorized disturbance.

At the project scale, the possible impacts of human-caused habitat fragmentation need to be examined in the context of the natural patterns of fragmentation. Fire history studies indicate that

wildfires created a mosaic of habitats in the Uinta Mountains, and that forest habitats were naturally fragmented (Wadleigh 1997). The patch sizes of these disturbances were often quite large (several thousand acres).

The East Fork Fire also caused fragmentation where the high and moderate severity burns removed the cover.

Table 3.11.15. Factors Contributing to Fragmentation

	Total Acres	Harvested Stands 0 –15 years old (acres)	High and Moderate Severity Burn (acres)	National Forest Open Road Density	All Lands Open Road Density
Analysis Area	71,000	973	6,937	0.99	1.20

The high and moderate to high severity burned areas within fire removed forest cover from approximately 7,000 acres. In this fire-dominated ecosystem, this is within the range of the size of historical fires. That may seem like a big impact but the duration of the habitat disturbance needs to be considered. An interstate highway or subdivision is not likely to ever return to suitable wildlife habitat, but these burned areas will grow back into forest vegetation.

Compared to the roads and fires, timber harvesting has had a smaller impact. Similar to the burned areas, even clearcuts return to a forested condition. For example, the large clearcuts that were done in the 1960s and 1970s have grown back into cover and are now excellent lynx foraging habitat.

All of the factors above have fragmented habitat in the East Fork Salvage project area. Some of the fragmentation occurred naturally from fires or open habitat. Cover lost in fires or timber harvests is a temporary change on the landscape and will grow back. Open roads, which probably have the greatest impact on fragmentation, are also the most difficult to change.

3.12 Fish and Aquatic Resources

3.12.1 Introduction

For the fisheries analysis, the project area was split up into East Fork of the Bear River, Mill Creek and the West Fork of the Blacks Fork to better facilitate the discussion of the project.

The East Fork of the Bear River and Mill Creek are tributaries of the Bear River and are part of the Bonneville Basin. Historically, the headwater streams of the Bear River contained Bonneville cutthroat trout (*Oncorhynchus clarki utah*), mountain whitefish (*Prosopium williamsoni*), mountain sucker (*Catostomus platyrhynchus*) longnose dace (*Rhinichthys cataractae*) and sculpin (*Cottus*) (Table 3.12.1). The Bonneville cutthroat trout has been petitioned for Federal listing under the Endangered Species Act and has been found not warranted (Federal Register / Vol. 66, No. 195 / Tuesday, October 9, 2001 / Proposed Rules 50 CFR Part 17). The Bonneville cutthroat trout is also listed as a Forest Service Sensitive Species. The Wasatch-Cache National Forest plays an important part in the long-term preservation of this species (Wasatch-Cache National Forest 2003). Over the last 100 years brook trout (*Salvelinus fontinalis*), from the eastern United States; rainbow trout (*Oncorhynchus mykiss*), from the West Coast; Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*) and Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) have been found or stocked in the area (Table 3.12.1).

The West Fork of the Blacks Fork forms part of the headwaters of the Green River in the Colorado River Basin. Historically, the West Fork of the Blacks Fork contained Colorado River cutthroat trout, mountain whitefish, mountain sucker and sculpin. The Colorado River cutthroat trout has been petitioned for Federal listing under the Endangered Species Act. May, in a rough estimate, suggests that Colorado River cutthroat trout are presently found in about 1-2% of their historic habitat (Personal Communication, Bruce May, Inland Cutthroat Trout Conservation Coordinator (April 12, 2000). Ninety-five to one hundred percent of the remaining populations currently reside on National Forest Lands (Personal Communication, Bruce May, Inland Cutthroat Trout Conservation Coordinator (April 12, 2000). The Wasatch-Cache National Forest (2003) has some of the largest drainages still containing Colorado River cutthroat trout. Rainbow trout are found below the project area (Personal Communication, Paul Thompson 12 March 2003). Over the last 100 years brook trout, rainbow trout and Yellowstone cutthroat trout have been found or stocked in the area (Table 3.12.1). A description of these fish can be found in the Final Environmental Impact Statement of the Wasatch-Cache National Forest Plan (Wasatch-Cache National Forest 2003)

Fire, as well as human activities, can affect water quality and aquatic habitat conditions, in turn affecting the fish in those habitats. Because water quality and aquatic habitat are closely linked with hydrologic conditions in waterbodies, the Hydrology and Fisheries sections of this chapter are complementary and should be read as a whole.

Table 3.12.1. Fish Species Found in Streams within the East Fork Salvage Project Area. *Information was derived from surveys on the Wasatch-Cache National Forest conducted by Utah Division of Wildlife Resources and the Wasatch-Cache National Forest.*

Stream	Drainage	Brook Trout	Rainbow Trout	Whitefish	Mottled Sculpin	Mt. Sucker	Dace	Cutthroat Trout
East Fork Bear River (1)	Bear River	Yes	Yes	No	Yes	Yes	Yes	Yes
Boundary Creek (1)	East Fk. Bear	Yes	Yes	No	No	No	No	Yes
Mill Creek (1)	Mill Creek	No	No	No	Yes	No	No	Yes
North Fork Mill Creek (1)	Mill Creek	No	No	No	Yes	No	No	Yes
Carter Creek (2)	Mill Creek	No	No	No	No	No	No	Yes
Lost Dog (3)	Mill Creek	No	No	No	No	No	No	Yes
Christmas Tree Creek (3)	Mill Creek	No	No	No	No	No	No	Yes
West Fork Blacks Fork at Wilderness Boundary (4)	Blacks Fork	Yes	No	Yes	Yes	Yes	No	Yes
West Fork Blacks Fork at State Boundary (4)	Blacks Fork	Yes	Yes	Yes	Yes	Yes	No	Yes

(1) Data collected by US Forest Service (Cowley 1995)
(2) Wasatch-Cache National Forest 1986 (page Q-7)
(3) Data collected by US Forest Service (Cowley 1998)
(4) Personal Communication, Paul Thompson, Utah Division of Wildlife Resources 12 March 2003.

3.12.2 Geographic Area Assessed

Fisheries resources and restoration opportunities for this project were evaluated at two levels. The larger scale is the drainage. This includes major drainages affected by the East Fork Bear River, Mill Creek and West Fork Blacks Fork (See Map 3.4.2 and Table 3.12.2).

Table 3.12.2. Drainages, Watersheds and Streams Included in East Fork Salvage EIS Fisheries Analysis.

Stream	Drainage	Area-acres (miles^2)	Acres in Fire perimeter (miles^2)
East Fork Bear River	Bear River	23,268 (36.4)	6,690 (10.4)
Boundary Creek	East Fk. Bear	2,948 (4.6)	1,108 (1.7)
Lower Mill Creek	Mill Creek	6,774 (10.6)	0
Deadman/Elizabeth Area	Mill Creek	14,615 (22.8)	0
Christmas Tree Creek	Mill Creek	1,614 (2.5)	141 (0.2)
North Fork Mill Creek	Mill Creek	2,385 (3.7)	15 (0.02)
Upper Mill Creek	Mill Creek	6,866 (10.7)	3,664 (5.7)
West Fork Blacks Fork at Wilderness Boundary	Blacks Fork	20,021 (31.3)	2,592 (4.1)
Total		78,491 (122.6)	14,210 (22.2)

3.12.3 Methodology Used to Collect Data and Make Scientific Findings

Reporting and Evaluating Information

Existing fisheries information and effects of the fires are reported by drainage. General parameters, such as amount of riparian habitat conservation area (RHCA), are usually reported for the drainage, while specific descriptors of watershed condition are reported for each stream (e.g., amount of large woody debris within a stream, fish species distribution, how stream habitat conditions compare with fish resource management objectives). Most of the following information was derived from the East Fork Fire Salvage fisheries and amphibians technical reports (Cowley 2003).

Data Acquisition Approach

Existing conditions were established with information from three sources.

- Literature related to fish, fire, and habitat concerns appropriate to this project.
- Existing Forest information from past stream and forest inventories and proposed or implemented land management activities. This information is found in the Forest fisheries database. Data from the Utah Division of Wildlife Resources was also used in the analysis.
- Specific new data collected on fish populations was collected after the fires in the summer of 2003.
- Site visits were made to each of the units being reviewed and site specific leave areas were identified to better protect water quality and fish habitat.

Existing Condition

Fisheries data were reviewed from data collected in previous years. Additional fish information was collected in the summer of 2003.

Stream survey information was collected via modified Region Six USFS protocol in 1994. One passage barrier was identified and corrected in Carter Creek which is part of the Mill Creek Drainage. No other barriers are known to exist in the drainage.

The area disturbed by the fire had been previously impacted by the cutting and removal of railroad ties in the earlier 20th century. Stream channels were dammed, channelized and cleared of obstructions. (Peterson and Speth 1980 pages 133-136).

3.12.4 Issues Specific to Fisheries

Figure 3.12.1 displays Combined Public and Internal Issue Statements related to fisheries and other aquatic habitat.

Fisheries Issues
Increased sedimentation from logging close to streams, particularly along sections with steep or unstable hill slopes and loss of shading in riparian areas, stream banks, and ponds, could affect cutthroat trout populations.

Potential positive effects of erosion control on fish may not be accomplished without timber salvage.

Timber salvage or road construction in riparian areas could have adverse effects on boreal toad and other amphibian habitat.

Figure 3.12.1. Fisheries resource issues. *Issues were identified during Interdisciplinary team discussions and by the public during Scoping.*

3.12.5 Fisheries Regulatory Requirements, Guidance and Coordination

There are a number of state and federal regulatory guidelines relating to the fisheries resource on National Forest lands. Figure 3.12.2 includes regulatory and management directives that govern Forest Service activities.

Federal and Utah Regulations Affecting the Fisheries Resource

Federal Clean Water Act has delegated enforcement authority to the Utah Department of Environmental Quality (DEQ).
Section 305(b) requires states to assess water quality in their waters and report biennially.

Forest Service Manual 2670, 50 CFR Part 402 provides for a separate Biological Assessment (BA) addressing direct, indirect, and cumulative effects of activities on Bonneville and Colorado River trout to be filed in the Project File prior to completion of the EIS.

Conservation Agreement and Strategy for Bonneville Cutthroat Trout (*Oncorhynchus clarki utah*) in the State of Utah is between the Utah Division of Wildlife Resources, USDI Fish and Wildlife Service, USDI Bureau of Land Management, USDA Forest Service, Confederated Tribes of the Goshute Reservation, USDI Bureau of Reclamation, Utah Reclamation Mitigation and Conservation Commission.

Range-wide Conservation Agreement and Strategy for Bonneville Cutthroat Trout (*Oncorhynchus clarki utah*) is between the Idaho Fish and Game Department, Nevada Division of Wildlife, Utah Division of Wildlife Resources, Wyoming Game and Fish Department, Confederate Tribes of the Goshute Reservation, USDI Fish and Wildlife Service, USDI Bureau of Land Management Utah State Office, USDI Bureau of Land Management Wyoming State Office, USDI National Park Service, USDA Forest Service, Utah Reclamation Mitigation and Conservation Commission.

Conservation Agreement and Strategy for Colorado River Cutthroat Trout (*Oncorhynchus clarki pleuriticus)* in the State of Utah is between the Utah Division of Wildlife Resources, USDI Fish and Wildlife Service, USDI Bureau of Land Management, USDA Forest Service, USDI Bureau of Reclamation, Utah Reclamation Mitigation and Conservation Commission.

Figure 3.12.2. Federal Regulations and Species Specific Conservation Agreement. *A number of regulations govern activities affecting fisheries on National Forest lands.*

In addition to the federal and state regulations above, the Wasatch-Cache National Forest Management Plan lists management goals and standards related to the Forest fish resources and activity in riparian areas. See Figure 3.12.3.

Wasatch-Cache National Forest Plan Fisheries Guidance

Goal 2. Maintain and/or restore overall watershed health (proper functioning of physical, biological and chemical conditions). Provide for long term soil productivity. Watershed health should be addressed across administrative and political boundaries. Page 4-17

Goal 3: Provide for sustained diversity of specis at the genetic, populations, community and ecosystem levels. Maintain communities within their hirtoric range of variation that sustains habitats for viable populations of species. Restore or maintain hydrological function. . (p. 4-18)

Standard S2: Apply runoff controls during project implementation to prevent pollutants including fuels, sediment, oils, from reaching surface and groundwater. (p. 4-36).

Standard S20: When constructing or maintaining roads, trails and facilities, use Best Management Practices to minimize sediment discharge into streams, lakes and wetlands. (p. 4-46).

Guideline G6: In Riparian Habitat Conservation Areas (defined in Glossary) when projects are implemented, retain natural and beneficial volumes of large woody debris. (p. 4-37).

Guideline G9: Avoid soil disturbing activities (those that remove surface organic matter

exposing mineral soil*)* on steep, erosive, and unstable slopes, and in riparian, wetlands, floodplains, wet meadows, and alpine areas. (p. 4-38).

Guideline G11: Use Best Management Practices and Soil and Water Conservation Practices during project level assessment and implementation to ensure maintenance of soil productivity, minimization of sediment discharge into streams, lakes and wetlands to protect of designated beneficial uses. (p. 4-38).

Guideline G21: For projects that may affect Forest Service Sensitive species, develop conservation measures and strategies to maintain, improve and/or minimize impacts to species and their habitats. Short-term deviations may be allowed as long as the action maintains or improves the habitat in the long term. (p. 4-43).

Guideline G45: Access routes for heavy equipment should be selected to limit disturbance to riparian vegetation and to limit the number of stream crossings. (p. 4-46).

Guideline G47: Waste material should be handled in a manner to avoid sidecasting materials to areas where they may enter a stream. (p. 4-46).

Management Area (MA) 3.1A Goals and Standards

Standard S3.1A-2: Cutting fuelwood larger that 5 inches in diameter is not allowed. (p 4-69)

Guideline G3.1A-1: Timber harvest, vegetation -fuel treatments, prescribed fire and wildland fire use are allowed only for the purposes of maintaining, improving or restoring riparian and aquatic habitat to desired conditions or to protect property in the wildland urban interface." (p 4-69)

Figure 3.12.3. Forest Plan Fisheries Guidelines. *The Wasatch-Cache Forest Plan, amended by INFISH, guides fisheries resources.*

☐ 3.12.6 Relevant Analysis

■ General Fisheries Resources and Life History Information

Native fish species within the project area include Bonneville and Colorado River cutthroat trout, mountain whitefish (*Prosopium williamsoni*), long-nose dace (*Rhinichthys cataractae*), and mottled sculpin (*Cottus bairdi*).

Introduced species within the project area include rainbow trout (*O. mykiss*) and brook trout (*Salvelinus fontinalis*) and various hybrids of these and/or native salmonids.

☐ *Cutthroat Trout Life History and Habitat Requirements*

Cutthroat trout also have migratory and resident life forms. Migratory fish spend most of their adult life in large rivers, migrating into tributaries to spawn. Resident cutthroat trout spend their entire lives in tributaries. Resident cutthroats tend to be much smaller than their migratory counterparts.

Cutthroat trout spawn between May and early July, when water temperature is about 10^{o} C (McIntyre and Rieman 1995). Fry emerge from the gravel nest (redd) in mid August. Juvenile migratory fish remain in the natal stream from one to four years, while resident fish carry out their entire life cycle in or around local natal areas. Cutthroats first spawn between 3 and 5 years of age (McIntyre and Rieman 1995). Spawning adults can be as small as 150 millimeters, with females producing as few as 100 eggs (Meehan and Bjornn 1991).

☐ *Other Non-native Salmonid Life History and Distribution*

Non-native salmonids in the project area include rainbow and brook trout. These two species may contribute to the decline of native salmonids (Rieman and McIntyre 1993).

Native species may be adversely affected when:

- Non-native species invade and become established
- Habitat degradation (decreased channel stability and complexity, and increased water temperature and fine sediment) occurs
- Hybridization between native and non-native species decreases productivity of natives
- Non-native and native species spawn in the same habitat and at the same time
- Non-native and native species have the same habitat requirements

Brook trout often spawn in the same places as cutthroat trout. Brook trout's earlier emergence

pattern can confer a size and competitive advantage (Griffith 1986).

Introduced rainbow trout can occupy the same habitat as cutthroat trout. Interactions and hybridization between cutthroat and rainbow trout can also cause impacts to native fish.

Below the project area, rainbow trout tend to occur in the mainstem of the East Fork Bear River. Brook trout can be found in the East Fork Bear River and the West Fork Blacks Fork. Brook trout are more dominant in the tributary streams, where much of the westslope cutthroat spawning and rearing occur.

■ Fire Effects and Fish

No long-term studies that relate wildfire effects and salmonids have been completed. More is known about how vegetative communities and the physical properties of watersheds respond to wildfires, from which inferences can be drawn for fish populations. Gresswell (1999) presents an overview of direct and indirect effects of fire on aquatic ecosystem processes and biological communities. The effects of fire on fish resources may depend on multiple factors that include: the scale and severity of fire; existing watershed and riparian habitat condition; the connectedness of habitats that provide for potential refugia and re-colonization; and the potential for the full range of life history expression (Rieman et al. 1997). Benda et al (2003) suggest that, ". . . when human activities, such as stream cleaning, log drives, diking, riparian logging, and damming, have simplified channels and decreased physical heterogeneity, disturbances in the form of fires, floods, and mass wasting may be a benefit in the long-term because they may increase physical and biological diversity. With this perspective, certain types of watershed disturbances do not need to be "restored" so that a watershed can "recover," but rather the disturbance itself may be an agent of recovery."

In small, discrete watersheds, high burn severities may result in death of local trout. This occurred on the Dixie and Fishlake National forests in 2002. This phenomenon, however, tends to occur in a very patchy pattern (Rieman et al. 1997, Minshall et al. 1989). Fish mortality may result from acute increases in water temperature and water chemistry parameters (Minshall et al. 1989). Given the intensity of the East Fork Fire in the riparian zones, it is believed that the macroinvertebrate communities were not significantly impacted. Minshall (2003), in reviewing other research on impacts to aquatic invertebrates from fire states, "The direct effects of fire on macroinvertebrate communities generally are minor or indiscernible." He does identify some exceptions but in reviewing the fire those exceptions do not appear to apply.

Fire can indirectly cause fish mortality or displacement when intense rain or runoff events result in mass instability and slope failures in severely burned watersheds. Conversely, salmonid populations are resilient and have persisted for thousands of years with fire disturbance regimes. This resilience is primarily derived from fish population structure and dynamics (Rieman and McIntyre 1993). Further, data suggest that fish population recovery can be rapid following fire-induced extirpation (Rieman et al. 1997).

However, wildfire pattern and severity have changed due to fire suppression activities (Gresswell 1999). Combined with other long-standing watershed stressors and human activities that have limited native fish populations, today's fires can have long-lasting detrimental effects on fish populations (Gresswell 1999). These include situations where artificially isolated fish populations may be impaired or reduced by short-term fire effects (either chemical, physical or thermal). These population segments may not be able to be re-established or recovery may be slowed if fish from other population segments are unable to migrate into, and reproduce in these areas of depressed fish productivity.

The overall condition of the watershed prior to fire disturbance has a major influence on fish population response to wildfire. The most important watershed condition is a connected stream network that allows for refuge and re-colonization by individuals from the same population or from other populations (Gresswell 1999, Rinne 1996).

In addition, healthier watersheds will be more capable of adjusting to the pulsed constituents such as sediment and ash, and increases in peak flows and water temperature that follow fire events. Pulsed events, such as debris flows after wildfire, can actually provide long-term sources of large wood and coarse sediments. Over time,

these provide the hydraulic complexity and fine sediment sorting and storage that are critical elements and processes of fish habitat (Rieman et al. 1997).

It appears that the best strategies for perpetuating robust aquatic communities, in light of wildfire disturbance, are to improve aquatic habitat structure and complexity, and to maintain connection or reconnect habitats for fish refuge and re-colonization (Gresswell 1999 and Rieman et al. 1997).

Minshall (2003) identifies the differences in indirect affects vary based on fire intensity and extent, stream flows and gradients, vegetative cover, precipitation and runoff, geology and topography. Indirect effects may range from major impacts from channel changes to almost no change at all.

☐ 3.12.7 Existing Conditions

This section of the report details the existing fisheries condition after the fire and, where data are available, before the fire. Fish population and habitat conditions will be related to the major issues identified, and to other resource criteria as appropriate (for instance, data related to INFISH riparian habitat objectives).

Existing conditions are presented at the drainage level (Table 3.12.2) in general terms, then at the watershed level in more specific terms, including information specific to riparian habitat management objectives (i.e., pool frequency, large woody debris, fish densities and composition, and desired future conditions, etc.).

■ East Fork Bear River Drainage

The East Fork Bear River Drainages contains approximately 33.0 km (20.5 miles) of suitable stream habitat for Bonneville cutthroat trout. Bonneville cutthroat trout are suspected to occupy all of the suitable area based on limited sampling. Some hybridization with rainbow trout has occurred in the mainstem East Fork Bear River (United States Department of Interior 2001).

☐ *East Fork Bear River*

The East Fork Bear River was found to contain rainbow and cutthroat trout, sculpin, longnose dace and mountain suckers. The section sampled goes from the mouth upstream to the Mirror Lake Highway Bridge (Cowley 1995).

Water temperature at the time of electrofishing the section was 63°F at about 2:00 in the afternoon of 11 August 1994 (Cowley 1995). No second pass was conducted. The total length of the cutthroat trout captured, n=3, ranged from 137mm to 225mm and averaged 174mm (6.9 in.). The average condition factor for the cutthroat trout over 100 mm was 0.876. The total length of the cutthroat trout captured, n=2, ranged from 230mm to 264mm and averaged 247mm. The average condition factor for the rainbow trout was 1.04.

UDWR sampled some of the upper sections of the E. F. Bear River and maintains the database from that effort. This area is upstream from the project area.

☐ *Boundary Creek*

Fish were also sampled up Boundary Creek in 1994 (Cowley 1995). The lower sample section was approximately 1 mile upstream of the mouth adjacent to a small group of old cabins. Water temperature at the time of electrofishing the section was 58°F at about 3:15 in the afternoon. Seven brook, one rainbow and five cutthroat trout were collected within the 100 meter sample section. Six additional cutthroat trout were collected outside the 100 meter sample section. The total length of the brook trout captured ranged from 104mm to 239mm and averaged 126mm (5.0in.). The brook trout weight ranged from 13 to 154 grams and averaged 35 grams (1.2 oz.) with an average condition factor of 1.2. The total length of the cutthroat trout captured ranged from 162mm to 241mm and averaged 162mm (6.4in.). The cutthroat trout weight ranged from 43 to 139 grams and averaged 94 grams (3.3 oz.) with an average condition factor of 0.99. No population estimate was made because of lack of time to conduct a second pass.

In 2003 this lower section was resampled. Water temperature at the time of electrofishing the section was 61°F at about 3:00 in the afternoon of 16 July. Twelve brook and eighteen cutthroat trout were collected within the 100-meter sample section. The total length of the brook trout captured ranged from 71mm to 272mm and averaged 138mm. The brook trout weight ranged from 4 to 183 grams and averaged 47 grams with an average condition factor of 1.13. The total length of the cutthroat trout captured

ranged from 63mm to 222mm and averaged 121mm. The cutthroat trout weight ranged from 6 to 92 grams and averaged 22 grams with an average condition factor of 0.90. The population estimate for the brook and cutthroat trout was 6 and 10, respectively. With the increased number of fish being collected you would expect the size to decrease and the condition factor to be lower. If the first passes were compared there was an additional 115 grams of additional biomass being produced in 2003 than in 1994.

An upper section starting 100m downstream from Baker Lake and going upstream to the mouth produced only one brook trout which was 212mm long and weighed 132 grams. The water temperature at the time of electrofishing was 62°F at 11:30 in the morning.

■ Mill Creek Drainage

The Mill Creek Drainage contains one of only a few remaining metapopulations within the range of the Bonneville cutthroat trout. The Drainage contains approximately 45.7 km (28.4 miles) of suitable stream habitat for Bonneville cutthroat trout. Bonneville cutthroat trout are common to abundant throughout most of the drainage (United States Department of Interior 2001). Streams in the drainage are well connected and provide conservation populations. It is a first-forth order stream on the north slope of the Uinta Mountains on the Evanston Ranger District. The stream eventually leaves Utah and empties into the Bear River in Wyoming. Within the area surveyed, Mill Creek flows on three sections of private land in Township 2 North, Range 11 East, Sections 19, 29, and 33. Management activities, in the area, include grazing, hunting, fishing, camping and hiking (Cowley 1995). Historically, heavy timber harvest or tie hacking occurred in the drainage (Peterson et al. 1980). Road 061 runs parallel to Mill Creek for the majority of the survey area.

☐ *Mill Creek*

Mill Creek is a tributary to the Bear River with only the headwater located on National Forest Lands. Historic land uses have included tie hacking or timber harvest as evidenced by the number of old cabins, a tie hack dam, and piles of log slabs, which can be found in the drainage. Grazing, hunting and other recreational activities are the primary uses today. Two sections were surveyed on Mill Creek in 1994 (Cowley 1985).

Fish Information

The lower section starts where the North Slope Road crosses over Mill Creek and goes upstream 100m. Additional fish were collected above the section to make up the necessary numbers of fish for genetic analysis. Cutthroat trout and sculpin were found in this area. In 1994, the population estimate for the 100m section was 19 fish, 100mm and longer. The population estimate ranged from 18, the number of fish captured, to 22 fish. Water temperature at the time of collection, 4:00pm on 10 August 1994, was 56°F. The 46 cutthroat trout captured ranged in total length from 35mm to 244mm and averaged 131.9 (5.2in.). The weight of these fish ranged from less than 1g to 137g and averaged 32.0g (1.1oz). The average condition factor for the cutthroat trout over 100 mm was 1.04 and ranged from 0.80 to 1.26. The larger fish appear to have a slightly lower condition factor than the smaller fish.

This section was resurveyed on 19 August 1999 (Personal Communications, 19 August 1999, Paul Cowley, Wasatch-Cache National Forest). The population estimate for the 100m section was 37 fish, 100mm and longer. The population estimate ranged from 36, the number of fish captured, to 41 fish. Water temperature at the time of collection, 4:00pm on 9 August 1999, was 57°F. The 40 cutthroat trout captured ranged in total length from 50mm to 340mm and averaged 172.7 (6.8in.). The weight of these fish ranged from less than 1g to 435g and averaged 71.6g (2.5oz). The average condition factor for the cutthroat trout over 100 mm was 1.02 and ranged from 0.87 to 1.27.

This section was resurveyed on 15 July 2003. The population estimate for the 100m section was 26 fish, 100mm and longer. The population estimate ranged from 24, the number of fish captured, to 29 fish. Water temperature at the time of collection, 3:00pm on 15 July 2003, was 61°F. The 33 cutthroat trout captured ranged in total length from 51mm to 249mm and averaged 155 (6.1in.). The weight of these fish ranged from less than 1g to 150g and averaged 52g (1.8oz). The average condition factor for the cutthroat trout over 100 mm was 1.02 and ranged from 0.58 to 1.28.

As the three samples are compared there are some areas of concern. Water temperatures

appear to be higher than regular. This would be expected as with much of the drainage being burned. The population estimate is lower than the estimate in 1999 but higher than the 1994 sample. Average condition factors for the fish appear to be constant. Some fish in the 2003 sample do appear to be less fit based on the minimum condition factors observed.

The upper section starts 100m below old road crossing in township 2N, range 11E, section 29 and goes downstream of the road crossing. The population estimate for the 100m section was 5 fish, 100mm and longer. The population estimate ranged from 5 the number of fish captured to 7. Water temperature, at the time of collection at 9:30a.m. on 10 August 1994, was 54^{o}F. The fish captured in the section ranged in total length from 145mm to 219mm and averaged 185mm (7.3in.). The weight of these fish ranged from 32g to 130g and averaged 77g (2.7oz). The average condition factor for the cutthroat trout over 100 mm was 1.13 and ranged from 1.05 to 1.24.

In 1999 the section above the road crossing was sampled. This is immediately above the upper section. These fish were not used in this analysis because the habitat differs from the above section with more beaver ponds and meadow areas.

The 1994 section was resurveyed on 16 July 2003. The population estimate for the 100m section was 2 fish, 100mm and longer, the number of fish captured. Water temperature at the time of collection, 10:00am on16 July 2003, was 50^{o}F. The 2 cutthroat trout captured ranged in total length from 191mm to 210mm and averaged 201 (7.9in.). The weight of these fish ranged from less than 84g to 92g and averaged 88g (3.1oz). The average condition factor for the cutthroat trout over 100 mm was 1.10 and ranged from 0.99 to 1.21. This difference of three fish over 100 meters may be a reflection of the impacts from the fire or the heavy use of the ford just upstream of the section. The decrease in numbers was not reflected in other areas that are being monitor and may merely be natural changes in populations.

Habitat Information

Muir and Cowley (2002) provide a good review of the habitat condition in Mill Creek. This area surveyed has several sections of private inholdings intermixed with the National Forest System lands. The stream's headwaters begins on a private section of land in Utah (Township 2 North, Range 11 East, Section 33), then flows west and northwest alternating between public and private land until it leaves the National Forest completely at Township 2 North, Range 11 East, Section 7, northeast quarter. Within the area surveyed, Mill Creek flows on three sections of private land in Township 2 North, Range 11 East, Sections 19, 29, and 33. Management activities, in the area, include grazing, hunting, fishing, camping and hiking (Cowley 1995). Historically, heavy timber harvest or tie hacking occurred in the drainage (Peterson et al. 1980). Road 061 runs parallel to Mill Creek for the majority of the survey area.

The existing habitat conditions in Mill Creek have most likely been influenced by historic activities in the drainage. The Standard Timber Company's tie hacking operation was located in the Mill Creek Fork of the Bear River during 1912 and 1913. The following seven sections were logged during this period: Sections 31 and 33 of Township 3 North, Range 11 E, and Sections 3,9,5,17, and 19 of Township 2 North Range 11 E (Peterson et al. 1980, p. 134). In 1912 alone, some 200,000 ties were cut and floated down stream. Significant alterations were made to the stream channel in order to increase the ability to run the ties down the system. "Mill Creek's bed broadened at certain points into meadows where rotting ties and timber from earlier years attested to the need for improvements. As a result, stretches amounting to about one-third of a mile were cribbed on either side and the channel grubbed and cleaned" (Peterson et al. 1980, p. 135). The scouring and channelization of the streambed, along with the logging activity of this period has certainly impacted stream habitat conditions. Critical impacts to fish would be reduction of slow water habitat, removal of pool forming structure and loss of woody material. The loss of woody material decreases pool formation potential and instream cover.

The Inland Native Fish Strategy Environmental Assessment (USDA Forest Service 1995) establishes interim riparian management objectives. The objective for pool frequency states that streams with an average wetted width of 10 ft (3.05 m) should have 96 pools per mile, and streams with an average wetted width of 20

ft. (6.10 m) should have 56 pools per mile. All reaches in the Mill Fork survey fall short of these objectives. Reaches two, four and six had wetted widths of 3.4 m, 2.8 m and 1.4 m, respectively. According to the interim objectives these three reaches should have approximately 96 pools per mile. The pools per mile values for reaches two, four and six were 26, 24 and 20, respectively, well below the objective value of 96. The average wetted widths of reaches one, three and five were 6.5 m, 5.7 m and 5.5 m, respectively. The interim objectives state that these streams should have approximately 56 pools per mile. The actual pools per mile values of reaches one, three and five were 41, 33 and 31, respectively, all below the objective value.

It should be recognized that one objective value is difficult to apply to individual and unique streams. Although the pools per mile values for Mill Creek were low, the slow water percentages were not necessarily below optimal range. This report has included habitat percentages calculated by surface area, length and count. It is the belief of these researchers, that in the final analysis, percentage by surface area is the most valuable, and gives the most accurate view of stream conditions. For example, this stream with adjusted percentage of habitat by surface area was 50% pool and 50% riffle. Hickman and Raleigh (1982) identified the optimal range of percent pools for cutthroat trout to be 35% – 65%. A value of 50 % pools by surface area suggests that the stream, as a whole, provides an optimal balance of pool and riffle habitat. By length the stream wide average for adjusted habitat percentage drops to 26% pool and 74% riffle. The adjusted percentage by count was 53% pool and 47% riffle. Although useful in comparisons, percentages by length and count do not necessarily reflect accurate stream conditions.

Habitat percentages varied greatly among reaches. Reaches two, four and six had 30%, 15%, and 5% pools, respectively. Although low in percent pools, these reaches with more riffle habitat provide important spawning areas and macro-invertebrate production. Reaches one, three and five all have very high percent pools by surface area, 75%, 70% and 93%, respectively. The pools in these reaches are quite large in relation to the rest of the stream. The large pools in these reaches provide critical holding and wintering habitat. It is important to look at the stream as a whole and not just individual sub-sample. As mentioned above, all reaches in the Mill Creek survey combine to produce a habitat percentage of 50% pool and 50% riffle, which is within the optimal range established by Hickman and Raleigh (1982).

The interim riparian management objectives (USDA Forest Service 1995) state that the value for large woody debris (> 12 inch diameter and > 35 feet in length) in forested systems should be greater than 20 pieces per mile. These size requirements would include both the small and large pieces counted in the Mill Creek survey. The combined values for small and large pieces per mile were 13, 32, 25, 68, 0, and 27 for reaches 1 - 6, respectively. Stream reaches one and five were below the minimum objective value of 20 pieces per mile. Reaches 2, 3 and 6 were just slightly above the minimum objective value. Reach 4, which had a relatively low percent pools value, had the highest value of large woody debris per mile at 68. Reach 5, which had the highest percent pools of the entire survey, had 0 pieces of large woody debris. This would indicate that large wood is not playing a significant role in pool formation. Other factors, such as beaver dams, are contributing to the current amount of slow water habitat in Mill Creek. Without beaver activity the number of pools per mile and percentage of pools would drop significantly

Hickman and Raleigh (1982) identified the optimal maximum temperature range during the warmest part of the year as 12- 15^{o}C (54 –59^{o}F). Maximum temperatures measured in Mill Creek ranged from 53^{o} F (11.7^{o} C) to 42^{o} F (5.6^{o} C). The average maximum temperature was 46^{o} F (7.8^{o} C), slightly below the optimal range. These temperatures were taken between September 12 and September 20. Earlier in the summer water temperatures were slightly warmer. On August 10, 1994 (Cowley 1995), the water temperature at the lower fish-sampling site in reach one was 56^{o} F (13.3^{o} C). On the same date, the water temperature at the upper fish-sampling site in reach five was 54^{o} F (12.2^{o} C). Both these temperatures taken on August 10, 1994 are within the optimal range of 12- 15^{o}C (54 –59^{o}F).

In 1981 a macroinvertebrate analysis was conducted from a sample taken in the main stem of Mill Creek. The species composition of macroinvertebrates found indicated that the aquatic ecosystem was in “fairly good condition” (Mangum 1981). The results also indicated a

moderate amount of sedimentation and excessive organic enrichment. There were 34 taxa present, indicating that impacts on the stream had not reached a severe magnitude as of the sampling date. It appeared that the macroinvertebrates found could support a resident fish population, even during winter months when instream nutrients become critical (Mangum 1981).

☐ ***Carter Creek***

Carter Creek is one of the original streams identified in the 1986 Forest Plan (Page Q-7) to contain cutthroat trout. This stream is part of the Mill Creek metapopulation. In 2002 the main culvert on the North Slope Road was replaced to allow for improved fish passage.

In 2003 Carter Creek was surveyed for fish. The survey reach started at the upper end of the new culvert and went upstream for 100 meters.

☐ ***Christmas Tree Creek***

Christmas Tree Creek was surveyed on 27 July 1998 (Cowley 1998). No fish were found on National Forest Lands. Cutthroat trout were found just off the Forest. This tributary is outside the project area.

☐ ***Lost Dog Creek***

Lost Dog Creek was sampled in 1998 (Cowley 1998). Cutthroat trout were captured above and below the North Slope Road. There is a very limited amount of water and fish on National Forest Lands. A total of 5 fish were collected. They ranged in total length from 165mm to 276mm and averaged 221mm. They weighted from 48g to 217 and averaged 118g. Their condition factor ranged from .80 to 1.10 and averaged 1.01.

☐ ***North Fork Mill Creek***

North Fork Mill Creek is a tributary to Mill Creek, Summit County, and flows north out of the Uinta Mountains. Two sample sections were surveyed in the North Fork Mill Creek. Activities that have and/or do occur in the drainage include tie hacking, grazing, timber harvest, hunting, camping and hiking.

Fish Information

The lower section starts where the North Slope Road crosses the North Fork and goes upstream 100m. The water temperature, at approximately 9:30a.m. on 9 August 1994 (Cowley 1995), was 53°F. Cutthroat trout and sculpin were the only fish capture in this section. The cutthroat trout captured ranged from 113mm to 160mm and averaged 129mm in total length. They weighed 12g to 37g and averaged 21g. Only one pass was made in the section because of a rainstorm at the time of sampling. Sediment, transported from the North Slope Road into the stream, made additional sampling on 9 August 1994 impossible. Eight cutthroat trout were collected during this first pass. Additional fish were collected below and above the sampling reach but were not included in this analysis. The average condition factor for the cutthroat trout over 100 mm was 0.94 and ranged from 0.83 to 1.27.

The lower section was resurveyed on 15 July 2003. Cutthroat trout and sculpin were the only fish capture in this section. The cutthroat trout captured ranged from 78mm to 187mm and averaged 140mm in total length. They weighed from 5g to 69g and averaged 33g. The average condition factor for the cutthroat trout over 100 mm was 1.06 and ranged from 0.83 to 1.20. The population estimate was 7 and ranged from 7 the number of fish collected to 9 fish. The condition factor may have been in direct result of the road work done on the northslope road which reduced sediment from draining from the road directly into North Fork Mill Creek. This reduction in sediment should have allowed for an increase in primary production and an increase in biomass production.

The upper section starts at the road crossing in Township 2N, Range 11E, Section 16 and goes upstream 100m. The water temperature at the time of sampling, at 9:30a.m. on 11 August 1994 (Cowley 1995), was 47°F. Cutthroat trout were the only fish capture in this section. The population estimate for fish 100mm and longer was 16 fish and ranged from 15, the number caught to 19 fish. Additional cutthroat trout were collected outside the section for genetic analysis. The cutthroat trout captured ranged from 92mm to 200mm and averaged 138.9mm in total length. They weighed 6g to 79g and averaged 33.1g. The average condition factor for the cutthroat trout over 100 mm was 1.04 and ranged from 0.52 to 1.32.

This section was resurveyed on 15 July 2003. The population estimate for the 100m section was 21 fish, 100mm and longer. The population estimate ranged from 17, the number of fish

captured, to 19 fish. Water temperature at the time of collection, 11:00am on 15 July 2003, was 55°F. The 28 cutthroat trout captured ranged in total length from 45mm to 225mm and averaged 127 (5.0in.). The weight of these fish ranged from less than 1g to 116g and averaged 28g (1.0oz). The average condition factor for the cutthroat trout over 100 mm was 1.00 and ranged from 0.81 to 1.25.

This section was then resurveyed on 22 September 2003 because it was thought that the data had been lost. The data was later found after it had been filed incorrectly. The population estimate for the 100m section was 21 fish, 100mm and longer. The population estimate ranged from 20, the number of fish captured, to 24 fish. Water temperature at the time of collection, 12:00pm on 22 September 2003, was 43°F. The 34 cutthroat trout captured ranged in total length from 29mm to 186mm and averaged 109 (4.3in.). The weight of these fish ranged from less than 1g to 55g and averaged 17g (0.6oz). The average condition factor for the cutthroat trout over 100 mm was 0.91 and ranged from 0.73 to 1.06. From the length data it appears like the older fish had been removed from the population either from migration or death and a new year class had been recruited. Stream width and depth was greatly reduced thus reducing available habitat.

Habitat Information

Muir and Cowley (2002) provide a good review of the habitat condition in North Mill Creek. Since only the first 1,141 m of stream were surveyed in the North Fork of Mill Creek, it is difficult to look at the stream as a whole. This first section of stream had fairly low slow water percentages. The composition was 30% pool, 70% riffle by length, and 29% pool, 71% riffle by surface area. This section is below the optimal range of 35% - 65% pools established by Hickman and Raleigh (1982). Even so, the increased riffle habitat may facilitate spawning and macro-invertebrate production. A survey of remaining reaches would be useful in assessing the overall habitat percentages in the North Fork of Mill Creek.

The North Fork of Mill Creek is within the area affected by historic tie hacking activity. As described in the Mill Creek discussion, the following seven sections were logged during this period: Sections 31 and 33 of Township 3 North, Range 11 East, and Sections 3,9,5,17, and 19 of Township 2 North Range 11 East (Peterson et al. 1980, p. 134). The logging of Sections 5 and 9 in Township 2 North Range 11 East would have directly influenced the North Fork Mill Creek watershed. Direct effects to the stream could have been reduced slow water habitat and lack of woody material. The interim riparian management objectives (USDA Forest Service 1995) state that the value for large woody debris (> 12 inch diameter and > 35 feet in length) in forested systems should be greater than 20 pieces per mile. The small and the large pieces of woody material counted in the North Fork Mill Creek survey meet these size criteria. Despite its history, this section of stream had a combined total of 139 small and large pieces of wood per mile (Table3.12.3). This value is well above the minimum objective of 20 pieces per mile. With an apparently sufficient supply of large woody material, the percentage of slow water habitat is still quite low. As in Mill Creek, this would indicate that large wood is not playing a significant role in pool formation. The North Slope road parallels the stream for approximately half of the section surveyed. The construction of this road has straightened and channelized the stream, which has most likely reduced slow water habitat. Above the surveyed area, the road parallels the stream for approximately two more miles.

In 1998 roadwork was done on the section of the North Slope Road that parallels North Fork Mill Creek. The work included narrowing the road surface, increasing the number and locations of the drainage ditches and placing rock and erosion mating in area's most vulnerable to erosion.

■ Management Indicator Species

Bonneville and Colorado River cutthroat trout are management indicator species under the Wasatch-Cache Forest Plan. Appendix B of the Wasatch-Cache National Forest Plan Revision FEIS (USDA Forest Service 2003c) includes information on the current status of management indicator species. The following information comes from that document.

Likelihood of persistence of Bonneville Cutthroat Trout Metapopulation

15 Years It is believed that the Bear River populations of Bonneville cutthroat trout, on the Wasatch-Cache National Forest, will persist over

the next 15 years based on the limited risks and moderate threats (Figure 3.12.3). The Mill Creek Drainage is important in that it provides habitat for a metapopulation. It is expected that the risks and threats will increase over the next 15 years as more land is sold for development.

Risks and Threats of Concern The primary concerns in the drainages are the non-native fish and some habitat impacts from historic tie hacking and grazing (Table 3.12.3).

100 Years It is anticipated that the Bonneville cutthroat trout will persist over the next 100 years also. The risks and threats are expected to increase over the next 100 years as demands for recreational opportunities and water increases.

Table 3.12.3. Risks to Bonneville Cutthroat Trout Associated with the Upper Bear River Drainage. *Information taken from the FEIS for the Wasatch-Cache National Forest Revised Foret Plan.*

Risk Factor	Drainage	
	East Fork Bear River	Mill Creek
Landscape Condition GI, WQ, WV	2,2,1	3,2,2
Temporal Variability	2 - Some disturbance in drainage	1 - Good stability
Population Size	2 - limited metapopulation, non-natives	2 - low population number 85-50 fish/mile
Growth and Survival	1 - limited influence	3 - tie hacking and road impacts
Isolation	2 - good connectivity	1 - good connectivity
Overall Extinction Risk	3 – High	2 - Moderate
Roads, Trails, Motorized Trails (%)	0.43	0.82
Developed and Special Use (%)	0.01	0.43
Grazing Head-Months (cow/sheep)*	285/751	9/1740
Non-native Fish	Rainbow, Brook	None
Trend**	Flat	Flat

* The grazing head/month data is for total permitted use within drainages. This number should have been total head months divided by miles of perennial streams within the drainage. This qualification is being made in errata for the Forest Plan FEIS.

** Trends for 6th level HUCs were identified in Appendix B of the Wasatch-Cache National Forest Plan Revision FEIS. An upward trend was identified where habitat had been added or habitat improvements had occurred. If a stream had been treated to remove non-native fish, the general trend was viewed as increasing. A downward trend was identified if the population had an overall risk rating of 3 or 4, had lost potential functioning condition in over 2.5% of the huc's riparian zone, and/or had two or more non-native fish with potential interbreeding. The population was considered stable if there was no evidence of major change from the last Forest Planning period.

Likelihood of persistence of Colorado River Cutthroat Trout Metapopulation

The West Fork Blacks Fork is part of the Headwaters of the Green River and run from the High Uinta Wilderness north into Wyoming. Surveys conducted by the Utah Division of Wildlife Resources above the project area found Colorado River cutthroat trout, mountain whitefish, mountain sucker, sculpin, and brook trout.

Hook and line surveys at the West Fork Trail Head produced only cutthroat trout. They ranged in total length from 129mm to 311mm, and averaged 214mm. They weighed from 13g to 293g and averaged 97g. Their condition

factor, for fish over 100mm averaged 0.89 and ranged from 0.61 to 1.13.

15 Years It is believed that these populations of Colorado River cutthroat trout will persist over the next 15 years in the Blacks Fork Drainage, based on the limited risks and moderate threats (Table 3.12.4). The replication risk is 2 with major populations in Smiths Fork, Blacks Fork, Brush Creek, and Sage Creek. The synchrony risk is 2 with impacts from historic tie hacking continuing to affect fish habitat. The frequency and potential of large-scale uncharacteristic events is assumed moderate.

Risks and Threats of Concern The primary concern in the drainage is the upstream movement of non-native fish. This concern has been addressed in some drainages with the installation of migration barriers in Little West Fork Blacks Fork, Gilbert Creek, and Sage Creek. The availability of water in the West Fork Blacks Fork may reduce the potential impact from grazing. There are 7,274 sheep head-months in this drainage but this drainage has 132 miles of perennial streams resulting in 55 sheep head months per year per mile of stream.

100 Years It is anticipated that the Colorado River cutthroat trout will persist over the next 100 years also. Again the risks and threats are expected to remain constant.

Table 3.12.4. Risks to Colorado River Cutthroat Trout within the West Fork Blacks Fork River Drainage. *Information taken from the FEIS for the Wasatch-Cache National Forest Revised Forest Plan.*

Risk Factor	West Fork Blacks Fork
Landscape Condition GI, WQ, WV	2,2,2
Temporal Variability	1
Population Size	1
Growth and Survival	2
Isolation	1
Overall Extinction Risk	1
Roads, Trails, Motorized Trails (%)	0.263
Developed and Special Use (%)	0.14
Grazing Head-Months (cow/sheep)	3/7274
Non-native Fish	Rainbow, Brook
Trend	Flat

* The grazing head/month data is for total permitted use within drainages. This number should have been total head months divided by miles of perennial streams within the drainage. This qualification is being made in errata for the Forest Plan FEIS.
** Trends for 6th level HUCs were identified in Appendix B of the Wasatch-Cache National Forest Plan Revision FEIS. An upward trend was identified where habitat had been added or habitat improvements had occurred. If a stream had been treated to remove non-native fish, the general trend was viewed as increasing. A downward trend was identified if the population had an overall risk rating of 3 or 4, had lost potential functioning condition in over 2.5% of the huc's riparian zone, and/or had two or more non-native fish with potential interbreeding. The population was considered stable if there was no evidence of major change from the last Forest Planning period.

Risk Assessment and Trend

Risk assessments for all of the drainages that contain Colorado or Bonneville cutthroat trout are included in Appendix B of the Forest Plan Revision FEIS. Many of the drainages have flat trends with a few having downward trends and a few having upward trends. Cutthroat trout in

seven 6th level hucs across the Forest were identified as being headed for extirpation over the next 15 years. One of these was in the Hayden Fork to the west of the East Fork Fire Salvage analysis area. The suspected cause is hybridization with non-native rainbow trout. A potential action to prevent this from happening would be treatment to remove non-native fish and habitat enhancement. Trends in all of the the drainages within the East Fork Fire Salvage analysis area (East Fork Bear River, Mill Creek, and West Fork Blacks Fork HUC's) are identified as flat or stable.

A draft Forest Monitoring Report for the Wasatch-Cache National Forest (USDA Forest Service 2004a) has been prepared that also includes reports on management indicator species. The following information is taken from that report.

The Wasatch-Cache National Forest conducted fish surveys in many of the headwater tributaries of the Bear River Drainage in 2003. An intensive single drainage survey was conducted versus extensive low intensive surveys across the forest. The use of an intensive survey was to better characterize the drainage with the recognition that conditions vary too much between streams to have one or two samples characterize the entire drainage. By monitoring fish species composition, fish species conditions factors and total fish biomass, in survey reaches, a better understanding of potential impacts from land management actions can be gained.

The Bear River Drainage was selected for the 2003 survey work because of the work done in the drainage in 1994. The data collected during the summer of 2003 is compared with data collected during 1994 (Cowley 1995). There are also a number of ongoing activities that are occurring or are planned in the drainage. These include the East Fork Fire monitoring and the East Fork Fire Salvage. The State of Utah, Division of Wildlife Resources, also conducted fish surveys on private lands downstream of the Forest (Figure 1) and on the Forest in a few locations.

A total of 31 sample sites on 19 streams were surveyed in 2003 in the headwaters of the Bear River, upstream of Evanston, Wyoming, on National Forest Lands (Figure 1). Sample sites were typically 100m long and the sampling consisted of two passes with electrofishing equipment. Of the 31 sample sites, 8 sites had not been surveyed before. Of these 8 sites (4 streams), 6 sites (4 streams) had only cutthroat trout present. One new sample site, in a stream that was surveyed in 1994, had a mix of trout species.

Of the 23 sample sites (15 streams) that were surveyed in 1994 that were resurveyed in 2003, 3 sample sites on two different streams have had non-native trout move into the sample sites. In one site, where cutthroat trout and brook trout were found in 1994, cutthroat trout were absent when surveyed in 2003. A sample site where brook trout were found to be the only fish present in 1994 was found to be fishless in 2003. These changes are probably a reflection of stocking changes and natural migration that has occurred over the last 10 years.

Fourteen sections were sampled in identical locations where previous samples had been taken. Of these 14, cutthroat trout in 6 sections increased in biomass and condition factors. This suggests that the overall fish health and production increased. Cutthroat trout in one section decreased in both biomass and condition factors. This section was located just downstream of a ford within the East Fork Fire. Impacts from the wildfire and potentially the ford may have caused this. Cutthroat trout biomass in five sections went down while the fish condition factor went up. This may reflect the extended drought in the area with habitat still supporting a high level of aquatic insect production with less overall fish biomass. Aquatic insects provide a primary food base on which fish survive. The fish remaining in the sections appear to be doing well. Two sections had increased biomass and decreased condition factors. Both of these are in the tributary from Teal Lake. This may suggest that there was a good production of young fish for a few year classes and this small stream now had more fish than it can support in a healthy condition.

It is assumed that these same species composition and population shifts probably exist throughout the Wasatch-Cache National Forest. This assumption is based on anecdotal information in discussions with other biologists within the range of the Bonneville and Colorado River cutthroat trout. The immigration of non-native trout into native trout areas has been seen in areas like the Logan River over the past 10 years. Fish stocking, which has caused some of

the most dramatic shifts in species composition over the last 70 years has dramatically changed over the last five years as new policies have been adopted and implemented. Much of the fish stocking has been terminated as the State of Utah strives to follow its fish stocking and transfer policy (Utah Division of Wildlife Resources 1997).

The drought continues to impact fish populations as habitat availability is reduced with declining water volumes. Fish populations in Soapstone Creek, on the Kamas District, and a portion of Saddle Creek, on the Logan District, were lost as the streams went subsurface causing additional loss of available habitat. This is seen in decreasing biomass or reduced condition factors as more fish compete for fewer resources. In the Colorado River Drainage the Colorado River cutthroat trout populations are more inherently vulnerable to competition from brook trout (personal communication Paul Cowley, Wasatch-Cache National Forest). Some streams in the Colorado River Drainage have had migration barriers installed trying to reduce the impact. Other populations in the Colorado River Drainage remain vulnerable to this threat.

Impacts from wildfire were observed and will continue to be a threat to cutthroat trout populations. These impacts include loading of fine sediments into the spawning areas causing direct and indirect mortalities and the super heating of small water bodies causing temperatures to rise above tolerance levels. Beaver ponds provide real benefits as many of the fines settle out and do not directly affect downstream populations. The increased depth also helps in maintaining cooler water temperatures.

Impacts from forest management activities were not identified during the surveys. The amount of change in the natural vegetation was extremely limited on the forest in comparison the forest as a whole. These impacts may be at such a low level that natural environmental changes masked them for the inventoried area.

■ Amphibians

Current Condition: Amphibians found within the project area include, and may not be limited to, the boreal toad (Bufo boreas) and striped chorus frog (Pseudacris triseriata). Other species found on the forest include tiger salamander, Great Basin spadefoot toad, northern leopard frog and woodhouse toad (Table 1). Loss of habitat is the primary threats to amphibians on the Wasatch-Cache National Forest. This occurs as vegetation around water sources is removed through grazing, recreational use, and timber harvest, or that reduce riparian vegetation and water. As riparian vegetation and water quality and quantity is maintained the amphibians should persist.

Table 1. Amphibians historically present on the Wasatch-Cache National Forest, January 2000 (Wasatch-Cache National Forest 2003).

Amphibians	Scientific Name
Tiger Salamander	Ambystoma tigrinum nebulosum
Great Basin Spadefoot Toad	Spea intermontana
Boreal Toad	Bufo boreas boreas
Boreal Chorus Frog	Pseudaris Ttriseriata maculata
Northern Leopard Frog	Rana pipiens brachycephala
Spotted Frog	Rana luteiventris
Woodhouse Toad	Bufo woodhousei

(Adapted from Lentsch et al. 1995)

Spotted Frog

The United States Department of the Interior, Fish and Wildlife Service (communication to Stephen Ryberg from Henry Maddux 1 April 2003), mention in their scoping letter the potential for spotted frog to occur in the project. The State of Utah (Lentsch et al. 1995) and the Peterson Field Guide of Western Reptiles and Amphibians (Stebbins 1985), species distribution maps for the spotted frog identify no known population in the analysis area. During aquatic surveys conducted in the area no spotted frogs were found. It is therefore believe that the project area is outside the range of the species.

Boreal Toad (Western Toad)

The boreal toad is known to inhabit the North Slope of the Uinta Mountains and has been found in the project area on the East Fork of the Bear River. On the Wasatch-Cache National Forest, they have been found along stream courses and in isolated ponds and in riparian vegetation. These are the same areas that are identified as RHCAs. Stebbins (1985) gives a good description of habitat used by boreal toads. They use a wide variety of habitats that range

from desert streams and springs, grassland, woodland, and mountain meadows. They live in and near ponds, lakes, reservoirs, rivers, springs and streams and are active at night in warm, low-lying areas; diurnal at high elevations and in the north. Their elevation range is from sea level to over 11,800 feet. Muths et al. (2000) found that boreal toads are known to travel up to 2.5 km between breeding sites.

Boreal toad eggs are generally laid in vegetation along the edge or in the middle of water. The eggs remain in incubation for up to 40 days in late May and June. During this time, the eggs can easily be crushed through hoof action by cattle or other animals. Toads also seek shelter in vegetation and large wood. If this vegetation is removed, the toads become more easily accessible for predation. The removal of vegetation can also impact the egg survival due to ultraviolet-B radiation from the sun (Blaustein and Wake, 1995). Shading is a critical part of the survival of eggs during incubation.

Chorus Frog

The chorus frog uses grassy ponds, lakes and marshes of prairies and mountains. It is well adapted to humans and is found on many farms (Stebbins, 1985). On the Wasatch-Cache National Forest it is very common and has been found in many of the small ponds in the project area.

Long Term Conservation of Amphibians

There is insufficient information on the current distribution, the species range across the forest or the importance of the Wasatch-Cache National Forest in the conservation of these species to conduct an analysis as to the long-term preservation of amphibian species. It is believe that with the existing standards and guidelines and the identification of riparian habitat conservation areas and the recognition of the importance of riparian areas that amphibians will persist. This assumption is made when viewing that all alternative recognize the importance of clean water, riparian habitat and downed large wood. Riparian Habitat Conservation Areas around ponds and streams should provide addition protection to amphibians found within the project area.

Much of the management of native aquatic and semi-aquatic species involves minimizing risks and threats. We do not fully understand all of the complex relationships that cause these species to expand or contract their geographic range, how species and individuals act and react to each other and how habitat alterations may affect individuals and populations. Therefore, threat management consists of managing above population-loss thresholds. The further above these thresholds, the more secure a population and species is. There have been several proposals made in the past to minimize the risks for fish and amphibians. These include: (1) The establishment of fish reserves (Rahr et. al., 1998), (Spangler, 1994); (2) The elimination of actions within riparian zones without site specific analysis; (3) The elimination of man's actions within known habitat; (4) The fencing of important areas to preclude livestock, wildlife and human caused trampling. On this project we are utilizing tasks 2 and 3 to prevent the potential loss from implementing the alternatives.

3.13 Recreation

3.13.1 Introduction

Recreation in many forms is a major use of Forest Service land. People hunt, fish, cut firewood, hike, camp, snowmobile, cross-country ski, snowshoe, and drive for pleasure in the forest.

Because of the wide variety of recreational activities and the importance of recreation in the public's view, recreation is a resource considered in the analysis area, both when evaluating the fires' effects and when proposing post-fire activities. Most of the information in this section was derived from a specialist report on recreation (Hatch 2003a)

3.13.2 Geographic Area Assessed

The area assessed for fire effects on recreation resources was the area included within the Project Area Boundary. This is the same area examined when developing alternatives for proposed post-fire actions.

3.13.3 Recreation Issues and Concerns

A Combined Public and Internal Issue Statement related to recreation is displayed below (Figure 3.13.1).

Recreation Issue

Timber salvage and road construction may result in the loss of quiet, back-country, non-motorized recreational opportunities

Figure 3.13.1. Recreation Issues. *Issues specific to recreation were identified by the Interdisciplinary Team and the public.*

3.13.4 Recreation Regulatory Requirements, Guidance and Coordination

The following Forest Plan Goals regulate activities affecting recreation (Figure 3.13.2).

Recreation Regulations

The Wasatch-Cache National Forest Plan revised 2003 provides management direction for recreation:
Desired Condition: "People visiting the National Forest find opportunities for a wide spectrum of recreation experiences that are harmonious with predominantly natural settings. A balance of diverse landscapes offer a variety of settings for a wide range of activities, including primitive settings where there are opportunities for solitude, risk and challenge, to more modified settings where there are opportunities for social interaction, comfort and less risk. Recreation facilities are constructed, reconstructed, relocated, eliminated or decommissioned as needed to provide a balance of safe, efficient, and environmentally responsible experiences and opportunities. Recreation facility maintenance meets established national standards and contributes to healthy, safe recreation experiences.
Recreation information and facility design and construction focus on people of all abilities and provide amenities and information to meet their needs. Conflicts between recreationists and with other users are minimized. Local communities, partnerships, and volunteers are involved and benefit from their roles in providing recreational opportunities. Recreationists understand the potential for impacts to resources and other users and actively assist in caring for the land and resolving conflicts."

Forestwide Goal 6: "Manage for an array of recreation opportunities and settings to improve the quality of life for a variety of Forest recreation users. Balance growth and expansion of recreation by managing within the capability of sustainable ecosystems found on the Forest for today and the future. (pg. 4-22)
Guidelines:
(G49) Manage recreation opportunities consistent with Management Prescriptions Categories (MPCs), Recreation Opportunity Spectrum (ROS) Classes, Landscape Character Themes (LCTs), Scenic Integrity Objectives (SIOs), and in accordance with Winter Recreation Maps as well as District Travel Management Plans. (pg. 4-47)
(G50) Design, construct, and operate recreation facilities, trails and concentrated use areas to provide a beneficial recreation experience, reducing social conflicts and minimizing or avoiding adverse effects on watershed integrity, soil productivity, aquatic/riparian systems, terrestrial species and their habitats, and cultural resources. (pg. 4-47)
(G53) Where recreation demand exceeds resource capabilities or significantly changes the recreation setting available to users, determine limits of
acceptable change and take actions to manage within those limits. (pg. 4-47)

(G54) Use interpretation and environmental education to assist in improved understanding and ownership of forest stewardship needs. (pg. 4-47)

Figure 3.13.2. Wasatch-Cache National Forest Direction for Recreation. *Several Guidelines within the Forest Plan are relevant to the project.*

3.13.5 Relevant Analysis

Recreation Opportunity Spectrum

The Recreation Opportunity Spectrum (ROS) is a framework for stratifying and defining classes of outdoor recreation environments, activities, and experience opportunities. The settings, activities, and opportunities for obtaining experiences have been arranged along a spectrum divided into seven classes for the Wasatch-Cache National Forest:

- Wilderness/Primitive
- Wilderness/Semi-primitive non-motorized
- Semi-primitive non-motorized
- Semi-primitive motorized
- Roaded natural
- Rural
- Urban

Figure 3.13.3 defines the five recreation opportunities found within the analysis area.

Recreation Opportunity Spectrum		
ROS Class	Description	
	Setting	Characteristics
Wilderness/Primitive	Physical	**Theme**: Remote (3 miles from motorized use), predominately unmodified, naturally evolving landscape character **Location:** MPC 1.1, High Uintas Wilderness **Infrastructure:** Access – non-motorized trails are present Fishing Sites – rivers and lakes Camp/Picnic Sites – not developed or defined, leave no trace Sanitation – no facilities, leave no trace Water Supply – undeveloped natural Signing – minimal, constructed of rustic natural materials Interpretation – through self discovery and at trailheads Crossing – minimal, some bridges made of natural (nondimensional) materials may exist, but are rare **Vegetation**: Natural, no treatments except for fire use
	Managerial	Few signs, few encounters with rangers, travel on foot and horse, no motorized or mechanized travel allowed
	Social	**Local adjustment**: High Uintas Wilderness may have the sights and sounds of commercial flight routes near by or directly over the Wilderness **Off Trail System**: Very Low encounters with other parties **Trails**: Low encounters with other parties **Camp Spacing**: Should not be closer than one mile apart **Opportunities**: Closeness to nature; self-reliance, moderately-high to high challenge and risk; little evidence of people off of trails
Wilderness/Semi-Primitive Non-Motorized	Physical	**Theme:** Remote (less than 3 miles from motorized use), predominately unmodified, naturally evolving landscape character **Location:** MPC 1.2 & 1.3, High Uintas **Infrastructure**: Access – non-motorized trails are present Fishing Sites – rivers and lakes Camp/Picnic Sites – not developed or defined, leave no trace Sanitation – no facilities, leave no trace Water Supply – undeveloped natural Signing – minimal, constructed of rustic natural materials Interpretation – through self discovery and at trailheads Water Crossing – minimal, some bridges made of natural (non-dimensional) materials may exist, but are rare **Vegetation**: Natural, no treatments except for fire use
	Managerial	Few signs, few encounters with rangers, travel on foot and horse, no motorized or mechanized travel allowed

Recreation Opportunity Spectrum		
ROS Class	Description	
	Setting	Characteristics
	Social	**Off Trail System**: MPC 1.1-Low encounters with other parties **Trails:** MPC 1.2, 1.3 in High Uintas Wilderness –Low encounters with other parties **Local Adjustment**: High Uintas Wilderness has the sights and sounds of commercial flight routes near by or directly over the wilderness. **Local Adjustment** for Weekends and Holidays Trails: High Uintas Wilderness – MPC 1.2 – Moderately Low encounters with other parties **Local Adjustment** for Weekends and Holidays Trails: High Uintas Wilderness – MPC 1.3 – Moderate encounters with other parties **Camp Spacing**: MPC 1.2 - 1.3, High Uintas – Campsites should be no closer than ¼ mile apart **Opportunities**: Closeness to nature; self-reliance, high challenge and risk; little evidence of people off of trails
Semi-Primitive Non-Motorized	Physical	**Theme:**Predominately a natural evolving /natural appearing landscape character with minimal rustic improvements to protect resources **Infrastructure:** Access – non-motorized trails are present closed and temporary roads may be present Fishing Sites – rivers, lakes, and reservoirs Camp/Picnic Sites – not developed, leave no trace Sanitation – no facilities, leave no trace Water Supply – undeveloped natural Signing – rustic constructed of natural materials Interpretation – through self discovery, at trailheads Water Crossing – rustic structures or bridges made of natural materials **Vegetation**: Predominately natural, treatment areas exist to enhance forest health but are few and widely dispersed.
	Managerial	Minimum or subtle signing and regulations, some encounters with rangers, motorized travel prohibited
	Social	**Off Trail System**: Low encounter with other parties **Trails:** Low to Moderate encounters with other parties **Local Adjustment**: Some areas are adjacent to population centers and the sights and sounds of these communities could be evident **Local Adjustments** for Weekends and Holidays Trails: Check with local Ranger Districts for information on trails with High encounters with other parties **Camp Spacing**: Usually less than 6 parties visible from a campsite **Opportunities:** Closeness to nature, self-reliance high to moderate challenge and risk, some evidence of others

Recreation Opportunity Spectrum		
ROS Class	Description	
	Setting	Characteristics
Semi-Primitive Motorized	Physical	**Theme:** Predominately a natural appearing landscape character with minimal improvements to protect resources **Infrastructure:** Access – motorized trails and primitive raods (maintenance level 2 roads) Fishing Sites – rivers, lakes, and reservoirs with some trails and primitive roads Camp/Picnic Sites – not developed, leave no trace, some identified concentrated use areas Sanitation – limited facilities, rustic, may have rustic outhouse available Water Supply – undeveloped natural, rustic developments Signing – rustic, made of natural materials Interpretation – self discovery, some located on site or at trailheads Water Crossing – rustic structures or bridges made of natural material, some designed for motorized use **Vegetation:** Treatment areas are very small in number, widely disbursed, and consistent with natural vegetation patterns.
	Managerial	Minimum or subtle on-site controls with some restrictions, motorized and mechanized travel restricted to designated travel routes, no motorized or mechanized travel allowed off designated travel routes
	Social	**Motorized Travel Ways**: Low to moderate contact frequency on loop travel ways, moderate contact frequency on cherry stem travel ways **Local adjustment** for Weekends and Holidays: Check with local Ranger Districts for information on travel ways with High encounters with other parties **Concentrated Use Sites**: Low to moderate group and family interaction **Opportunities**: Closeness to nature, high degree of challenge and risk using motorized equipment, evidence of motorized equipment on trails and primitive roads, and by audible motor sounds
Roaded Natural	Physical	**Theme:** Predominately a natural appearing and developed natural appearing landscape character with nodes and corridors of development such as campgrounds, trailheads, boat launches, small-scale resorts, and recreation residences **Infrastructure:** Access – Roads (typically maintenance levels 3-5) and motorized and non-motorized trails Fishing Sites – rivers, lakes, reservoirs with some facilities Camp/Picnic Sites – concentrated use areas and developed sites Sanitation – developed outhouses that blend with natural setting Water Supply – often developed Signing – Rustic with natural materials to more refined using a variety of materials such as fiberglass, metal, etc. Interpretation – simple roadside signs, some interpretive programs Water Crossing – bridges generally constructed of natural materials **Vegetation**: Changes (treatments) to the natural vegetation patterns are evident, but in harmony with natural environment

Recreation Opportunity Spectrum		
ROS Class	Description	
	Setting	Characteristics
	Managerial	Opportunity to be with other users in developed sites, some obvious signs (information and regulation) and low to moderate likelihood of meeting Forest Service Rangers, motorized and mechanized travel restricted to designated routes, no motorized or mechanized travel allowed off designated travel routes
	Social	Developed and Concentrated Use Areas: Moderate evidence of human sights and sounds Travel Ways: Moderate to high sites and sounds of humans Opportunities: Moderate concentration of users at campsites, little challenge or risk

Figure 3.13.3. Recreation Opportunities Spectrum. *This separates the range of outdoor recreation opportunities into classes.*

3.13.6 Existing Conditions

The three predominate seasons of recreation use within the East Fork analysis area are summer, fall and winter.

The Revised Forest Plan reports that recreation use on the Wasatch-Cache National Forest is increasing (USDA Forest Service 2003). Of particular concern to recreation managers is the increase in visitation from the Salt Lake/Davis/Weber County areas. As population increases more and more pressure from the front communities along the Wasatch Front seek outdoor recreation experience. The analysis area provides natural appearing setting for five developed recreation sites where the facilities have been developed for user convenience. Two permitted organization camps are on the Northerly boundary of the analysis area, one Boy Scouts of America camp resides in the western edge of the analysis area, one concentrated use area at Lilly Lake and 106 inventoried undeveloped primitive vehicle and non-motorized camps are disperse along travelways through out the analysis area.

Summer Recreation. Summer use generally starts in early June as the high elevation snowpack melts. As temperatures at the lower elevation increase and dry conditions prevail, campers tend to move up to the shaded areas accessed by the designated motorized travel routes that stem off of the North Slope Road (FS road 80058a-d). Undeveloped primitive vehicle recreation camping is the dominant activity along with Off Highway Vehicle (OHV) riding, driving for pleasure, Hiking and horseback riding. Mechanized recreation also occurs but at lower use levels.

Campsites are generally accessed by motor vehicle and consist of vehicle camping associated tents. An undeveloped recreation campsite inventory was conducted on the Evanston/Mountain View Ranger Districts in the winter of 1999 where campsite were mapped per District personnel knowledge. See Map 3.13.2 in Appendix A for inventoried undeveloped primitive campsites, ROS classification and travelways.

All inventoried campsites are found within coniferous plant communities, adding to the supposition that the shade and the cooler temperatures are part of what attract people to select a campsite.

Fall Recreation. Fall (generally September through October) is the hunting season and the North Slope Road accesses some high elevation big game hunting areas. During this time, recreation is dominated by camper/hunters, most with OHV's or four wheel drive vehicles, and a lesser number hiking or with horses. During this time, illegal OHV use increases with many decommissioned routes, cow trails, routes to springs, or ridgelines being ridden illegally.

Winter Recreation. The winter season (December 15 through March 15) is dominated by winter sports use. Snowmobiling is by far the most popular activity in the analysis area. The State of Utah Division of Parks and Recreation, through an agreement, grooms an extensive and

very popular snowmobile trail system along the North Slope Road alignment. Most visitor access is from the junction of the North Slope Road, with Highway 50. Visitors also access the area from adjacent Summer Home and Bear River Lodge.

Recreation Opportunity Spectrum (ROS). Allocations for general types of recreation or recreation activities are inventoried, categorized, and mapped by a system called the Recreation Opportunity Spectrum (ROS). The ROS as used in the Wasatch-Cache Final Environmental Impact Statement (FEIS) (USDA Forest Service 2003c) has eight categories. These categories range along a scale from "Wilderness/Primitive" which is the most remote, least developed, with the least evidence of human impact to "Urban" which is the least remote, most highly developed and has the most evidence of human use. There are five categories of classification of ROS found within the analysis area, see Table 3.13.1 Analysis Area ROS Classification in Acres.

Table 3.13.1. Analysis Area ROS Classification in Acres

Analysis Area ROS Classification in Acres	
ROS Classification	**Acres**
Wilderness/Primitive	1
Wilderness/Semi Primitive Non-Motorize	22,965
Semi Primitive Non-Motorized	14,213
Semi Primitive Motorized	13,218
Roaded Natural	11,192
Non-Forest Lands	10,520

Travel Plan Management. Access to public lands is an important issue to visitors. The Forest Service establishes appropriate motorized and non-motorized travel routes through a travel planning process. This site-specific process looks at public and administrative needs for accessing areas and develops a plan (generally presented as a map) that balances those needs with concerns about impacts to biophysical or social resources. Current access to the East Fork Fire analysis area is managed as shown on the "Travel Map Wasatch-Cache National Forest Evanston and Mt. View Ranger Districts 2003" (available in the project file). This map designates open routes for motorized over-land travel on roads or trails. A Forest wide winter recreation map identifies areas open and closed to motorized travel (available in the project file).

The summer travel management system currently in place was developed during the years preceding 2003 through a series of public and working groups meetings. At that time many routes were proposed for closure and decommissioning. Some of these routes were probably created to construct fence lines, develop ponds for watering animals, and for harvesting timber or fighting fires. Due to the increase in the use of OHV's and advances in their technologies many of the old road grades or scars are being reopened illegally. Some are reopened by recreational riders, but the majority are reopened during the hunting season for game retrieval, vantage points from ridgelines and other prominent points and access to developed and undeveloped water sources.

Over-Land Travel. Spring, summer, and fall travel constrains motorized use to roads or trails designated as open for motorized use (refer to Table 3.8.1) The majority of the allowed motorized use in this area is on Forest System roads. The North Slope Road is the main travel route through the analysis area. Visitors use these roads while driving for pleasure, to seek out undeveloped primitive recreation campsites, for access to hunting locations, and in the fall for hauling fuel wood. In addition to the roads system, there are also opportunities for OHV use on designated motorized trails.

Over-Snow Travel. Snowmobiling is the dominant use in the part of the analysis area during the winter months. There are approximately 15.6 miles of groomed snowmobile trails in the analysis area. Most of

the analysis area with the exception of the High Uintas Wilderness and the Lily Lake Cross Country Ski Area is open to over-snow travel when there is an adequate snow depth. The rest of the analysis area is open to non-motorized uses. Lilly Lake cross country ski area is a groomed area for non-motorized use and permitted yurts for overnight use.

3.14 Social Economic Setting

3.14.1 Introduction

One focus of the East Fork Salvage Project's Purpose and Need (See Chapter 1) is working with the local communities and people affected by the fires. Residents of Uinta County, Wyoming and Summit County, Utah were among those directly affected by the East Fork Fire.

A major concern about the fires' effects is economic. The Wasatch-Cache National Forest contributes to the economy of Uinta and Summit Counties in a variey of ways, from providing recreational opportunities to providing natural resource outputs, all of which attract dollars and jobs to the local economy. Governing bodies of both counties are very interested in close involvement in the economic and social effects of national forest management as it relates to county citizens. Uinta County requested and was granted cooperating agency status for the purposes of forest planning.

The fires provided some immediate employment opportunities in suppression and rehabilitation activities. These activities were relatively short-term. Longer-term opportunities for jobs and wood products would be made available through salvaging timber burned in 2002. Most of the information in this section was derived from a specialist report on the socio economic setting (O'

3.14.2 Geographic Area Assessed

The actual fire perimeter and the general analysis area boundary used for most resources are shown on Map 1.1.3, Appendix A. The area analyzed and affected economically is much larger, including communities in Uinta and Summit Counties. Economic effects are analyzed for these counties.

3.14.3 Methodology Used to Collect Data and Make Scientific Findings

Information in this section was derived from data collected and summarized in the Revised Forest Plan. Plan data came from several sources, including 2000 Census data and data from the US Department of Commerce, Economic and Statistics Administration, Bureau of Economic Analysis. All charts were generated using the Department's RCN-0250 Regional Economic Information System 1969-1998 Data. The IMPLAN economic model was used to determine the extent of wildland dependency in the areas.

3.14.4 Issues Specific to Economics

Working with communities is one emphasis of the Proposed Action. A Combined Public and Internal Issue Statement was identified and is displayed below in Figure 3.14.1.

Issue Specific to Socio-economics

The local economy could lose timber values if salvage is not accomplished and is not done in an expeditious manner.

Figure 3.14.1. Economics Issues. *Several economic issues were identified by the public during Scoping.*

3.14.5 Regulatory Requirements, Guidance and Coordination

The Wasatch-Cache National Forest Plan includes forest-wide goals and standards affecting the economics of the area (Figure 3.14.2). Appendix G of the Wasatch-Cache National Forest Plan is a guideline for selecting timber harvest systems.

Wasatch-Cache National Forest Plan

Forest-wide Goal 10: Contribute to the social and economic well-being of local communities by promoting sustainable use of renewable natural resources and by participating in efforts to devise creative solutions for economic health diversity and resiliency). Provide timber for commercial harvest, forage for livestock grazing, exploration and development opportunities for mineral resources, and settings for recreation consistent with goals for watershed health, sustainable ecosystems, biodiversity and viability, and scenic/recreation opportunities.
Subgoal 10b: Use timber harvest where allowed, to contribute to the economy while achieving properly functioning conditions of vegetation and watersheds

Forest Plan Guidelines:

Guideline G5.1-1: Timber harvest, vegetation/fuel treatment, prescribed fire and wildland fire use are allowed to maintain or restore proper functioning conditions, for hazardous fuel reduction, to protect property in the wildland urban interface, and to provide for commodity and non commodity outputs and services.

Figure 3.14.2. Wasatch-Cache National Forest Plan Guidance Pertaining to Economics.

The Code of Federal Regulations (CFR) and the FSH (Forest Service Handbook) provide additional rules for government agencies.

36 CFR 219.27 Section (b) Vegetative Manipulation lists requirements as: (1) Multiple-use; (3) Not chosen for greatest dollar return; (7) Practical transportation, harvest requirements, and preparation and administration.

FSM 2432 and FSH 2409.18 require a financial analysis for timber sales expected to exceed $100,000 in advertised values.

3.14.6 Existing Conditions

Economic and Social analysis for the Wasatch-Cache National Forest was completed during the forest plan revision process. This section briefly summarizes the relevant data from that analysis. Additional information is contained in the plan, pages 3-439-3-466 and files located in the Supervisors Office. Information specific to Uinta County was developed in response to Uinta County concerns raised during the forest plan revision.

■ Setting

Uinta and Summit are adjacent counties and together encompass the most of the north slope of the Uinta Mountains. Approximately 42 percent of the Summit County land base in within the National Forest (WCNF Revised Forest Plan 2003). In contrast, Wasatch-Cache National Forest lands comprise less than 3 percent of Uinta County lands; however, access to the North Slope is primarily through the communities of Evanston and Mountain View. The impact of forest management is therefore very important to citizens of Uinta County.

■ Population

The populations of Summit and Uinta counties are relatively small compared to other counties along the Wasatch Front. Summit County growth rate since 1991 has been much higher than Uinta (75% versus 3%), reflecting the development of "bedroom" communities for people who work in the Salt Lake Valley, and increasing summer home development. The combined two-county population grew from 36,385 people in 1991 to 49,683 people by 2000. Thirty-five percent of the homes in Summit County are second or vacation homes, versus 3 percent in Uinta County.

Ranching, timber, oil and gas and recreation user in Uinta County are very interested in long term planning and project activities on the Wasatch-Cache. Many long-term residents are concerned that possible changes to general multiple-use opportunities will deleteriously affect desirable traditional lifestyles and the local economy. It is a strongly held belief among these people that there are trends towards restriction of ongoing land uses, that this trend has been apparent for the last 20 years, and that the trend is undesirable and threatens their interests.

■ Economy

Approximately two-thirds of the employment in Uinta County is in the government, services, and retail trade sectors.

Per capita personal incomes in 2000 were $40,528 and $22,042 in Summit and Uinta Counties, respectively. That compares to statewide averages of $23,436 (Utah) and

$27,372 (Wyoming). (See WCNF Revised Forest Plan).

■ Forest Resource Industries

The timber industry in northern Utah and southwest Wyoming is not a big contributor to the regional economy, but it has existed for a long time and is integral to local communities and those individuals directly employed within the industry.

Similar to the larger regional trends, the Wasatch-Cache timber sales program has declined in the last 10 years. Table 3.14.1 displays the volume offered and sold since the original forest plan was approved. The primary species in sales are lodgepole pine and spruce, although within the last 5 years, increasing interest in aspen has been seen.

Table 3.14.1. Timber Volume Offered Since 1986. *Sold volume totals that exceed the offered volume reflect sales that received no bid in prior years that subsequently were reoffered and sold in the current year.*

Fiscal Year	Volume Offered		Volume Sold	
	ccf	mbf	ccf	mbf
1986	28,958	13.9	26,875	12.9
1987	24,583	11.8	23,958	11.5
1988	25,833	12.4	25,833	12.4
1989	29,583	14.2	19,166	14.0
1990	17,916	8.6	17,916	8.6
1991	20833	10.0	20,833	10.0
1992	20833	10.0	20,833	10.0
1993	20833	10.0	20,833	10.0
1994	11,458	5.5	9,583	4.6
1995	5,000	2.4	3,750	1.8
1996	13,720	6.6	2,541	1.7
1997	11,250	5.4	15,625	7.5
1998	11,875	5.7	15,833	7.6
1999	6,458	3.1	10,416	5.0
2000	9,791	4.7	9,791	4.7

Since 1994, the forest has sold approximately 67,539 ccf (hundred cubic feet) of timber (33 million board feet). Approximately 21,000 ccf was sold to Louisiana-Pacific mills outside of Uinta County and another 21,000 ccf was sold to Ayres and Baker Pole and Post in Mountain View, Wyoming. The remaining volume went to mills in various locations, including Mountain View, Wyoming, Vernal, and Kamas, Utah, Ovid, Idaho, and Montrose, Colorado.

The forest participates in the Small Business Administration timber program. This program ensures that a certain percentage of the Forest's sale offerings are purchased by small business. If the percentage purchased by small business falls below the threshold, sales will be "set-aside" and offered to small business only. The threshold percentage is recalculated every 5 years, and was recomputed in the fall of 2000. The current small business percentage is 66%.

Three small business mills in Uinta County have interest in timber from the project area. Ayres and Baker in Mountain View manufacture primarily dimensional timbers from lodgepole pine. About 80 percent of their supply is from national forest timber sales, the other 15 percent from private and five percent from state lands. The mill employs about 24 people and operates one eight-hour shift for a volume configuration

in terms of log input of 6,000-16,000 ccf (3-8 mmbf) (Rideout and Hessln, 2000, 2003).

South and Jones Lumber is located outside of Evanston, Wyoming and produces primarily industrial and mine timbers. They operate an eight-hour shift at the mill as well as log their own sales. They have purchased national forest timber in the past; however, in the last 5 years, they have purchased 100 percent of their supply from private lands. They are configured to process about 12,000 ccf (6 mmbf) annually (Rideout and Hessln, 2000).

A more recent arrival in the county is Western Wood Products, located south of Mountain View. This facility processes primarily small diameter timber, manufacturing turned poles and specialty products. They have been, up to this point, primarily subcontracting with purchasers of national forest and private timber to handle the smaller material included in those sales. However, they have indicated an interest in bidding on national forest timber sales directly. They employ 22 people and operate a single shift. The volume configuration in terms of log input is approximately 8000 ccf (Western Wood Products, personal communication).

Several other mills purchase timber from the forest, including Blazzard Lumber in Kamas, UT, Thompson Logging in Frances, UT, Intermountain Resources in Montrose, CO,

The most significant change that has occurred recently is the closure of the Louisiana-Pacific mill in Saratoga, WY. LP had become a major purchaser of Wasatch-Cache sales. The exit of this company from the area may result in a higher percentage of the volume going to local mills.

3.15 Air Quality

Forest Service considerations for air quality usually relate to effects created by burning vegetative materials. Short-term negative effects to air quality can sometimes occur from prescribed burning projects, wildland fire use, or wildfires. For timber harvest projects there can be very minor short-term effects from burning slash piles after timber has been harvested. Usually slash piles are burned in winter when there is little if any risk of burning beyond what is intended.

The 1990 Clean Air Act provides legal direction for air quality. States were given a key role monitoring air quality so that it meets acceptable standards (US EPA, 2004). National Forest lands in the State of Utah are classified as Class II attainment areas through application of the Clean Air Act. Forest Service burning activities associated with burning slash must comply with applicable federal, state and local standards for air quality, especially the standards of State of Utah, Division of Air Quality's Utah Smoke Management Plan. The Forest Service must coordinate slash burning with the state and burn when atmospheric conditions reduce potential risks of air quality degradation.

While the State of Utah does not actively monitor air quality in most places on national forests there is no evidence that air quality in the project area is below standard. In general, air quality in the Rocky Mountains is considerably better than in most other areas of the continental United States (GYA Clean Air Partnership, 1999). The project area is relatively remote and far from most air-polluting population or industrial centers.