CHAPTER III

AFFECTED ENVIRONMENT

CHAPTER III - AFFECTED ENVIRONMENT

A. CHANGES BETWEEN DRAFT AND FINAL

Minor edits were completed throughout this chapter to provide clarification of information previously presented. Clarification was provided, based on public and Agency comments to the July 2003 DEIS, as necessary.

In the Physical Environment Section:

Clarification of objectives, timing and methodology of snow measurements was provided. The sub-section previously entitled "Global Warming" was revised to discuss climate change and the relationship of this situation to snowfall and ski area expansion, based on additional consultation with a local climatologist.

The section on soil processes, erosion and sedimentation was extensively re-written to reflect new modeling using the Water Erosion Prediction Project (WEPP) model, based on additional consultation with a soil scientist familiar with this area and granitic based soils. The historical soil disturbance section and estimated sediment yield rates sections were revised.

The watershed resources sub-section was edited for clarification and accuracy, based on further detailed review by the Forest Hydrologist. The discussion on flow regime was revised and clarified. The discussion on the Aquatic Conservation Strategy (ACS) was revised based on the 2004 Record of Decision for Clarification of Language in the 1994 Record of Decision for the Northwest Forest Plan "Proposal To Amend Wording About The Aquatic Conservation Strategy."

In the cumulative effects analysis for the Draft EIS, the *Cumulative Watershed Effects* (CWE) method was compared with results from the *Equivalent Roaded Area* (ERA) *Methodology*. Based on the DEIS analysis, the two models yielded similar results for the Upper Ashland Creek Watershed Scale analysis area. For the FEIS, only the ERA Methodology is used to assess past, current, and future activities. Since the DEIS, the Ashland Forest Resiliency project has been proposed that would affect areas within the Upper Ashland Watershed and the Upper Neil Creek watershed; this project is included in the cumulative watershed efffects analysis.

In the Biological Environment Section:

The botanical and terrestrial wildlife sub-sections were revised to reflect the 2004 Record of Decision Final Supplemental Environmental Impact Statement *To Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines*. For the Forest Service, the decision to abolish the Survey and Manage (S&M) Standards and Guidelines results in eligible species being managed under the Forest Service Sensitive species program.

Relevant botanical sub-sections were revised to reflect new information, specifically the discovery of whitebark pine and the reported presence of Cascade parsley fern in the Special Use Permit area. A fire risk and hazard section was added to described current conditions associated with SUP and surrounding areas.

In the Human Environment Section:

The status of the Roadless Conservation rule was updated. Data provided by Jackson County was used to update the information regarding the Mt. Ashland Access road (County road 1151). Data from the last two operating seasons was used to update skier use and parking lot capacity information. Skier visitation information was expanded based on public comment. The skiable area information for MASA was clarified. Information regarding snow tubing facilities in the Pacific Northwest supplements previous information.

B. INTRODUCTION

This chapter presents a synopsis of the physical, biological, and human social and economic environment that may be affected by implementation of the Proposed Action or alternatives, including the No-Action Alternative. It presents the current condition within and around the current Special Use Permit (SUP) area boundary.

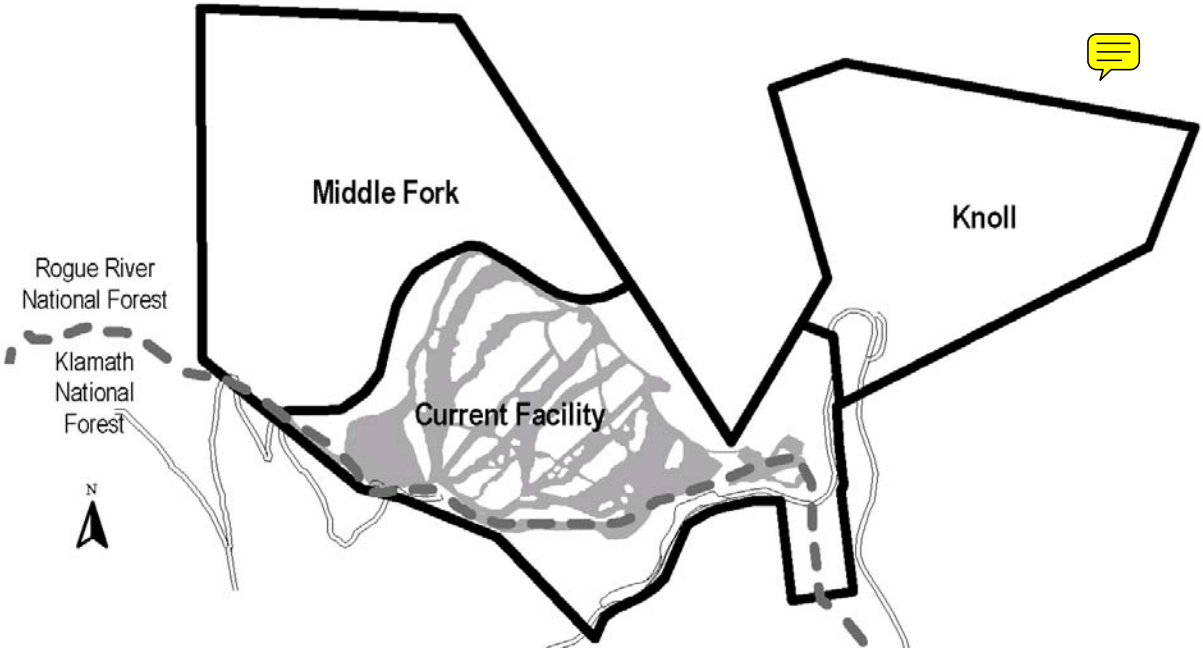
a. Geographic Sub-Areas Within Special Use Permit Area

Within the overall 960-acre SUP area, there are three somewhat distinct sub-areas that logically correspond to geographic locations of potential expansion activities, and are associated with the Alternatives Considered in Detail. In this analysis, reference is made to these three areas in order to provide clarity of geographic reference. These areas are described as follows and are portrayed on Map III-1:

- The **"current facility"**, or the area within the central and southern portion of the (SUP) area where ski area developments currently exist (see Map I-1 and Map II-1); this area is primarily associated with Alternatives 1 (No-Action), and Alternative 5.
- The **"Middle Fork"** area, or the area associated with the northwest portion of the Special Use Permit area and the Middle Fork of the East Fork of Ashland Creek; this area is primarily associated with Alternatives 2, 3 and 6 (which include proposed Chairlift LC-6).
- The **"Knoll"** area, or the area in and around the northeast portion of the Special Use Permit area associated with the geographic feature known as the Knoll; this area is primarily associated with Alternative 4.

The focus of resource descriptions in this Chapter is on the SUP area, and these sub-areas where developmental activities are proposed to occur, i.e., the area where ski lifts, runs and associated facilities would be located.

MAP III-1. Geographic Sub-Areas Within Special Use Permit Area



b. Analysis Areas

"Analysis areas" are also described in this Chapter and in Chapter IV where appropriate to define current conditions or the area of potential effect at the appropriate scale. These scales are not always the same between resource areas and may be a portion of the area, or a larger scale that extends beyond the SUP area; examples include hydrology (Site Scale and Watershed Scale Analysis areas), wildlife (species presence and range, or habitat types), or social-economic areas (where people recreate, viewed landscapes), etc. The affected environment or current condition of the SUP area (i.e., the No-Action Alternative) sets the environmental baseline for comparing the effects of all of the Action Alternatives. Topics are generally presented and discussed in a similar order in Chapters III and IV of this Final EIS, in order to provide a logical format for reference and comparison.

C. PHYSICAL ENVIRONMENT

Located in the Siskiyou Mountain Range, approximately 7 air miles south of the City of Ashland, the Mt. Ashland Ski Area (MASA) occupies the highest peak of the Siskiyou Range in Oregon and California. The current MASA facilities lie primarily on the ridgeline and within the Ashland Creek Watershed, generally facing North and East.

1. Climate

The climate associated with the SUP area and general vicinity is characterized by mild wet winters and hot dry summers. Precipitation ranges from 40 to 60 inches annually. The elevation of the SUP area ranges from an approximate minimum of 5,600 feet, to a maximum of 7,532 feet at the summit of Mt. Ashland.

At these elevations, winter precipitation occurs primarily as snow. The SUP area is located above elevation bands typically affected by "rain-on-snow" events. Rain-on-snow events typically occur at 3,500 to 5,000 feet in elevation, and are characterized by rapid snowmelt triggered by rain (Bear Watershed Analysis)(USDA RRNF FS 1995). Summer thunderstorms are common, often bringing high intensity short-duration rain or hail to localized areas. Maximum precipitation rates can vary from 1 to 2 inches per hour.

a. Snowfall

Snowfall amounts in mountain ranges throughout the world are highly variable from year to year; Mt. Ashland is no exception. Forest Service and MAA personnel have determined annual snow depths within the existing ski area and overall SUP area. Data is based on observations and measurements from three Natural Resource Conservation Service (NRCS) snow courses located within one air mile of the ski area (Ski Bowl Road, Mt. Ashland Switchback, and Caliban II), from MAA records, and from one NRCS SNOTEL (for SNOwpack TELemetry) site located about eight miles west of Mt. Ashland.

NRCS Snow Course Data

Snow courses in Mt. Ashland's immediate vicinity (in existence since the mid 1960s) are measured within the last five days of each month from January through late April. The Ski Bowl Road snow course site is located about one mile southeast of the Base Lodge near Forest Road 2080. The Mt. Ashland Switchback site is located on the north side of the Knoll and is adjacent to the MASA wastewater drainfield. The Caliban II site is located immediately below Upper Rodger's Way ski run.

The snow course system evolved from NRCS's Congressional mandate in the mid-1930s to measure snowpack in the mountains of the West and forecast the water supply. (Manual snow courses have been supplemented with automated SNOTEL sites since the late 1980s.) The major reason for the snow survey program, with its extensive data collection network throughout the West, has always been the forecasts of annual streamflow volume at specific points along a river system. Early season measurements are not useful in predicting streamflow because the snowpack has only begun to develop, typically reaching its maximum water content in March at the three Mt. Ashland sites. The FEIS makes use of available data that was generated for a different purpose than to measure early season snowpack. This data was supplemented in the DEIS with early season data that was available from MAA records.

Table-III-1 shows the **average** snow depth at the end of each month (January through late April), from 1970 to 2002.

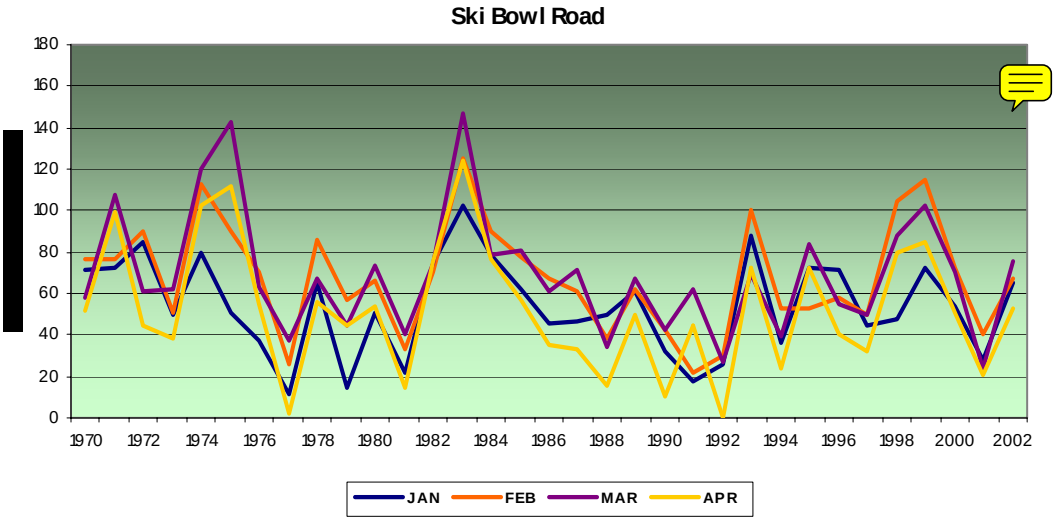
Table III-1. Average Snow Depth 1970-2002

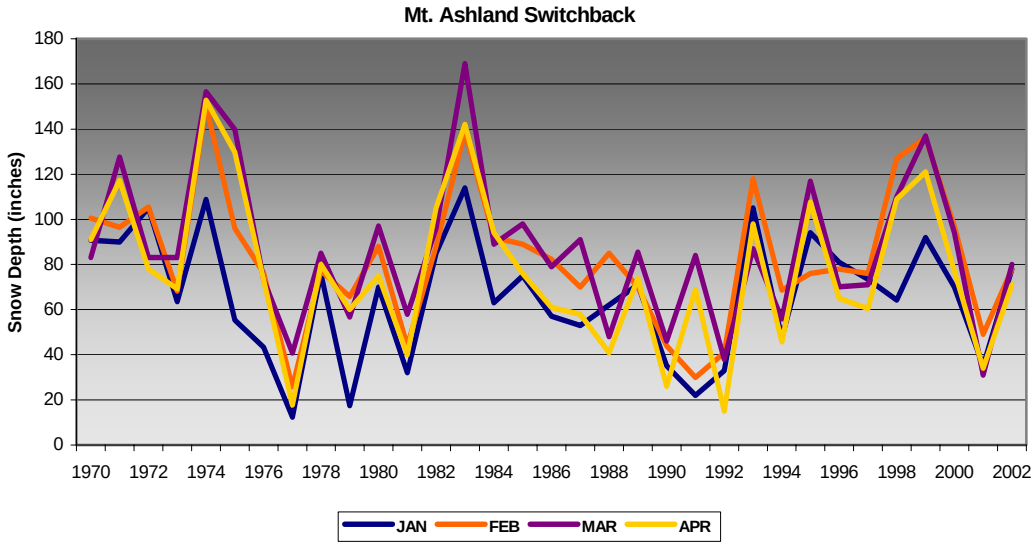
Snow Course	Elevation	January	February	March	April
Ski Bowl Road	6,000	54	68	69	52
Mt. Ashland Switchback	6,500	66	83	87	77
Caliban II	6,500	61	76	80	74

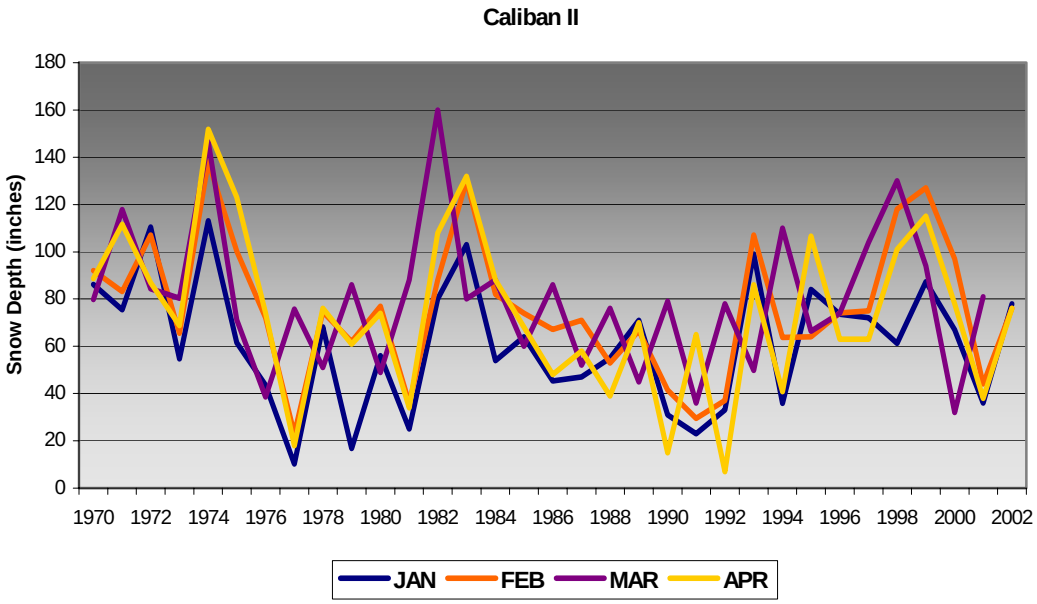
Source: Ashland Ranger District Snow Survey Files *(updated averages as of Nov 2002)*

The following charts (Figure III-1) show the **actual** snowfall (and trends) for these three snow courses during the months of January through April, from 1970-2002. Snow depth is the vertical axis and year is the horizontal axis.

Figure III-1. Actual Snowfall Depths 1970-2002







MASA Snowfall Data

Snowfall data in the Mt. Ashland vicinity prior to late January is available from MAA records. "Base area" snow depths, as reported by MAA in their daily ski report, are taken at a wind-protected site below the Base Lodge, at 6,520 feet. During most low snowfall years, maximum snow depths at MASA range from about 50 to 75 inches. In other years, snow depths have exceeded 200 inches. Cumulative annual snowfall amounts at MASA since the 1983/84 season range from about 160 inches to about 450 inches. The average snowfall for the 19-year period from 1983/84 to 2001/02 is 263 inches (See Table III-2). Since the mid 1990s, MAA has also recorded snow depth near the bottom of the Bowl at 7,150 feet. A cursory review of this site shows an average depth approximately 30 percent greater than the site below the Base Lodge.

Table III-2. Yearly Snowfall Data at MASA - 1983/84 - 2001/2002

SEASON	OPENING DATE	OPENING DEPTH (Inches)	MAX DEPTH (Inches)	DATE of MAX DEPTH	TOTAL SNOWFALL (Average in Inches)
83/84	23-Nov	40	120	10-Apr	324
84/85	16-Nov	48	126	28-Mar	418
85/86	6-Dec	27	95	21-Feb	264
86/87	23-Dec	30	99	24-Mar	204
87/88	8-Dec	38	69	17-Jan	202
88/89	22-Nov	40	80	20-Mar	205
89/90	18-Jan	24	57	18-Feb	164
90/91	20-Dec	24	84	24-Mar	181
91/92	21-Dec	36	48	17-Feb	160
92/93	10-Dec	34	162	24-Feb	369
93/94	10-Dec	38	72	24-Feb	188
94/95	16-Nov	38	167	25-Mar	334
95/96	16-Dec	31	114	2-Apr	205
96/97	11-Dec	51	140	9-Mar	229
97/98	11-Dec	29	193	15-Apr	447
98/99	25-Nov	58	236	10-Mar	419
99/00	5-Dec	20	187	5-Mar	310
00/01	17-Dec	25	78	4-Mar	170
01/02	30-Nov	44	150	20-Mar	285
AVERAGE		35	120		263

Source: Mt. Ashland Association

Reliable cumulative snowfall data from MAA is not available prior to the 1983/84 season. MASA's average opening date since 1963 is December 10. Accumulated depth and new snow depths are measured by the Ski Patrol only when the area is open. The following table (Table III-3) displays snow depths at MASA from 1978 to 2001 on November 30 and December 30. All measurements are from the Main Lodge location.

Table III-3. Snow Depth Measurements at MASA (in inches)

Year	30 Nov	30 Dec	Year	30 Nov	30 Dec
1978	Closed	Closed	1991	Closed	Closed
1979	24	52	1992	Closed	75
1980	Closed	Closed	1993	Closed	38
1981	Closed	Closed	1994	50	58
1982	38	120	1995	Closed	25
1983	48	82	1996	Closed	64
1984	85	86	1997	Closed	35
1985	Closed	31	1998	66	64
1986	Closed	30	1999	Closed	18
1987	Closed	45	2000	Closed	20
1988	47	70	2001	44	74
1989	Closed	Closed	2002	Closed	92
1990	Closed	91	2003	Closed	76

In an effort to determine relative snow depth differences between the Base Lodge site and the proposed base of LC-6, 11 measurements were taken near the Lower Wetland (approximately 5,925 feet in elevation) from December 1997 to April 1999. Snow depths at this location were 86% of the depth recorded at the Base Lodge site. Its expected that snow depths near the base of proposed LC-7 at the Knoll would be nearly identical to those near proposed LC-6. Additional measurements were taken in 2000 and 2001 with similar results (MAA 2001, pers. com. Jeff Hanson). Based on these measurements and conversations with the NRCS, early-season average snow depths at 5,900 feet would be less than one inch on November 1, 25-30 inches on December 1, and 40-45 inches on January 1 (pers. com. Jon Brazier - Forest Hydrologist 1998).

Big Red Mountain SNOTEL Site

An additional source of data is the Big Red Mountain SNOTEL site (6,250 feet in elevation) located about 8 miles west of Mt. Ashland near Wrangle Gap on the Siskiyou Crest. SNOTEL sites measure and transmit snowpack, precipitation, and temperature data on a daily (or more frequent) basis throughout the West. A snow "pillow" serves as a hydraulic weighing platform to measure the snow water content. Actual historical snow depth data is not available from this site.[1] In order to estimate snow depths at this location, Snow Water Equivalent (SWE) is used. SWE is the amount of water contained within the snowpack.

To determine the depth of snow from SWE data the following formula is utilized: [SWE] ÷ [Density] = Snow Depth. Typical early season snow densities in the Cascades and Siskiyous range from 20-30 percent. Table III-4 shows estimated snow depths at Big Red Mountain assuming a 25 percent snow water density.

[1] A snow depth sensor is now installed at Big Red Mountain and began providng snow depth for the 2002/03 water year

Table III-4. Estimated Average Snow Depths - Big Red Mountain SNOTEL Site 1971-2000

Date	October		November		December		January	
	SWE	Est. Depth	SWE	Est. Depth	SWE	Est. Depth	SWE	Est. Depth
1st	0.0	0.0	0.5	2.0	5.3	21.2	11.6	46.4
15th	0.2	0.8	1.7	6.8	8.7	34.8	13.5	54.0

Source: SWE data source is National Water and Climate Center, 2002.

The 54-inch estimated depth on January 15th is identical to the measured average depth on January 30 at the Ski Bowl Road snow survey site listed above.

Based on snow depth recordings and field observations at various locations in the Mt. Ashland vicinity, the greatest snow accumulations occur on the north and northeast facing slopes within the SUP area. This is primarily due to the predominant south to southwest wind pattern associated with storms, and to limited solar exposure. The quality of snow for skiing is generally higher on north and east facing slopes since the densities of snow are generally lower (due to limited solar exposure) than those found on the west and south facing slopes.

b. Climatic Change (Global Warming)

In the 2003 DEIS, the Forest Service position on "global warming" was that it is an issue that cannot be dealt with at the scale of NEPA analysis for ski area expansion at one site. The Forest Service acknowledged and continues to acknowledge that climatic change may be a factor in precipitation (snowfall) predictions, and therefore on long-term economic viability of an expanded ski area. It should also be noted that climatologists describe this issue as "climatic change" and not "global warming". This is because while it is acknowledged that climate is changing, it is not changing everywhere (globally) and it is not necessarily or exclusively "warming". The term "climatic change" is ultized hereinafter within this FEIS.

In response to comments received on the 2003 DEIS and discussed in the Response to Comments document (FEIS Appendix A), the Forest Service contracted the services of Dr. Gregory V. Jones, Associate Professor, Southern Oregon University, Ashland, OR. Dr. Jones was asked to research the references mentioned in public comment and provide the Forest Service with an assessment of the validity and relevancy of the sources and the content comment. His findings are documented in a paper *Understanding Climate Variability and Change in the Pacific Northwest* (March 2004), which is incorporated by reference, and is summarized in this section.

The following (from the abstract of the paper) summarizes the findings:

> *From 1920-2002 six climate stations in the intermountain valleys of southern Oregon and northern California exhibit an average observed warming of 1.83°F and 2.41°F for annual and wintertime periods, respectively. Annual precipitation has increased roughly 15% for these same stations, while winter precipitation has not changed significantly. Snow depths for the Mt. Ashland area have not significantly changed from the late 1960s to the present. Longer-term data from the Big Red Mountain site (located WSW of Mt. Ashland) finds that there have been no significant trends in snow water equivalent for the 1st and 15th of the month (December, January, February, March, and April) snow surveys from the mid-1930s through 2002*

Future climate change projections for the region are found to not adequately represent the varying nature of the landscape of the southern Oregon region, let alone predict complex changes in snow characteristics. The best regional climate model projections show a winter period that is 1.5°C (2.7°F) too warm and 20% too wet and a summer that is roughly 50% too dry and 1.1°C (2.0°F) too warm compared to observations. While climate modeling is a useful tool to better understand the complex Earth/Atmosphere system, it does not at this point provide the tools needed to make prudent policy-oriented decisions at an appropriate scale.

In consultation with Dr. Jones, the Forest Service continues to believe that most of the effects of climatic change on the resource factors are out of scope to the analysis and decision regarding expansion of the Mt. Ashland Ski Area. This is because while climatic change may or may not actually be occurring, these effects are related to global issues, and not related to the MASA ski area.

Scientific research indicates that while clamatic change may affect the amount of snowfall in the future, that situation cannot be accurately predicted. Annual snowfall amounts are highly variable and will remain highly variable in the future. A ski area cannot control the snowfall in any given year, ski area management can however, adjust operations to account for the available snowfall over many years. The degree that climatic change would change the snowfall situation at Mt. Ashland is likely to be unnoticeable in the current range of snowfall variability. Relevant consequences regarding snowfall and variability of snowfall arediscussed in Chapter IV, Section C, 1, b, and Section E, 13.

2. Avalanche and Natural Hazards

Snow avalanche hazards exist throughout the winter at many ski areas in the western United States and Canada. Relative to other ski areas in the Far West, such as Alpine Meadows (CA), Mt. Hood Meadows (OR), and Crystal Mountain (WA), avalanche occurrence and size are much less at MASA (Johnson 2002, and Heywood 1992). Nevertheless, the hazard is real and needs to be addressed through proper analysis and planning. No injuries or fatalities have occurred as a result of avalanches within the MASA and none are known to have occurred within the Siskiyou Mountains.

About 90 percent of all avalanches begin on slopes of approximately 30 to 45 degrees/58 to 100 percent. About 98 percent of all avalanches occur on slopes of 25 to 50 degrees/47 to 120 percent (Colorado Avalanche Information Center website). The highest frequency rate is at 40 degrees/82 percent (McClung 1993). It is this range of slope angles that produces the most critical balance between stress and strength within the snowpack. Due to gravity effects, steeper slopes (>50-55 degrees/120 to 144 percent) tend to continually sluff[2], while more gentle slopes (< 25 degrees/47 percent) solidify and strengthen. In the maritime climate of the Cascade and Siskiyou Mountain ranges, avalanche hazard conditions generally exist just before, during or after storms when weather conditions change rapidly. Rain on snow events also contribute to avalanche events (Heywood 1988).

[2] Small, usually harmless avalanches or snow movement less than 150 feet on steep slopes that contribute to progressive stabilization of the snowpack.

Most avalanche slide paths within the eastern Siskiyou Mountains do not exceed 700 to 800 feet in length and generally occur above the 6,000 foot elevation band at three geographic vicinities: Red Buttes, Dutchman Peak, and Mt. Ashland. The latter area extends from Mt. Ashland westward along the Siskiyou Crest to McDonald Peak. Prevailing storm winds from the southwest deposit large amounts of snow on the Crest's north facing slopes. These winds form large cornices (an overhanging snow formation) and "snow pillows" (a concentrated snow deposition area) which contribute to avalanche occurrence by increasing stress in the snowpack. Overhanging cornices may suddenly break off and instantaneously add weight to the snowpack, thereby causing an avalanche. Similarly, but more slowly, the increased weight caused by "snow pillow" formation also stresses the snowpack and increases the chance of an avalanche.

Most avalanche activity within the Current Facility area is confined to the "Bowl" ski run and "2nd Bowl," the latter in the area of proposed Run 15. The "2nd Bowl" area overlaps the existing ski area and the Middle Fork area (see Map II-2 in Chapter II). Very small avalanche hazard zones also occur at Upper Tempest and Balcony ski runs.

Within the Middle Fork area, avalanche hazards exist along the north face of the "West Ridge" in the vicinity of proposed Run 15. Small hazard pockets exist at isolated locations in the headwaters area of the East Fork of Ashland Creek. No avalanche terrain occurs in the Knoll area within the SUP area boundary. Small pockets of avalanche terrain may exist in some of the headwater areas of Neil Creek in meadows, and clear cuts south of the Knoll area and outside of any proposed ski expansion development. Avalanche hazard zones within the SUP are displayed on Map III-2.

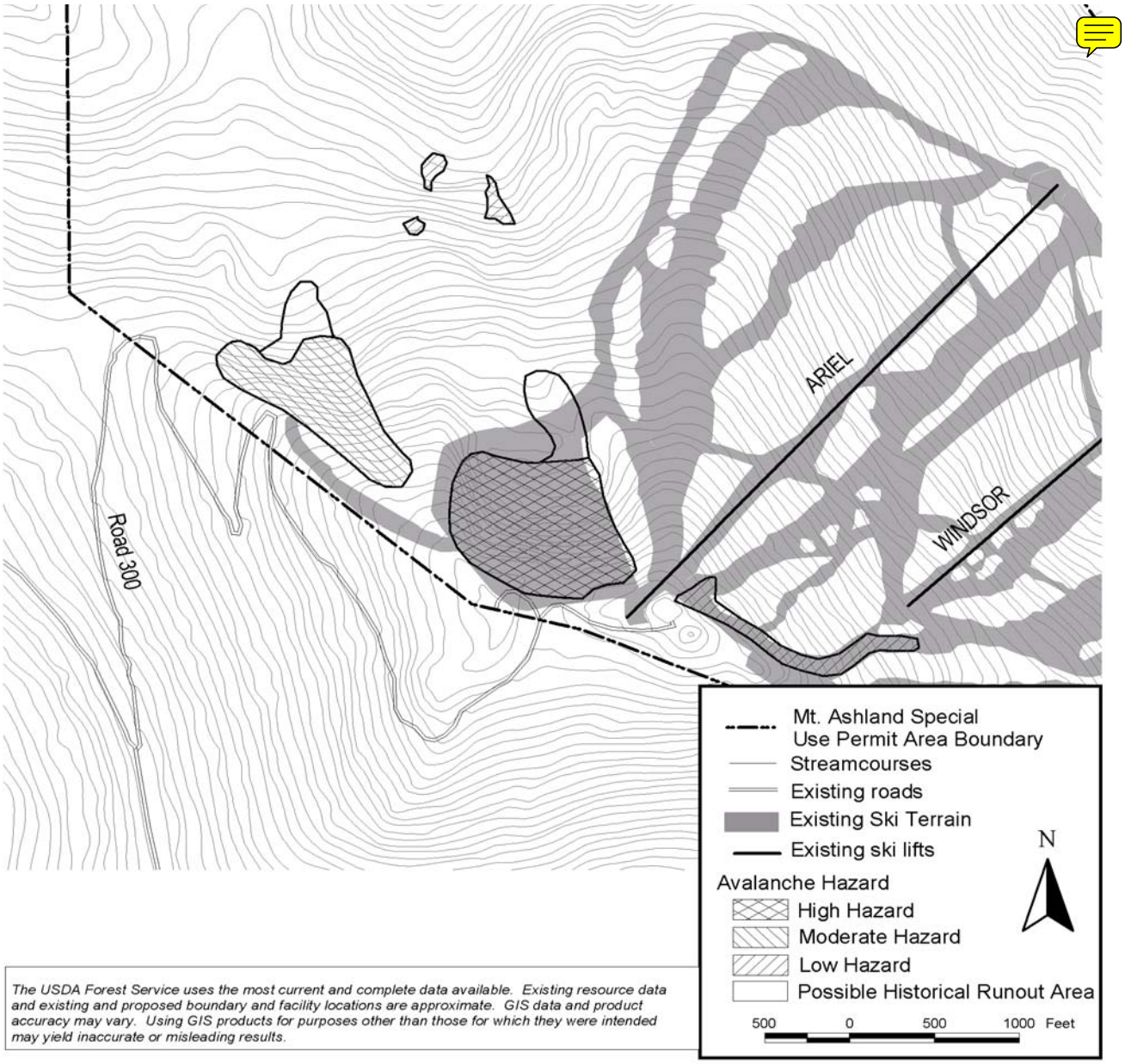
For this analysis, hazard ratings are broken down into three classifications and are based on natural avalanches occurring without control work by avalanche professionals.

- **Low** hazard refers to generally stable snow that requires minimum control work. Natural avalanches are very *unlikely* and if they do occur, are less than 100 feet in length. These slides might more accurately be termed "sluffs", which are usually but not always harmless.

- **Moderate** hazard refers to areas of potentially unstable snow where more control work is needed than in low hazard areas. Without control work, natural avalanches are *possible* on steep (> 30 degrees/58 percent) open slopes and gullies, and in areas with cornice formation.

- **High** hazard refers to unstable snow where natural avalanches are *expected* to occur. Control work almost always takes place after every storm or wind event.

MAP III-2. Avalanche Hazard Zones



Avalanches cannot be predicted with certainty. Consequently, the Mt. Ashland Ski Patrol checks avalanche hazards on a daily basis through a variety of methods. Weather data and forecasting can help establish avalanche danger. Ski testing of slope conditions is used when conditions allow. Explosives are also used independently or in conjunction with ski testing. Avalanche checking and control is accomplished prior to allowing public or employee access to potential hazard areas. Ski runs are closed when avalanche control work is in progress.

"Protective skiing" is another technique used by the Patrol. This method consists of encouraging the skiing public to ski potential slide paths while the snow is falling, prior to dangerous accumulation. This practice tends to stabilize the slope by compaction and minimizes chance of a large avalanche at a later date (McClung 1993), and is commonly used at ski areas with avalanche terrain. This technique is only used at MASA after the Patrol has thoroughly evaluated the slope

Natural hazards also exist within the current ski area facility, the Middle Fork area, and the Knoll area: open streams, bare slopes, poor snow conditions, cliffs, tree wells, hidden objects beneath the snow, and severe wind, whiteout, and cold conditions during some storms. These hazards are managed through signing, pamphlets, trail and lift closures, and snow grooming. During extreme weather conditions, the ski area does not operate.

3. Geology

a. Topography

Slopes within the SUP area range from about 5 percent, to over 100 percent in "The Bowl" area. Some of the dry meadow areas have slopes of 10 percent or less. A majority of the slopes within the areas proposed for ski run development range from about 10-50 percent. However, slopes up to 65% occur in small, isolated portions of the area. Map II-2 in Chapter II shows topography and elevation in relation to the current ski area and existing developments. Maps II-3 through II-7 in Chapter II, show topography in relation to proposed ski area developments.

b. Landform/Stability

The Mt. Ashland SUP area is located within the Klamath Mountains Physiographic Province. The Mt. Ashland area is called the "Ashland Pluton", a large granitic, intrusive body. Approximately two-thirds of the Ashland Pluton is located in Oregon and Mt. Ashland is its major exposure. Mt. Ashland is 7,532 feet in elevation and is the highest peak in the Oregon Klamath Mountains.

The Mt. Ashland portion of the Klamath Mountains Province is characterized by highly dissected terrain with rocky ridges, separated by incised channels, steep small creeks, and alder glades. The dominant rock types located in the SUP area are granodiorite, quartz diorite, and quartz monzonite. Resistant outcrops of granitic rocks are often exposed at the surface, as seen on the upper slopes of the mountain. Elsewhere, many of the numerous rock outcrops are decomposing and tend to weather rather easily.

Millions of years ago, the Ashland Pluton formed well beneath the earth's surface, but subsequent erosion has removed hundreds of meters of material in the Klamath Mountains Province. During an interval toward the end of the Jurassic period, Mt. Ashland was folded and faulted. The Klamath Mountains were also uplifted thousands of feet and continued to build mountain peaks over millions of years.

Small glaciers formed in the Oregon Klamaths during the Ice Ages, however this range of mountains didn't have the extensive glacial system of the California portion of the Klamaths or Cascades Range. Glacial features, such as cirques and large moraines, are found on the upper portions of the slopes of Mt. Ashland. There is a steep walled cirque and moraine located west of the Dream Ski Run (in and below "The Bowl"). Evidence for glacial features farther to the west is apparent with two other cirques, many small remnants of moraines, and two U-shaped valleys northwest of the Bowl. Glacial deposits above elevations of approximately 5,800 feet are found scattered throughout the basin below the Bowl and also in the basin located immediately to the west (2nd Bowl).

The majority of naturally occurring active debris landslides are located along or above the East Fork of the East Fork of Ashland Creek, and/or above some of the wetlands. Field investigations completed in and below the Middle Fork area by a Forest Service geologist during 1998 and 2001, did not locate any new/active debris landslides.

The only active landslides mapped are outside of the SUP area. A total of eight active landslides were mapped in 1989, as part of the 1991 FEIS for the Master Plan. Three of the eight active landslides were located below the Middle Fork area, below 5,400 feet in elevation. The other five active debris landslides are located along the East Fork of the East Fork of Ashland Creek, which is also outside of the SUP boundary. Additional older landslides (occurring more than 100 years ago) and surface erosion features were located and mapped in 1998.

A more detailed mapping, investigation, and landslide-monitoring effort was conducted during 1998 and 2001. The slope stability and soil erosion features were mapped accurately during 1989; however, some of the sizes and shapes of the features were slightly adjusted to more accurately portray observed field dimensions during the 1998 and 2001 surveys. Site-specific investigations were done in 1998 and 2001, which included revised measurements of landslide widths, lengths, depth of scarps, and soil types

c. Landslide Hazard Zonation

Landslide Hazard Zonation (LHZ) is a technique used by Forest Service Geologists to assess slope stability of the terrain of the SUP area (see Appendix E, and Table III-1, page III-2 of the 1991 FEIS for descriptions of each hazard zone). Landslides were mapped using a process entitled and documented as *Landslide Mapping on the Rogue River National Forest* (Hicks and Sitton 1998), in "Environmental, Groundwater and Engineering Geology: Applications from Oregon." This paper includes descriptions and definitions of activity levels, landslide hazard levels and risks evaluation discussed herein.

With the latest mapping efforts associated with the 2003- 2004 EIS process, Hazard Zones include more specific parameters with which to characterize the SUP area. These more site specific parameters and changes to the 1991 FEIS Table III-1 are described in Table III-5.

Table III-5. Revised Geologic Landslide Hazard Zones

Hazard Zone	Description of Zone
1	This is the highest risk terrain which included steep slopes (70% and higher), active landslides, and over-steepened creek banks. This zone is classified as unstable and potentially unstable terrain and is designated as Riparian Reserve under the NWFP.
2	This zone is the second highest risk terrain. It is land characterized as terrain with slopes from approximately 50-69%, and is typically located upslope from Zone 1. This zone is *not* designated as Riparian Reserve under the NWFP.
3	This zone usually contains slopes from 25-49%, is relatively dry, has rocky soils, and with only a few dormant slides. It is usually relatively stable terrain.
4	This is the most stable terrain. It is characterized as rocky ridges with smooth relatively flat slopes, which usually range from 0 - 24%.

Slope ranges reflected in the above table are not always utilized and are not used solely to classify the Hazard Zones. In some cases slopes over 70% may be stable. An example is the Bowl, where slopes are steeper than 70%, but are rocky and stable. Also, some slopes under 70% may be classified as Hazard Zone 1 based on other indicators/parameters.

The analysis in the Middle Fork area was not based on mapping and computer modeling from the existing ski area. The landslide features for the Middle Fork of the East Fork of Ashland Creek were mapped separately from the existing ski area. Field mapping was completed with site-specific detail and hazards were assigned for that area based on the particular soils, geology, and geomorphology that exist for the Middle Fork basin.

A total of 63 computer modeling scenarios, each with 500 iterations, were selected and analyzed for ski expansion areas that proposed crossing wetlands and possible high landslide hazard zones identified with the 1991 LHZ (Landslide Hazard Zonation) map (1991 FEIS Appendix E). Slope stability parameters were modeled to simulate potential landslide movements under both natural and ski area expansion modification. A wide range of slope gradients, groundwater and soil depths, soil cohesion, and root strengths were used to determine if conditions would be changed enough to cause future landslides.

As a result of the monitoring, modeling, investigations, and more detailed mapping, the LHZ map was revised to reflect these findings. This was determined to be a more appropriate and accurate method of slope stability assessment and was used instead of the method utilized in the 1991 FEIS.[3] The Revised LHZ Map (Map III-3) reflects updates since the 1991 FEIS Hazard Zonation Mapping. Map III-3 better reflects the site-specific mapping and analysis conducted for proposed activities for each alternative considered in detail. This new LHZ map is more accurate and should be utilized instead of the older, original 1991 FEIS LHZ Map. The 1991 LHZ mapping was completed at less intensive detail, primarily using aerial photos, which was considered acceptable for program level planning. As directed by the 1991 ROD/FEIS, for current analysis (2004), site-specific modeling and investigations were conducted for the proposed activity locations, and in many cases, terrain was determined to be more stable than originally interpreted during the 1991 FEIS planning level effort. Therefore, many Hazard Zone 1 areas now begin at lower elevations than shown on the 1991 FEIS LHZ map (pers. com. Sitton 2002).

High landslide risk percentages (90%, 70% and 40%) reflected on Table IV-4 (page IV-5) of the 1991 FEIS for developed conditions were shown to be too high when compared to site-specific modeling. Values for landslide potential from the 1991 FEIS should not be utilized for Hazard Zones 1, 2 and 3 in the areas currently proposed for ski expansion. Table III-6 below is currently being used for predicting landslide and sediment delivery potential.

[3] The 1991 FEIS (page II-17) recommended that each high hazard site have geophysical surveys, exploratory drilling, and have piezometers installed in drill holes to determine groundwater changes. Since the current technology of utilizing computer modeling that includes saturated conditions at the surface and "worst case" scenarios for slope stability, it has been determined to be unnecessary to drill and install piezometers.

Factors considered in sediment delivery from potential landslides are the distance to the streams and to Reeder Reservoir. For example, if the distance to the stream is 300 feet or more, the percentage for the potential of material being transported to that stream is much less than a slide located only 50 feet away. Slope gradient also affects the distance debris landslides transport sediment down slope. A debris landslide would likely not travel far within the SUP area, since most slope gradient ranges from 10-50%, especially where the proposed ski runs are located. Flat areas and "benchy" terrain are common which would also catch much of the slide deposits and keep the material from entering a stream. Generally, the most stable areas are found on the ridges where most ski runs, lifts, and buildings have been proposed. This terrain is equivalent to landslide Hazard Zones 3 and 4 and has much lower risk of landslide activation than Zones 1 and 2.

Landslide Hazard Zonation is comprehensively mapped for this analysis at the Site Scale Analysis Area. The basis for this analysis area is discussed in this chapter in Section B, 8, a. Hazard Zones for the Site Scale Analysis Area are portrayed on Map III-3. The following table (Table II-6) describes inherent landslide risks and sediment delivery potential, and displays the acreage within each zone, for the Site Scale Analysis Area.

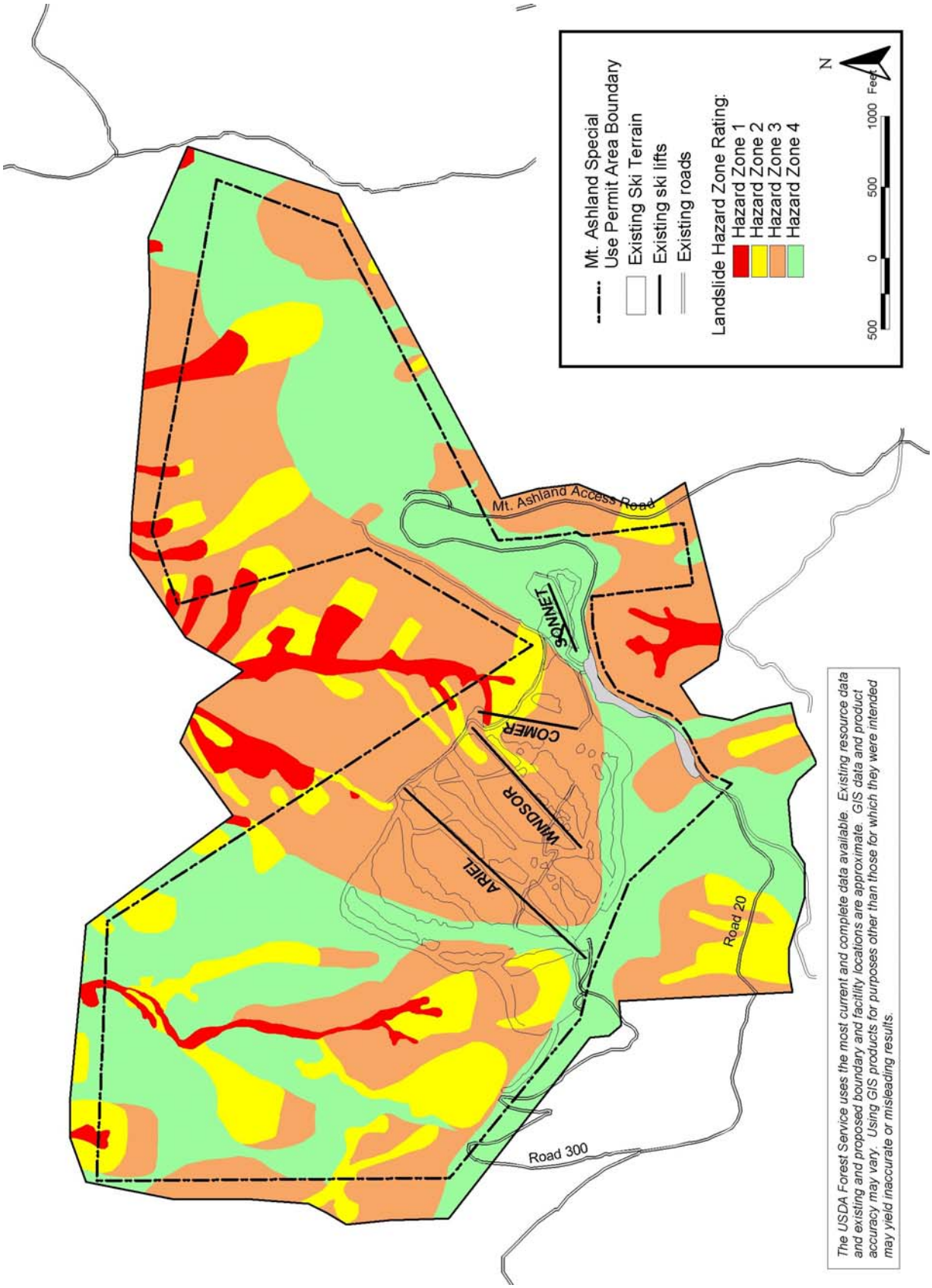
Table III-6. Revised Geologic Slope Stability Hazard Ratings and Acres

Hazard Zone	Natural Risk for Landslides	Sediment Delivery Potential	Acres within Site Scale Analysis Area
1	High	High	79.1
2	Moderate to High	High	213.4
3	Low	Moderate to Low	649.1
4	Lowest	Low	527.3

Following the January 1997 flood event, the Landslide Hazard Zonation mapping was reassessed at lower elevations of the Ashland Creek Watershed, in conjunction with the Ashland Watershed Protection Project. This allowed the Forest Service geologist to compare the initial Hazard Zonation map to where the 1997 landslides and severely eroded areas had actually occurred. A majority of the 1997 failures and erosion proved the prior LHZ mapping to be a confident prediction of where the high-risk terrain was located. Most new landslides occurred in the highest hazard zone (Zone 1), but some also occurred in the lower portions of the second highest hazard zone (Zone 2) (USDA FS 2001c). No new landslides were initiated within the Study Area following the 1997 flood.

In 2001, in response to public comments, a wider range of options for ski area expansion to be considered in detail was developed. The Middle Fork area, the Knoll area, and the Current Facility area were more extensively mapped during the fall of 2001. During this mapping effort, no additional active landslides were located in the areas associated with the Middle Fork or the Current Facility. However, surface erosion and sapping failures were mapped in the northwestern portion of the Knoll area above and below the Bull Gap Trail, and in the Current Facility. These are shown on Map II-3, which shows these more recently mapped sapping failures and surface erosion areas, now included within the highest zone (LHZ 1).

MAP III-3. Revised Landslide Hazard Zonation



Potential landslide terrain was mapped at elevations ranging from 6,900 to 6,980 feet in the Middle Fork of the East Fork of Ashland Creek. Terrain associated with moderately steep wetlands was mapped as Hazard Zone 1. The gentle, wetland terrain below this area was also mapped as Hazard Zone 1, since a debris flow landslide that occured on these steeper slopes would likely track through this terrain and may continue down beyond these more gentle alder glades.

Surface erosion and sapping failures were also mapped in the northwestern portion of the Knoll area above and below the Bull Gap Trail, and in the Current Facility. These are also shown on Map II-3, which shows these more recently mapped sapping failures and surface erosion areas, concurrent with proposed watershed restoration activities. The areas are now included within the second highest hazard zone (LHZ 2).

In a study documented in *Oregon Geology*, March/April of 2000, data from four recent large storms indicate that debris flow landslides will occur in Western Oregon where eight inches of rain has fallen since the end of September and the 24-hour rainfall exceeds 40 percent of mean December rainfall. However, the results of this study also depend on the local geology, amount of snow covering the ground, and the elevations of rapid snow melt. Since the large majority of the SUP area is located in relatively stable glaciated granitic terrain and is usually protected by thick blankets of snow, the likelihood of debris flow landslide initiation from rain-on-snow events at these elevations is considered low. In lower elevations below approximately 5,000 feet where active and potentially active landslides exist, the risk for landslides inducted by this phenomenon are considered moderate to high.

4. Minerals and Seismic Conditions

The SUP area has no known occurrences of locatable-type minerals and no known history of past mining or valid claims. The closest known mining took place in the lower sections of the East Fork of Ashland Creek watershed at 3-4,000 feet elevation (circa 1900 to the 1930s). This activity was limited to some small-scale placer and hard rock mining for gold.

New mining claims cannot be filed within the SUP area. The 1996 Omnibus Public Lands and Water Bill (Public Law No. 104-333, Title VII Section 701) states that “subject to valid existing rights…ski area[s] are hereby and henceforth automatically withdrawn from all forms of appropriation under the mining laws…” for the life of the permit. The Special Use Permit issued to the City of Ashland expires in 2017.

There are no known active seismic faults in the immediate vicinity (within 30 miles) of Mt. Ashland or the Rogue Valley. However, there are numerous ancient faults in the region as a result of the complex tectonic geologic history of the area. Recent geologic studies indicate that the Pacific Northwest is periodically impacted by large magnitude (8+) earthquakes generated off the West Coast. These large, continuous fault zones parallel the coastline, approximately 50 miles off shore. They are the result of the eastward movement of the oceanic crustal plate being forced under the continental crustal plate. The result of this subduction is periodic high intensity, long duration ground shaking earthquake events that occur approximately every 350-500 years. Such events would greatly affect widespread areas of the West Coast. The last great event is now thought to have occurred about 300 years ago. Shallow crustal earthquake producing faults are concentrated in the Basin and Range terrain east of the Oregon Cascades. These faults tend to generate lower intensity ground shaking (magnitude 5 to 6), such as occurred during the September 20, 1993, Klamath Falls earthquake.

5. Soil Processes: Erosion and Sedimentation

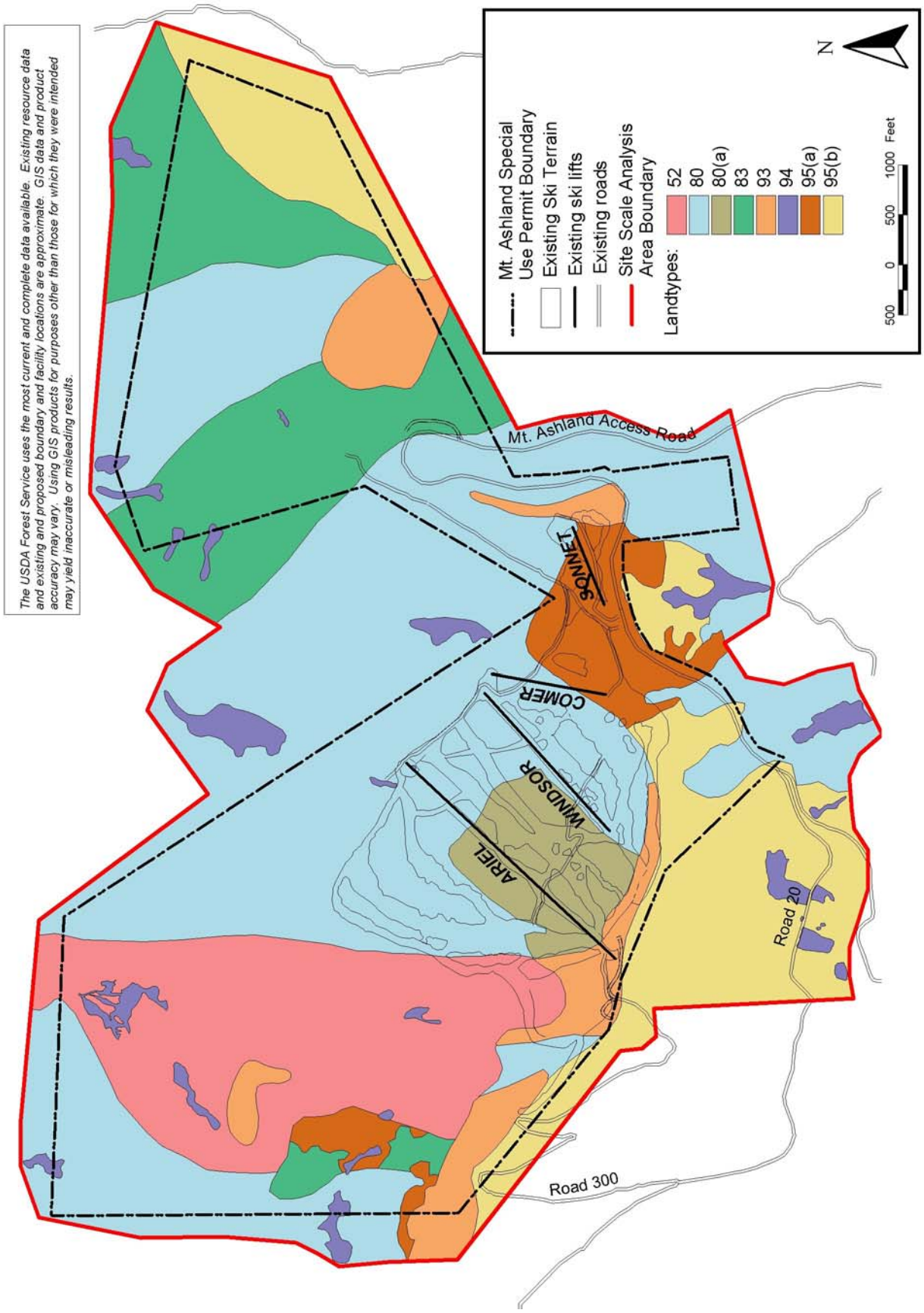
In the SUP area, soils occur on eight landtype units. These units correspond to mapping done for the *Soil Resource Inventory for the Rogue River National Forest* (Badura and Jahn 1977) but at a more detailed scale based on recent (2002) site-specific field surveys. Landtypes are mapping units of a land classification system used in mountainous terrain. They are a product of the interaction between soils, geology, landforms, vegetation and climate. For this analysis, soils are discussed in relationship to the landtypes where they occur (Table III-7).

Revised soil landtypes are comprehensively mapped for this analysis at the Site Scale Analysis Area. The basis for this analysis area is discussed in this Chapter in Section C, 8, a. These revised landtypes are portrayed on Map III-4. Table III-7 describes inherent physical properties, and displays the acreage within each landtype, for the Site Scale Analysis Area.

Table III-7. Revised Soil Landtype Descriptions

Landtype	Slope Range	Landform	Typical Vegetation	Soil Texture	% Rock Content	Thickness of Surface	Depth to Substratum	Acres within Site Scale Analysis Area
52	15 – 45%	Glacial deposition	Shasta red fir	Sandy loam	35 – 65%	6 - 12”	6 – 12’+	180.1
80	45 – 80%	Smooth, slightly dissected	Shasta red fir	Sandy loam	30 – 50%	3 - 6”	2 – 4’	661.7
80(a)	45 – 80%	Smooth, straight	Shasta red fir	Sandy loam	>50%	3 - 6”	2 – 4’	47.3
83	30 – 55%	Smooth, slightly dissected	Grasses/forbs & scattered trees	Sandy loam	<25%	5 – 10”	2 – 4’	192.1
93	45 – 100%+	Ridges & cirque scarps	Scattered vegetation	Sandy loam	>90%	NA	0 – 1’	80.6
94	10 – 45%	Seeps & springs	Wetland species	Sandy loam	NA	NA	NA	40.8
95(a)	10 – 50%	Glacial trough bottoms, broad ridges	Grasses/forbs & scattered trees	Sandy loam	<25%	0 – 6”	2 – 4’	59.4
95(b)	10 – 50%	Ridges, south slopes	Shrubs, grass, forbs	Sandy loam	>25%	0 – 6”	2 – 4’	206.6

MAP III-4. Revised Soil Landtypes



Soils are derived from the decomposition and weathering of granodorite, quartz diorite and quartz monzonite granitic parent material. Soil textures are generally sandy loams with coarse rock fragment content (gravels, cobbles and stone) ranging from less than 25% on Landtype 83 and 95(a) to over 50 percent on Landtype 80(a). Soils are very low in very fine sands, silts and clays (Table III-8). Soil depths vary from less than one foot on ridges and cirque scarps (Landtype 93), 2 to 4 feet on landtypes forming from colluvial parent material (Landtypes 80 and 83), to over 10 feet on glacial deposits (Landtype 52).

Table III-8. Particle Size Distribution of Soils of Three Landtypes

		Landtypes		
		95(a)	**80**	**52**
	Particle Size	**% Of Soil Fraction**		
Rock Fragments	>2mm	23	33	49
Coarse Sands	0.5 – 2mm	37	33	22
Medium and Fine Sands	0.1-0.5mm	28	27	21
Very fine sands, silts, clays	<0.1mm	12	7	8

Duff and litter layer thickness and extent vary by vegetation and disturbance history. Under forested canopy, duff layers typically range from 1 to 2.5 inches deep and cover between 95 to 100 percent of the soil (less than 5 percent bare soil). Bare soil is exposed in forested areas where gophers are present and the extent of bare soil can be as high as 20 percent. In openings occupied by grasses and forbs (Landtype 95a), duff layers are not present and litter cover from grasses is generally very thin, if present at all. The amount of bare soil of this landtype ranges from 20 to 90 percent. Under shrub cover of manzanita and ceanothus, litter layers are thin but soil cover is generally greater than 75 percent. Site Scale Analysis Area sites occupied by shrub cover are areas where previous disturbances occurred either from historical fires, or ski run clearing and scalping.

Undisturbed topsoils are thin, ranging from 3 to 6 inches in openings and steep upper slopes to 6 to 12 inches under forest canopy on lower, more moderate slopes. Sub-soils are very low in soil organic matter, nitrogen, potassium, calcium, and magnesium levels. Sub-soils also have weak soil structure and low water holding capacity. Soil depths range from a foot or less on ridges, to greater than 12 feet in basins.

a. Soil Erosion Potential

Soils derived from granitic rock tend to have a higher potential for erosion than soils derived from most other parent materials. The potential for soil erosion varies by landtype and is a function of slope gradient, length of slope, precipitation amounts and intensities, soil cover, rock content, vegetative community and inherent erodibility of the soil.

In the SUP area, there are examples of historically high rates of surface erosion (rill and gully erosion on Landtypes 95(a). These features have occurred on this landtype because of the high inherent erodibility of the soils (high sands, low rock, lack of soil structure), the long moderately steep slopes and high amount of exposed surface soil. Landtype 95(a) is a grass-dominated landtype, which inherently has a much greater potential for surface erosion than landtypes dominated by shrubs or trees (Elliot et al. 2000).

Soils of Landtype 95(a) tend to be low in rock fragments (generally less than 25 percent) and are strongly influenced by populations of pocket gophers. Gophers continually expose new soil to the surface every year and denude the site of vegetative soil cover, creating conditions for increased surface erosion.

Proposed ski area expansion also includes soils with relatively lower erosion potential (Landtypes 52, 80 and 80(a)). These soils have greater quantities of rock fragments in the surface soil. In Landtype 80(a) surface rock content can be as high as 50 percent. Rock fragments act to reduce soil erosion in several ways. Where the gravels and cobbles are exposed, they form a cover over the soil surface, protecting the finer textured soil from rainfall impact, sheet and rill erosion. As surface rock content increases to greater than 20 percent cover, surface erosion decreases proportionately (Sumner 1999). With more rock fragments, there is more soil cover and less soil fraction to erode. On landtypes with gentle slopes, moderate rock fragment content, and supporting a forested plant community (Landtype 52), there is a slight to moderate potential for soil erosion.

Disturbances associated with ski area expansion activities can increase the rate of soil erosion when soil cover is removed; topsoil is disturbed or removed; or slopes are steepened. Conversely if soil cover is increased, topsoil is conserved and if conservation techniques are applied through ski area management activities, there is the potential to decrease, or mitigate erosion potential created by human disturbance.

b. Soil Erosion Under Disturbed and Undisturbed Conditions

Undisturbed Erosion Rates

Soil erosion on granitic soils under undisturbed forest or shrub canopy are relatively low where soil cover is high. Clayton and Megahan (1997) found when soil cover was greater than 75 percent on undisturbed sites; the rate of erosion was 0.02 cubic yards per acre per year. The *Water Erosion Prediction Project* (WEPP) soil erosion model (*Disturbed WEPP*) computer simulations (see FEIS Appendix H) predict similarly low rates for undisturbed forest and shrub sites.

Erosion rates increase in meadows (Landtype 95(a)) due to the increase in bare soil, lack of trees and shrubs, and a history of overgrazing in some areas. Most meadows (Landtype 95(a)) are inhabited by pocket gophers, which during a typical year, bring up and deposit large quantities of soil. Laycock (1975) found that on high elevation grasslands**,** pocket gophers covered 11 percent of the soil surface each year with fresh mounds. Since not all pocket gopher mounds revegetate in a year, the accumulated soil exposure over time can be quite high. This appears to be the case in many openings along the Siskiyou Crest (Laurent 1994). In most extreme cases, for example the headwaters of McDonald Basin, bare soil exposure is strongly related to gopher activity and foraging. Native grass and shrub seedlings planted on the upper slopes of McDonald Basin (a mile to the west of Mt Ashland and similar to soils in Landtype 95(a)) as part of a restoration project in the late 1990s were found to establish and grow well in the first years after planting, but over time the seedlings were substantially reduced due to foraging by pocket gophers (documents on file at Ashland RD). The lack of vegetation and the high percent of bare soil in upper McDonald Basin have resulted in extensive rill and gully erosion that is still active today. Somewhat similar, but not as extensive, processes are apparent in the meadow openings in the SUP area where bare soil can be as high as 50 percent during certain parts of the year.

Wildfires
Intense wildfires that begin or spread into openings with high concentrations of slash, such as clear cuts or cleared ski runs have a much higher propensity for increased soil erosion rates. Megahan and Molitor (1975) monitored heavily slashed clear-cut sites on granitic soils in Idaho before and after an intense wildfire and found that surface erosion rates increased 20 fold over natural rates of erosion. In an adjacent un-logged area that underwent the same wildfire, they found that while some surface erosion occurred within the small watershed, no eroded material moved far enough to be deposited in the drainage. They attributed the difference to 1) the higher fuel levels in the clearcut site creating a higher intensity burn and associated soil water repellency, and 2) the lack of canopy cover which would drop post-fire needles that would cover and protect the soil from surface erosion.

These findings have direct implications to analysis of ski area expansion since the newly created ski runs would be openings with relatively high fuel loads. While the objective of leaving high amounts of slash on sites that would be exposed would be for soil protection, an intense wildfire would consume much of this material and create the potential for soil erosion. The northerly aspects, cooler temperatures, high moisture held in large wood and lack of aerial woody vegetation would, however, make large scale wildfires unlikely. Over time, needle-fall from adjacent forests after a wildfire would cover soils on the edges of ski runs and shrub establishment would increase soil cover thereby reducing erosion rates.

Handpile Prescribed Burns
Hand pile burning methods (being proposed) could create intense heat for long durations that would consume organic matter in the topsoil and create bare soil. Burned soils have a higher inherent erodibility because of fire induced soil water repellency and the loss of soil structure and the binding strength of roots. This is offset by the fact that these burns occur on the landscape as small, discrete disturbances, which greatly reduce the possibility that soil would move more than the diameter of the pile downslope. The area of soil exposure for each pile is generally less than 100 square feet, with burn piles averaging between 6 to 8 feet diameter.

Helicopter Yarding
Helicopter yarding can expose up to 5 percent of the soil surface (Swanson 1982) depending on the amount and size of logs removed from a site. The disturbance is caused by the butt of the log being dragged across the soil as the log is suspended from the cable. The larger diameter trees create more disturbance than the smaller diameter trees and higher number of trees per acre has greater potential for disturbance. The soil disturbance created by the lifting of each tree is shallow and discontinuous. Swanson (1982) found that 3 percent of the soil was deeply disturbed and 2 percent slightly disturbed with helicopter yarding.

Overstory Canopy Removal
Removal of the overstory canopy as would occur during ski run construction exposes duff and litter layers to direct sunlight and increases the potential for higher rates of decomposition. The rate of decomposition is dependent on heat and moisture. Sites with higher heat loading and greater moisture results in higher decomposition rates. Removal of forest canopy would expose the duff to more heat through direct solar radiation, but due to the low sun angle, the heat load increase would be slight. The duff would dry out sooner in the summer and this would slow decomposition rates. While the total effect of removing canopy on duff decomposition would be minor (pers. com. Dr. Matt Busse), the greatest effect would be that the input of litter would cease until the reestablishment of new vegetation occurred.

Overstory canopy removal could increase gopher activity if favorable pocket gopher habitat is created. The most susceptible areas are those near or adjacent to high gopher habitat, such as meadows, and areas with soils that are low in coarse fragments (Landtypes 83 and 95(a)). These are sites that will revegetate with forb and grass vegetation when the canopy is removed. Forbs are preferred gopher forage followed by grasses (Bonar 1995). By limiting food sources, gopher populations can be limited. Areas associated with the proposed ski expansion that have high shrub and tree seedling cover or have high amounts of slash cover, show very little gopher activity because of the reduced amount of preferred forage. The proposed practice of placing slash on ski runs as they are created would limit the reestablishment of forb and grass cover and encourage shrubs and trees to revegetate over time, thereby limiting the amount of gopher activity.

Glading is less disturbing to the soil than total tree clearing for ski runs since much of the forest canopy would be retained. Ground disturbance would be minimal since there is much less material to remove. Any disturbance that could occur with helicopter yarding would be quickly covered up with litter from the over story canopy.

Excavator

The use of an excavator is proposed on slopes that are less than 35% gradient. On these sites the potential for bare soil exposure, soil displacement and compaction increases. Excavators were used on granitic soils in the Ashland Watershed in 2002 to thin small diameter trees. Soils were monitored before and after for compaction (April 2, 2002 letter to District Ranger). After one pass of an excavator, soil bulk density increased by 6% which is below the Regional soil quality standards applicable to this area of 15% (FSM 1998). Soil displacement and soil exposure increased as slopes exceeded 20%, especially when the excavator was traveling sideslope, upslope, or turning. The amount of soil erosion produced by clearing ski runs with an excavator depends on many factors, such as the number of passes, amount of slash, and equipment operator skill level.

Roads and Parking Lots, Ski Trails, Footings of Terminals, Towers and Surface Lifts

Topsoil is disturbed or removed through the proposed construction of roads and vehicle parking lots, ski trails, footings of terminals, towers and surfaces lifts and this creates the greatest potential for soil erosion in the SUP area. Subsoil that is exposed during construction is far more erosive than the topsoil because it lacks organic matter, has weak soil structure, high bulk densities, and slower infiltration rates. Cutslopes and fill slopes are usually much steeper than the natural slope gradient, which also increases the potential for soil erosion.

First year erosion from road construction is typically 1,000 times higher than natural rates of erosion (Megahan and Seyedbagheri 1983). Erosion rates can remain at this magnitude for up to two years, then drop by 80% or more when armoring of the soil surface has occurred, creating a protective soil cover (Megahan 1974). In a study on granitic soils in Idaho, Megahan (1974) found that the rates of erosion occurring within road prisms averaged 66 cubic yards/acre the first year. Yet by the second to fifth years of monitoring, he found the annual rates to decrease to 1.5 cubic yards/acre.

A summary of research on road erosion (Washington Road Surface Erosion Model Technical Documentation - Appendix A: (http://www.dnr.wa.gov/forestpractices/adaptivemanagement) shows that there is an exponential decline in erosion rates following construction. Road erosion rates in the first year following construction yields approximately 10 times the long-term rate; second year yields twice the long-term rate and third and subsequent years are at the long-term rate. Repeated disturbances, such as driving over un-surfaced roads can bring a new supply of fine soil particles to the road surface, which can maintain erosion rates at high levels.

Mitigation Measures

Properly installed mitigation measures can substantially reduce soil erosion from sites where topsoils have been disturbed or removed. Erosion control blankets and organic mulches have been extensively investigated and where properly applied, will reduce sheet erosion by 70 to 90 percent (Ayres Associates 2000). In combination with other practices such as tree planting and grass seeding, surface erosion can be reduced by up to 100 percent. Soil losses from erosion plots in Idaho were reduced 98 percent by combining ponderosa pine planting with straw mulch plus netting (Megahan 1978). Bethlahmy and Kidd (1966) reported that soil losses on study plots in Bogus Basin were reduced about 70 percent by straw mulching and 98 percent by covering the straw with netting. Some manufactured erosion control fabrics can be over 95% effective in reducing soil erosion (Swanson and Grant 1982). These fabrics tend to be lightweight, have a high water holding capacity, conform closely to the soil surface, and create enough cover that soil is not exposed.

The proposed construction of roads and buildings under the Action Alternatives considered in detail call for mitigation measures to be installed before, during and after the structures have been built (see Section 7, Past and Present Restoration Pactices for further discussion of effectiveness of erosion mitigation practices).

c. Sediment Delivery

Sediment Yields

The percent of soil erosion that actually enters an intermittent or perennial stream is referred to as the sediment delivery rate or sediment yield. The sediment delivery rate is a function of the characteristics of the buffer that separates the soil disturbance from the channel and whether the water coming out of the disturbance is concentrated or diffuse.

Sediment Yields from Diffuse Flows

In studies conducted in the Idaho Batholith, Ketcheson and Megahan (1996) measured the distance that sediment traveled downslope from eroded forests roads. They found on exposed road fills, where there was no presence of concentrated water, most sediment traveled only short distances (<30 feet) from the source of exposed soil. They calculated that there was less than a 2% probability that the furthest transported sediment would exceed 100 feet downslope from the disturbance, and that this material would account for less than 10% of the sediment transported in a year. Supporting this are field observations of past disturbances in the SUP area, especially on the fill slope portions of the lower roads.

Sediment Yields from Concentrated Flows
As road water is concentrated, the distance that sediment will travel is much greater. Ketcheson and Megahan (1996) found that sediment from cross drains (culverts that carry discharge from road ditch and/or upslope runoff) on granitic soils in Idaho had a 75% probability of exceeding 100 feet and a 20% probability of exceeding 300 feet annually. Burroughs and King (1989) found similar relationships on granitic soils but at shorter distances – 40% probability of exceeding 100 feet and 5% probability of exceeding 300 feet. Megahan and Ketcheson (1996) found that sediment travel from rock drains (shallow rocked dips providing drainage for road tread and cut) was much less than for roads with culverts. On the average, sediment traveled 39 feet with a maximum travel distance of 111 feet. A summary of studies on road erosion indicates that 90 percent of sediment travels less than 200 feet from culverts and only a fraction past 300 feet (see Appendix A: Washington Road Surface Erosion Model Technical Documentation). Observations of concentrated runoff from parking lots and roads observed at Mt Ashland after several thunderstorms in the summer of 2003 confirmed these research findings (documents on file at Ashland RD).

Sediment Storage
The most effective buffers separating soil disturbances from channels are those with the greatest density of obstructions, which include fallen trees, large branches, standing trees and large rocks. These features slow surface water and act as hillside sediment traps. There are many examples of effective buffers in the Siskiyou Mountains, especially in the headwaters of McDonald Basin.

Megahan and Ketcheson (1996) found that sediment travel distances on granitic soils were inversely proportional to the quantity of obstructions on a hillslope. They showed that woody material, such as fallen trees and large branches, that were greater than 3 inches in diameter and in direct contact with the ground, were very effective in storing sediment originating from fill slopes, rock drains and culverts. For example, by increasing the number of feet of obstructions immediately below a rock drain from 19 feet of obstructions (length of obstructions measured normal to the slope) to 58 feet, the mean length of sediment travel would be reduced from 47 to 31 feet of travel distance.

d. Historical Soil Disturbances

The high elevation Siskiyou Mountains have many examples of past management practices that have accelerated soil erosion processes. These include some of the practices implemented in the early phases of the construction of the Mt. Ashland Ski Area, where accelerated soil erosion rates would have been at their highest. A review of these practices and the history of the ski area can serve in the discussion of how the currently proposed ski expansion activities could affect soil erosion and sedimentation.

Overgrazing in Meadows
Overgrazing by sheep and cattle during the mid to late 19th century occurred over much of the high Siskiyou Mountains, creating bare soil conditions in most of the high mountain meadows (Laurent 1994, Vance 2000). Between 1870 and 1890, extensive sheep grazing took place in the meadows on both north, and south slopes of Mt. Ashland (Brown 1969). By the turn of the century, drift fences had been installed to prevent cattle from moving into the watershed (Crater/Rogue River National Forest Historical Grazing Records 1915 – 1950).

With the reduction of cattle, the meadows were allowed to recover but reestablishment of vegetation has been very slow. Historical photos taken below and east of the Rental Shop in the early 1960s, before the ski area was developed; show the effects of overgrazing on meadows. These photos show sparse soil cover and well-established rill and gully systems.

The upper slope of nearby McDonald Basin is a good example of the effects of overgrazing on surface erosion. The basin is located several miles west of MASA and in the headwaters of the Little Applegate watershed. The slopes are completely devoid of vegetation, exposing the granitic sands to extensive sheet, rill, and gully erosion. This area, like many of the denuded openings scattered along the Siskiyou Crest, has been referred to as the "Shasta red fir barrens" (Laurent 1994).

With loss of vegetative cover and high soil disturbance by sheep trampling, it is believed that the topsoil eroded away during a century of summer thunderstorms (Vance 2000). Re-establishment of vegetation has been slow in the barrens and overgrazed meadows because of poor soil conditions, harsh climate, and gopher activity. The meadows in the SUP area undoubtedly once experienced these extreme grazing pressures, but have had more time to recover due to the near total exclusion of cattle grazing over the past one hundred years. Nevertheless, surface sheet and rill erosion were active prior to the development of the ski area and are today still very active processes in areas with low vegetative cover. The meadow north of the Rental Shop is an area where high sheet and rill erosion is still actively occurring but the sediment originating from this area is filtered through an undisturbed forested buffer below the Windsor access road.

The open meadows below the main parking lot also experienced high rates of soil erosion, which was likely associated with historic grazing. An interpretative review of 1966 aerial photographs shows that large gullies were likely present prior to the construction of the ski resort. Other openings in the northwestern section of the SUP area show similar erosional features.

Tractor Ground Modification and Slash Piling

Tractors or other ground-based equipment were used to pile slash, skid logs and grade slopes of several ski runs during and after the ski area was constructed in the mid 1960s. These activities would have compacted and displaced soils and increased soil erosion and sedimentation. Where ski runs were graded (e.g., Poma), sheet, rill and gully erosion would have been high for at least several years after construction. Aerial photographs taken shortly after the construction of the ski area show that topsoils in these areas were displaced long distances or mixed with subsoils, leaving a surface of compacted subsoil over most of these areas.

Based on historical photos, approximately 9.9 acres appears to have been affected in this manner. Soil erosion from this area would have been extremely high and could have reached the East Fork via the access road, but it is more likely that sediment was routed into an undisturbed section of undisturbed forest and filtered out.

Similar to this disturbance, but not as destructive, was the piling of slash and brush with tractors. In this operation, tractors pushed logs and brush downslope into piles. The thin topsoils were exposed, mixed, compacted or moved downslope into piles. The vertical tractor paths would have been paths for water to concentrate, creating rills and gullies. This activity occurred in the early 1970s on the upper slopes of Romeo, and lower slopes of Calaban ski runs, and covered approximately 10.3 acres. These soil disturbances led to very high erosion rates immediately after disturbance and until vegetation was reestablished. 1975 aerial photographs show signs of direct sediment transport from disturbances on the upper slopes of Romeo to the Windsor access road system.

Most of the brush removal associated with the Calaban ski run appears to have been separated by a forested buffer and it is likely that most sediment was filtered out before reaching Pumphouse Creek. Recent field surveys and review of 1998 aerial photographs show that the runs that were brush-piled, have reestablished with shrubs, trees, forbs and grasses. Runoff and sediment yield from these areas appear to have been curtailed. Some areas, like the Poma Run, have been very slow to revegetate because of the very low soil fertility and exposure to wind and extreme temperatures.

Slash and Brush Removal from Ski Runs

Piling and burning slash in large piles was previously a common method of removing large wood during clearing for ski runs at Mt. Ashland. This activity appears to have occurred across most of the ski runs within a 10-year period after the ski runs were built. As discussed above, some of this work was done with tractors, but most were completed by hand. A review of 1966 aerial photos showed trees that were cut to create the ski runs were left on the site at that time. The same sites nine years later, as observed from the 1975 aerial photos, show that most of the logs and slash were removed from the sites either by hand piling or by tractors. These photos show large burned pile areas, 20 to 40 feet in diameter, on most of the ski runs. These sites would have had bare soil immediately after burning and an increased potential of eroding during summer thunderstorm events. However, most eroded material would likely have been filtered out at the downslope edge of the burned pile, where some undisturbed duff and litter layers would have existed.

Vegetative cover appears to have quickly returned to the burned pile areas. The 1975 photos show vigorously growing vegetation in the piled areas, a response probably due to the higher concentration of nutrients in the ash. Outside the burned piles, topsoil would have been protected from erosion by the existing litter, duff and tree and shrub seedlings.

Ski Lift Construction

Past ski lift construction practices included building temporary roads to access ski lift towers. One of the biggest impacts of the ski area to Ashland Creek was the construction of the access road below where Windsor Chailift currently exists. This low standard road traveled up a steep slope (30 percent gradient) and was adjacent (within 50 feet) to one of the headwater channels of the East Fork of Ashland Creek. Road water from this disturbance appears to have created gullies that would have delivered sediment to the East Fork. Aerial photographs taken in 1975 indicate that water concentrated on this road and was likely diverted into the adjacent stream channel. 1998 aerial photographs and recent site visits indicate that this disturbance has recovered significantly with the establishment of shrubs and ground vegetation and concentrated water has further been eliminated through construction of water bars and other restoration activities. The vegetation between this disturbance and the channel has also recovered and functions more fully as a sediment filter.

Temporary road construction also occurred below the lower section of the Ariel Chairlift but at lesser impact than the road constructed below Windsor Chairlift. After this construction, the lower portion of the lift area and pad for the Ariel terminal were very disturbed and erosion rates were high. Delivery of sediment to the headwaters of the East Fork would have happened only if channelized water flowed down the access road to the lower Windsor terminal. This would have occurred no later than the 1970s since there is no indication that water channelized in this access road in later photographs.

Road and Parking Lot Construction

Most of the roads associated with the ski area development were built by the late 1960s. Road and parking lot construction were undoubtedly the greatest soil disturbing activity associated with the ski area. One of the largest sources of sediment would have originated from the development of the parking lot. Excavated material from the large cuts was sidecast into the headwaters of Cottonwood Creek. Storm and snowmelt runoff carrying sediment from cutslopes and unpaved parking lot surfaces cut gullies into the fillslope. The gullies subsequently delivered sediment directly to the headwaters of Cottonwood Creek. First and second year sediment rates would have been extremely high. Annual sediments yields rates were high from unpaved road and parking lot surface but decreased with the pavement of road surfaces in the late 1980s.

Access roads to the lower terminals of Ariel and Windsor contributed a large amount of sediment to the East Fork of Ashland Creek. These steep roads lacked adequate drainage to prevent the concentration of water and subsequent delivery of sediment to the East Fork. Redesigning the drainage of the roads as well as graveling the surface has helped to reduce the sediment delivery to the stream system.

Terminal Construction

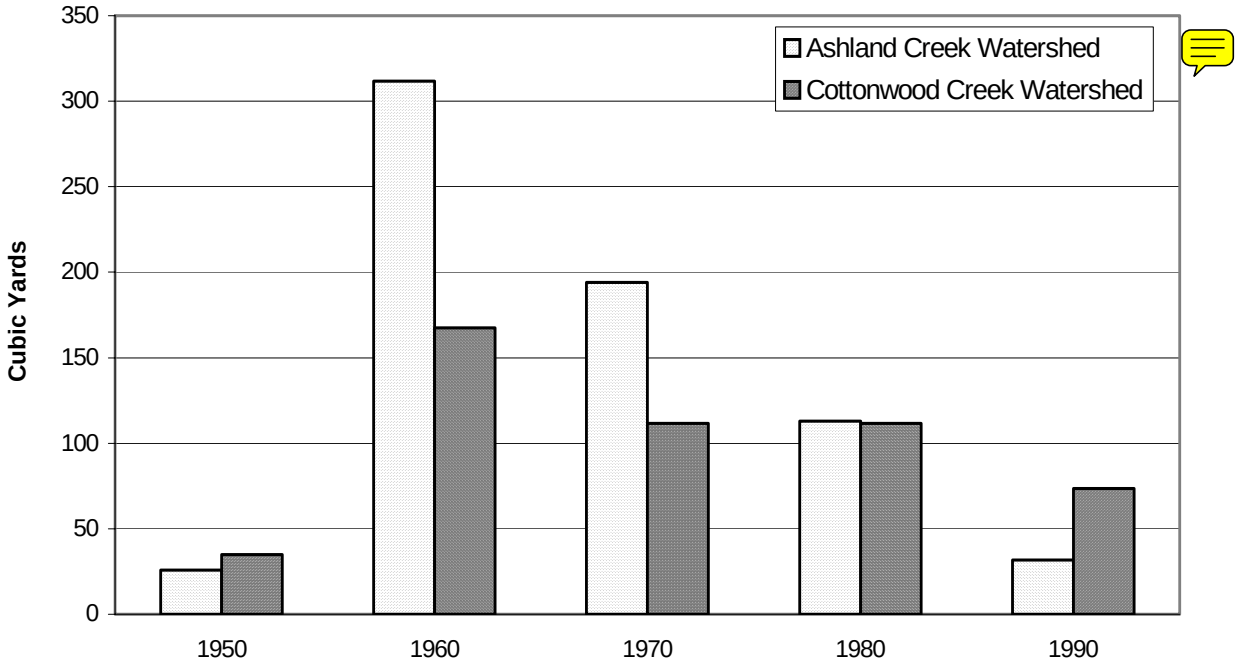
Terminal construction in the Ashland Watershed contributed a large source of sediment. The pads of the lower terminal of the “Big” T-Bar (replaced by Windsor in 1977) and “Little” T-Bar (replaced by Comer in 1987) would have contributed sediment to the headwaters of the east fork whereas the terminal site for Ariel could have contributed sediment if water was diverted down the access road to the lower Windsor terminal. Improvements to drainages of the access roads and terminal pads have helped to decrease the sediment from these areas.

The upper terminals of Ariel and Windsor Chairlifts, while in a very erosive state immediately after construction, probably did not contribute much sediment to the Ashland Watershed because of the long distances to stream or gully channels. The upper terminal of the Little T-Bar did however appear to contribute considerable sediment. From the 1966 and 1975 aerial photographs, it appears that runoff from the pad for this terminal contributed sediment to a gully system immediately downslope of it. This channel system was diverted down the Windsor access road eventually into the East Fork drainage. Aerial photographs taken in 1998 and field surveys indicates that this site has revegetated to a point where soil erosion rates have dissipated and the gully system that had transported sediment has healed.

Sediment Yields from the Development of Mt Ashland Ski Area

A history of sediment delivery to the Mt Ashland Ski Area is presented in Figure III-2. The estimated sediment yield rates were based on identifying soil disturbance areas on four sets of aerial photographs taken in 1966, 1975, 1993 1998 and using this information to run WEPP erosion model simulations (see Appendix H for WEPP assumptions and methods). Sediment yields from the WEPP model were obtained for years 1966, 1975, 1993 and 1998 values were extrapolated to develop a per decade sediment rate estimate. These rates do not include channel or gully erosion.

Figure III-2. Estimated Sediment Yield Per Decade



Prior to the ski area development, background sediment rates were estimated to be less than 50 cubic yards per decade for the Ashland and Cottonwood sub-watersheds. The development of most of the roads and ski runs in the 1960's, increased sediment yields significantly. The largest sources of sediment would have originated within the first and second years of construction. During the 1970, several ski runs in the Ashland Creek sub-watershed were cleared of brush with tractors and access roads continued to be in a poorly maintained state. Pulses of sediment from brush clearing would have contributed increased sediment to Ashland Creek. By the 1980s and 1990s, many disturbed sites had become revegetated and soil cover had increased significantly. Restoration projects were implemented during this time that helped heal gullies and areas of extensive bare soil. In 1988 the parking lot was paved which would have substantially reduced erosion. Restoration work in gullies and redesigning road drainage on the access road to lower Windsor Chairlift further helped reduce sediment yield in this area. By the late 1990s many disturbed sites had reestablished a moderate to high shrub and ground cover.

6. Site Productivity

Site productivity is defined as the ability of a geographic area to produce vegetative biomass, as determined by conditions (e.g. soil type and depth, rainfall, temperature) in that area. Specifically as related to soils in this analysis, productivity is related to the capacity or suitability of soil for establishment and growth of specified plant species, primarily through nutrient availability (USDA and USDI 1993).

Forest Plan management direction for the SUP area specifies a goal of maintaining or improving soil site productivity in all resource management activities (RRNF LRMP page 4-1). The overall objective is to provide a suitable substrate for vegetation reestablishment, following developmental activities associated with ski area expansion. This vegetation could involve establishment, reestablishment or maintenance of forested conditions, or growth of vegetation (such as grasses or brush) that could minimize or control erosion and sedimentation, and delivery to stream courses. The Forest Plan direction for Management Strategy 4 (Developed Recreation) requires projects to address the potential for detrimental soil conditions. It should be noted that specific Standards and Guidelines for MS-4 (RRNF LRMP page 4-59) do not contain specific thresholds for detrimental conditions, as is the case for many other management strategies (many of which are allocated to some level of timber growth and yield). The Regional Guidelines (FSM 2521 R-6 Supplement 2500-98-1, Effective August 24, 1998), for soils also do not specifically apply to certain areas such as developed recreation sites (e.g., developed ski areas). The reason for this is likely due to the fact that many of the specific features and structures associated with recreation areas (e.g., paved roads and parking lots, or footings for ski lift towers) could not be constructed to result in limited disturbance below specific thresholds, as is the goal in forested areas. Nevertheless, concern for soil site productivity is an important consequence of ski area expansion and is analyzed and consequences disclosed in this document. The primary disturbance mechanisms that could affect soil site productivity of the SUP area are compaction, loss of site organic matter, and loss of topsoil.

a. Soil Compaction

Soil compaction is the increase in soil bulk density, decrease in soil porosity, or increase in soil strength caused by the application of mechanical forces such as weight and vibration. For reference, Regional Forest Service soil quality standards classify an increase in bulk density of more than 15 percent at 4 to 12 inch soil depths as "detrimental compaction". The duration of compaction on granitic soils has been reported to persist for 45 years at 6 to 12 inch soil depths (Froelich et al. 1983). Bulk density measurements made in areas that had been disturbed by tractors in the Little Applegate watershed (Steinfeld - personal files) indicate that bulk density recovery rates might be sooner than 45 years, especially if gophers or deciduous shrubs (i.e., manzanita) invade the site. Compaction will lower site productivity and increase the potential for higher runoff if it is extensive or located in areas where water will concentrate. Landtypes 83 and 95(a) are the most susceptible soils in the SUP area to compaction and erosion due to the low rock content.

Under the current proposal, the use of an excavator to place logs on ski runs and excavate foundations is being analyzed. This equipment runs on tracks and would compact soils where it has traveled. The wide tracks of an excavator distributes its weight across the surface of the soil to create ground pressures that are generally much less than that of tractors (about half the ground pressure).

Sites with higher slash on the soil surface would further distribute the weight of the excavator and reduce the amount of compaction. The degree of compaction can be reduced depending on the amount of woody material on the site to distribute the pressure of the tracks across greater soil surface area. Soil bulk density monitoring of granitic soils in the Ashland Watershed (April 2, 2002 letter to District Ranger) showed that excavators increased bulk densities 6% over undisturbed levels. This is below the Regional Soil Quality Standards of 15% for soil productivity applicable to that area.

Lower impact ground-based equipment is also being considered for use on this project. This equipment (for example a "Spider" excavator) would only compact the soil where its pads and bucket are placed as it moves across a slope. The compacted area created in the path of a spider is discontinuous and expected to be less than 3% of the area this equipment would be used in. A survey of soil scientists who have worked with this equipment indicates that there is minimal soil resource damage (pers. com. Steinfeld).

b. Loss of Site Organic Matter

Loss of organic matter occurs when extensive amounts of large wood, branches, soil duff and litter are removed from the soil surface. Past ski area construction practices of the early 1970s where logs, shrubs, and surface organic material including duff and litter were removed through slope shaping and brush blading (see Sub-section d) most likely lowered the site productivity in those areas. Under the current proposal, extensive removal of site organic matter is not proposed. While a minor amount of organic material would be removed through yarding of logs or burning of piles, most of the organic material resulting from clearing ski runs would be left on the site to cover soils. As these materials decompose, they would contribute to the soil organic matter.

As addressed in Section 5, d, the effect of a wildfire, if it occurred several years after construction of ski runs, would produce a more intense ground fire. This would consume greater organic matter and expose more soil than non-cleared sites. The risk of a potentially intense ground fire would diminish as surface fuels became compacted by snow and site organic matter begins to decompose.

Bringing in organic matter from other sources can mitigate sites that are low in organic matter. This can be in the form of branches, woody material or chipped organic material. Establishment of vegetation, especially trees and shrubs, would increase overall site organic matter with time.

c. Loss of Topsoil

Loss of topsoil can occur as surface erosion or soil displacement. Loss of topsoil through surface erosion can reduce overall site productivity through loss of nutrients, soil organic matter, water-holding capacity, and soil microflora and fauna. This is especially the case in the high elevation Siskiyou Mountains, where topsoils are very thin and recovery rates are slow. Extreme cases of topsoil loss on site productivity can be observed on the upper slopes of nearby McDonald Basin. In pre-European settlement, these open slopes were more vegetated but through historical overgrazing, vegetation was drastically reduced and topsoil eroded (see Sub-section d). These sites have been very slow to recover, even with the elimination of grazing, because of the loss of topsoil.

Soil displacement is the removal and horizontal movement of soil from one place to another by mechanical forces such as a blade or object dragged along the soil surface. "Detrimental displacement" is defined in the Regional soil quality standards as the removal of more than 50 percent of the "A" horizon from an area greater than 100 square feet and a width that is at least 5 feet. Due to the non-cohesive nature of granitic soils, the soils in the SUP area are very susceptible to displacement, especially on slopes over 20% slope gradients. The activities that would create permanent soil displacement are the construction of roads, towers, terminals and buildings. Soil displacement would also occur during helicopter yarding, and excavator and/or spider work. As reported in Section 5, c above, soil disturbance through helicopter yarding is discontinuous and minor in extent (less than 5 percent). It is unlikely that displaced soil would be moved more than 5 feet from the area of disturbance.

Displacement caused by operating a low impact excavator would most likely not result in levels reaching the definition of "detrimental displacement" since displacement by the pads or by the bucket would not exceed 100 square feet, nor displaced soil be moved more than 5 feet. However, the use of a standard conventional excavator on slopes over 20% could reach levels of "detrimental displacement" depending on the amount of area traveled by the excavator.

The duration of soil displacement is long term and recovery rates depend on soil development factors inherent to the site, which at these high elevation sites is extremely slow. Mitigation of displacement can be accomplished where soils can be manually placed back on the originating site. Short-term stockpiling of topsoil and later re-placement over areas where topsoil has been removed is a mitigation that can accelerate site recovery. This can be further enhanced with the use of stabilizing erosion mulches or fabrics.

7. Past and Present Restoration Practices

Soil erosion on disturbed sites can be reduced through restoration practices that increase soil cover, shorten slope lengths, disperse concentrated water, or improve soil conditions. Over the years, many restoration practices have been tried in and adjacent to the Mt Ashland Ski Area. These include seeding, planting, contour trenching, fertilization, irrigation, slash placement, contour placement of logs, road surfacing and drainage, geotextile and rock blankets, erosion control blankets, mulches, and placement of gully-control structures. An understanding of the revegetation potential and limiting factors of the landtypes in need of restoration, as well as the effectiveness of each restoration practice is important for achieving greatest success. For instance, planting tree seedlings on a grass dominated landtype such as 93 and 95(a) will fail over time, as gophers and snow will either kill or severely limit seedling growth. This practice has been tried several times in openings around McDonald Basin with very limited success.

a. Vegetation

Maintenance and Enhancement of Existing Vegetation

The best strategy for maintaining soil cover is to encourage the growth and spread of native vegetation. While shrubs and trees were eradicated on some ski runs using tractors during initial ski area construction, most of the runs were left undisturbed, allowing manzanita shrubs and other low growing vegetation to spread and occupy the site. Re-establishment of vegetation was greatest where manzanita shrubs were prevalent in the understory before the ski runs were constructed, and the soil was left undisturbed (e .g., Calaban, Dream, and Pistol). Historical photographs of these areas prior to ski run clearing show that there was high shrub cover with young trees occupying the site. The removal of trees encouraged these areas to proliferate in shrub species.

Revegetation with Native Plants

From a watershed standpoint, the benefit of re-establishing vegetation results from the amount of soil cover it provides through either the plant itself, or the litter that the plant drops. Shrubs and trees provide the most effective cover over time because of the higher annual biomass production and the greater longevity of leaf and needle litter cover. Grass and forb seedlings are more successful in natural openings especially when they are planted close together, but produce less effective litter cover.

Where soils in the high Siskiyou Mountains have been disturbed, the reestablishment of native plants has been a difficult task. Several attempts to establish non-native grasses were made in the early 1970s with little success. Steinfeld and Feigner (1997) investigated the applicability of using native grass seed on erosive soils in McDonald Basin. In monitoring plots, they sowed *Elymus elimoides* (squirrel tail) seed immediately after snowmelt in June and documented the germination and establishment of native grasses over the summer. They found that seed germinated at moderate rates and grew into small seedlings, but by August, all seedlings had perished. The cause of mortality was determined to be low soil fertility, low water holding capacity, low summer precipitation, and lack of mycorrhyzae.

In the 1990s, several studies using a variety of native shrub and grass seedlings, were installed in McDonald Basin by Southern Oregon University students, Forest Service personnel (PNW Research Station and Stone Nursery), and Jobs in the Woods crews. The best results were seen where seedlings were planted in moist soils immediately after spring snowmelt (Steinfeld 1999). Grass seedlings inoculated with mycorrhyzae in the nursery were found to grow better than non-inoculated seedlings (Amaranthus and Steinfeld 2002). In areas with gopher populations, seedlings were destroyed through stem girdling or root grazing during the period the McDonald Basin site was covered with snow. Of the thousands of native grass seedlings planted over a four-year period at this site, more than half were killed by gophers (see Figure III-3, below and notice gopher mounds in foreground).

Figure III-3. Grass Seedlings – 2 Years After Planting - McDonald Basin 1999

Shrub seedlings of *Arctostaphylos patula* (greenleaf manzanita) and *Arctostaphylos nevadensis* (pinemat manzanita) survived well in study plots at McDonald Basin but after many years of heavy snowfall, seedlings of greenleaf manzanita, the more upright of the two species, were destroyed by snow loading and snow creep. The pinemat manzanita has succeeded on these sites because it is a low growing species; nevertheless it is still susceptible to gopher damage. Once a manzanita seedling becomes established on a site, it spreads through vegetative propagation. Roots will initiate on branches in contact with the soil and one plant can spread over a large area with time. This plant growth mechanism can be seen on many of the existing ski runs at MASA. Since manzanita seeds are often difficult to obtain in the high Siskiyou Mountains, vegetative propagation of manzanita seedlings is a viable alternative.

Over the past decade, students from local middle schools have planted bare soils in the MASA SUP area with native grass seedlings. Generally, the best restoration success at Mt Ashland has been on sites where seedlings have been irrigated after planting. In general, the most successful plant restoration has occurred in more protected areas (edges of forests, downslope from ridges), areas not dominated by gophers and on soils with topsoil intact. MAA personnel currently report success on lower Sonnet, where soils were amended with lime before broadcast seeding and covering with straw mulch.

Fertilization
Fertilizer trials using an inorganic nitrogen fertilizer were conducted in 1969 in McDonald Basin and the Mt. Ashland area. The native vegetation showed "some response…but not great enough to justify fertilizing the high, barren slopes in the Siskiyou Area" (1971 letter from Glendon Jeffries to the Forest Supervisor). Nitrogen is not the only limiting nutrient on these soils; calcium and magnesium are at critically low levels for plant growth. Small trials at McDonald Basin and MASA using lime as a soil amendment to increase calcium and magnesium have indicated that this practice can improve plant growth on sites that have been disturbed (pers. com. David Steinfeld). Seedlings grown in slow release fertilizers mixed in the media of grass seedling plugs at the nursery have also shown good response on disturbed granitic soils (study on file at Stone Nursery).

b. Structures and Material

Gully Lining and Sediment Dams
During the 1980s and 1990s, many gullies on the upper slopes of McDonald Basin and several gullies at MASA parking lot fill slopes were lined with rock, and sediment check dams were installed (see Figure III-4, three years after installation). In addition, high-strength erosion control blankets have been utilized to line sites of active gully runoff and erosion. The erosion blankets also assist in promoting the establishment and protection of revegetation. These structures have shown to be very effective in providing soil cover, slowing runoff, stopping gully erosion and collecting sediments behind check dams and in voids in the rock and blankets. The effectiveness to store sediment behind these structures decreases with time as they fill up. However, the storage capacity of the sediment dams can be re-established through the periodic removal of collected sediment.

Figure III-4. Rock/Geotextile-Lined Gullies and Sediment Check Dams in McDonald Basin

Contour Trenching
Contour trenching is the construction of large (1 foot and greater) trenches on the contour of the slopes that have active rills and gullies. They act as sediment basins, slowing runoff and capturing sediment. The construction of contour trenches was a popular conservation practice applied to many high elevation sites in the Western States to control the high runoff rates, including areas in the Siskiyou Mountains (e.g. Silver Fork Basin). During the development of the Mt. Ashland Ski Area, contour trenches were constructed through active gullies to the north of the Rental Shop and on disturbed slopes to the north of the Base Lodge (both sites are in Landtype 95(a)).

In both places, this practice appears to have been poorly implemented since the trenches were not constructed on the contour, but deliberately designed to drain downslope in one direction. Instead of capturing and depositing sediments, the practice accelerated runoff and sediment delivery. These areas have been very slow to re-establish plant revegetation and are still actively eroding today.

Log Placement and Slash Filters
Placing woody material at the base of road fills, drain dips and on ski slopes have been used effectively at MASA (see Figure III-5). On sections of the Lower Dream and Calaban ski runs, as well as other run locations, trees were delimbed and placed on the contour in contact with the soil and tree limbs placed between the log barriers. Several conservation objectives are accomplished with this practice: 1) bare soil surfaces are protected by woody material, which reduces or eliminates raindrop splash and sheet erosion, 2) any sheet erosion that might occur will only travel as far as the nearest downslope woody obstruction where it would be deposited, 3) woody material adds long-term organic matter and nutrients to the site, and 4) deep soil cover reduces the habitat and forage for gophers.

Figure III-5. Slash and Log Placement - Lower Dream Ski Run 2002

The placement of logs in a small ephemeral channel at the bottom of Tempest during the early 1970s also appears to have been very effective in capturing sediment by reducing runoff energy and retaining sediment. The logs have acted as sediment traps, capturing approximately 2 yards of sediment in recent years. The lack of a defined channel below the log filters at the bottom of Tempest indicates that these structures are functioning in this capacity. Placement of logs or any other structures in perennial streams must be carefully engineered to avoid increasing bank erosion.

Cook and King (1983) showed that cull logs and logging slash placed below the road fills as filter windrows, were about 80 percent effective in reducing the downslope movement of sediment. Studies in Northern Idaho have recorded average sediment transport distances below windrows of 4 feet, and maximum transport distance of 33 feet (Burroughs and King 1989). Ketcheson and Megahan (1996) developed predictive equations for travel distances based on the amount of obstructions encountered below culverts, rock dips and fill slopes. They found travel distances of sediment downslope were inversely proportional to the quantity of obstructions. In the Mt. Ashland area, logs and slash have been placed below fills of some sections of the lower Access Road. These features have been effective in retaining sediment from moving downslope.

Logs and slash are not permanent and will decompose with time. The rate of decomposition depends on the size of the material. Small diameter trees can decompose in decades, while larger logs could take centuries. Large logs cut 40 years ago and placed in the drainage at the bottom of Tempest, are still intact and effective today.

Topsoil Placement

Covering disturbed sites with local topsoil sources can also reduce erosion. This practice is often used in road construction where topsoil is removed from a site to be excavated and placed in stockpiles. Near the completion of the construction project, the topsoil is placed over the subsoil and covered with erosion cloth or to keep the soil in place. This practice can reduce erosion by creating favorable soil conditions for plant establishment and growth. Topsoils also store large quantities of native seed which given the right conditions, will germinate and reestablish vegetation on the site. There are no examples of this practice in the MASA SUP area.

Erosion Fabrics and Mulches

Erosion fabrics have been installed on the “Z” road in the headwaters of McDonald Basin (see Figure III-6, one year after installation). Erosion fabrics and mulches can be very effective in eliminating raindrop splash erosion, which is a primary cause of soil detachment. Where rills and gullies are present in road fills, mulches can be only 35 to 50% effective (Burroughs and King 1989).

Figure III-6. Bark Mulch on "Z" Road – McDonald Basin

Using standard test methods, erosion control blankets have been shown to reduce rainfall-runoff to approximately 1 percent of the soil loss for bare sands, and 2 percent of the soil loss for bare loam (Ayres Associates 2000). The lifespan of temporary fabrics and mulches is short term (1-3 years) and re-application, maintenance or the reestablishment of vegetation is necessary to maintain their effectiveness.

Long-term (greater than 3 years) erosion control blankets are composed of stable plastic netting or lofted weaves that, with maintenance, provide good extended performance. They are often combined with biodegradable materials such as excelsior, cocoanut fiber, or straw to provide a mulching effect and immediate soil cover. Like short-term materials, they are intended to interact with and reinforce the rooting system of grasses and shrubs. The long-term erosion control blankets are particularly useful where concentrated water flow is of concern, such as rills, ditches, gullies or as fill slope armoring on roads or trails.

Road Surfacing, Drain Dips, Waterbars, and Fill-slope Armoring

Placement of durable, coarse rock for surfacing is very effective at retarding erosion from roadways. The Swift study showed that placement of 6-inch lift of 1.5 inch minus crushed rock reduced sediment production by 70% from an undisturbed condition over a 5-month period. Another study showed a 79% reduction with a 4-inch lift. Thickness of gravel layer is important. Swift showed that a two-inch lift did not reduce erosion while a 6-inch lift reduced it by 92%, and 8-inch by 97% (Swift 1984a).

Typically, onsite sediment production of about 60% comes from fillslopes, 25% from travel ways and 15% from cutslopes and ditchlines (Burroughs and King 1989). Erosion practices on roadways focus on reducing the potential for concentrated water to flow over unprotected fillslopes. Water bars, rolling dips, and grade sags are installed at frequent intervals that are designed to direct overland water flow to sections of the fillslope that have been reinforced with geotextile overlain by coarse rock. These installations are very effective at providing complete cover of the soil fillslope with an erosion-resistant surface that slows water velocity and allows any transported coarse sediment to drop out of the flow (see Figure III-7).

Figure III-7. Erosion Control Blanket Placement in Gullies – McDonald Basin

c. Other

1992 Restoration EA

In the winter and early spring of 1992, the RRNF analyzed a proposal to dismantle the facilities located at the MASA that resulted in the *Mt. Ashland Ski Area Restoration Environmental Assessment* (EA) and the *Decision Notice and Finding of No Significant Impact* (DN) signed by Jim Gladen, Forest Supervisor, on April 28, 1992. Ski Ashland (MASA) was not dismantled and has functioned as a developed ski area since that time.

In 2002, a survey was conducted to identify and document specific areas at MASA that were identified in 1992 as needing ***restoration*** work and to briefly describe the 2002 condition and current needs of these areas. A more accurate term to describe the first objective would have been **reclamation** as was the intent of the 1992 plan. This term better fits the needed actions associated with dismantlement of the ski area and returning the site to a more natural and stable forested environment, similar to that which existed prior to 1963 (before the ski area was constructed).

The 2002 survey (*Status Report on the 1992 Ski Area Restoration EA: Ten Years Later*) looked at 35 sites identified in the 1992 EA; this report is contained in Appendix F of this FEIS and is incorporated by reference. As a functioning ski area, many of the decisions made in 1992 are not applicable to the current situation. Examples include parking lots that would be ripped and planted, buildings and lift towers that would be removed, and roads that would be re-contoured to the original shape of the land. Other sites are fully recovered in terms of vegetative cover through either natural processes or through the efforts of ski area personnel (plantings, check dams, mulching, etc.). Five sites were identified that could benefit from spot planting or mulching. This work will be accomplished by MAA as part of their annual restoration work at the ski area. Three more sites were identified as “watershed restoration” projects in this EIS: Little T-Bar Bottom Terminal, Big T-Bar Terminal, and Cottonwood Meadow. This restoration work does not conflict with the currently authorized uses at MASA, and would help to attain the objectives of the Northwest Forest Plan.

Fire Suppression
Wildfires pose some of the greatest risks to increasing surface erosion and runoff, especially where fuel loading is high (Megahan and Molitor 1975). Fire suppression by the Forest Service has been effective in keeping fires out of the ski area and therefore can be considered a successful soil conservation practice.

8. Watershed Resources

The MASA is located within the headwater portions of four separate watersheds (technically sub-watersheds), the Ashland Creek watershed, the Neil Creek watershed, the Grouse Creek watershed, and the Cottonwood Creek watershed.

The SUP area includes approximately 796 acres of the Ashland Creek sub-watershed. The Upper Ashland Creek sixth field watershed has barriers to anadromous fish passage at Reeder Reservoir and Granite Street Reservoir, but does support anadromous habitat below the Granite Street Reservoir. The larger Bear Creek Watershed is a fifth field watershed (a hydrologic classification of stream basins applied to watersheds of 20-200 square miles). The SUP area also includes approximately 92 acres of the Neil Creek sub-watershed. The Neil Creek sixth field watershed supports resident and anadromous habitat as a tributary to the larger Bear Creek Watershed. These watersheds are part of the Rogue River Basin.

The MASA SUP area also includes a small portion (approximately 64 acres) of the Cottonwood Creek watershed (above Mill Creek). This fifth-field watershed is a mix of interspersed private and Federally managed lands. The main stem of Cottonwood Creek is almost entirely within private ownership, and supports anadromous fish in its lowest reaches. Also within the SUP area is a small portion (approximately 8 acres) of the Grouse Creek sub-watershed, a tributary to the larger Beaver Creek fifth-field watershed. The Beaver Creek watershed supports anadromous fish populations downstream from the SUP. These watersheds are part of the Klamath River Basin.

a. Watershed Analysis Areas

For the purposes of the analysis of existing conditions under this Final EIS, as documented within this Chapter, and Chapter IV (Environmental Consequences), reference is made to two different Analysis Areas, the “Site Scale” Analysis Area, and the “Watershed Scale” Analysis Area. These four watersheds (technically sub-watershed) are displayed graphically in relation to the SUP area on Map III-5.

The Site Scale Analysis Area (also described in Appendix E as the Streams and Wetlands Study Area) includes the entire MASA SUP area and additional, adjacent area outside of the SUP area. This additional area was included to provide the basis of analysis of watershed conditions that may be affected by proposed expansion activities. The Site Scale Analysis Area is shown on Map III-5 (and Map III-6 at a larger scale). The Site Scale analysis in this Chapter presents the existing condition of watershed resources within the Site Scale Analysis Area, which may have been affected by historical and/or ongoing processes or activities.

The Watershed Scale Analysis Area also addresses historical and ongoing direct and indirect effects to watershed resources, but the focus is on a larger and logical portion of the affected sub-wtersheds. The Watershed Scale Analysis areas are not the entire extent of affected fifth-field watersheds. The geographic extents of the Watershed Scale Analysis Areas used in this analysis are depicted on Map III-5. It is important to note that the scope of the analysis of existing conditions at the Watershed ScaleAnalysis Area is dependant on the nature of the historic and ongoing effects, and the availability of data for the watershed area being analyzed.

The **Site Scale Analysis Area** is approximately 1,469 acres in size and includes approximately 1,065 acres of the (Upper) Ashland Creek sub-watershed, which is a tributary to the 231,087 acre Bear Creek fifth-field watershed. Upper Neil Creek is also a tributary to Bear Creek with a small portion of the Upper Neil Creek sub-watershed (154 acres) located in the Site Scale Analysis Area as well. Also within the Site Scale Analysis Area is a portion (94 acres) of the Grouse Creek sub-watershed, a tributary to the larger Beaver Creek fifth-field watershed. The Site Scale Analysis Area also includes approximately 156 acres of the Upper Cottonwood Creek sub-watershed, tributary to the Cottonwood Creek fifth-field watershed, which includes a mix of interspersed private and Federally managed lands.

The **Watershed Scale Analysis Areas** include the identified portions of the Upper Ashland Creek watershed, the Upper Neil Creek watershed, the Grouse Creek watershed, and the Upper Cottonwood Creek watershed. The total area of these four sub-watersheds is approximately 30,738 acres.

The **Upper Ashland Creek Watershed Scale Analysis Area** is approximately 19.8 square miles (12,700 acres) in size and is one of the primary tributaries to Bear Creek. For this analysis, Upper Ashland Creek is separated from Lower Ashland Creek by Reeder Reservoir, which is the primary drinking water source for the City of Ashland. This separation was made at the reservoir because potential impacts are best measured to that point in the drainage system. Effects contributed by ski expansion activities below the reservoir would likely not be measurable with current technology. This analysis area includes all of the hydrologic area of the Ashland Municipal Watershed.

The **Upper Neil Creek Watershed Scale Analysis Area** also contributes flow to Bear Creek, and this 10.5 square mile (6,715 acre) watershed is located almost entirely within the National Forest boundary. The lower boundary of Upper Neil Creek is located in the vicinity of Interstate 5, which is near to the boundary of the RRNF, and also the point in the sub-watershed where the slope of the valley floor decreases dramatically. The area downstream from NFSL is primarily pasture or developed lands.

The **Upper Cottonwood Creek Watershed Scale Analysis Area** is located in a generally south facing basin that is 7.5 square miles in size (4,797 acres). The lower extent of Upper Cottonwood Creek is at the confluence with Cottonwood Creek and Mill Creek, which is in proximity to the Klamath National Forest boundary. The sub-watershed is a mix of interspersed privately owned and Federally managed lands. The main stem of Cottonwood Creek is almost entirely within private ownership.

The 10.2 square mile (6,526 acre) **Grouse Creek Watershed Scale Analysis Area** is immediately adjacent to Upper Cottonwood Creek, sharing Upper Cottonwood Creek's western boundary. The southern end of the Grouse Creek sub-watershed is located at the confluence of Grouse Creek with Cow Creek. The Grouse Creek sub-watershed is a tributary to the larger (fifth field) Beaver Creek watershed.

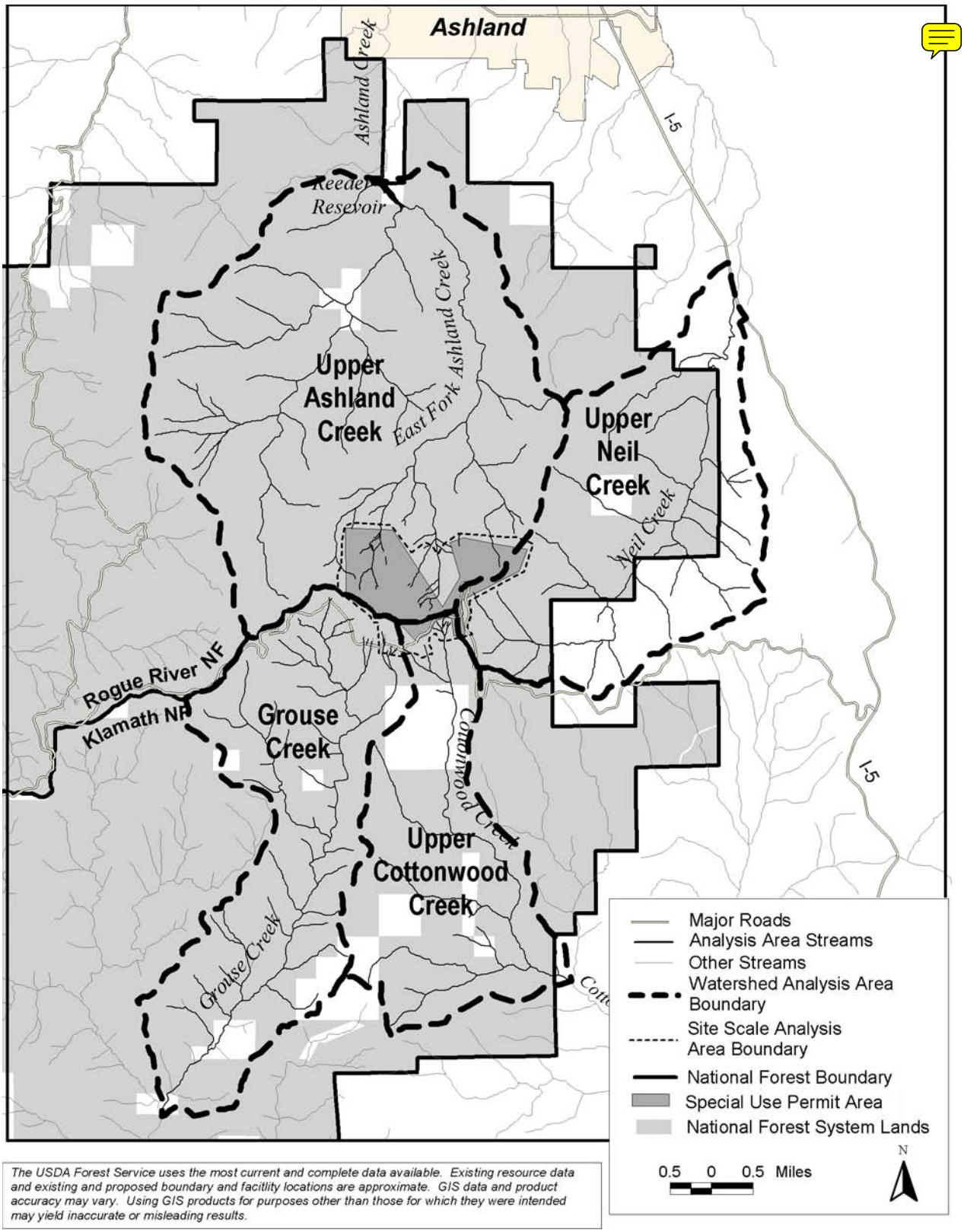
The following table summarizes acreages of watersheds within the SUP, at the Site Scale, the Watershed Scale Analysis areas, and at the fifth-field watershed levels. These analysis areas are the basis of several physical parameters presented in this chapter, and as associated with consequence analysis in Chapter IV.

Table III-9. Acres Within Watershed Analysis Areas (Scales)

	Upper Ashland	Upper Neil	Upper Cottonwood	Grouse	Total All Watersheds
Special Use Permit Area	796	92	64	8	960
Site Scale Analysis Area	1,065	154	156	94	1,469
Watershed Scale Analysis Area	12,700	6,715	4,797	6,526	30,738
Fifth-field Watershed[4]	Bear Creek 231,087		Cottonwood Creek 70,400	Beaver Creek 69,700	

[4] The fifth-field watershed is the basis of attainment of Aquatic Conservation Strategy Objectives under the Northwesst Forest Plan.

MAP III-5. Site Scale and Watershed Scale Analysis Areas



The USDA Forest Service uses the most current and complete data available. Existing resource data and existing and proposed boundary and facitlity locations are approximate. GIS data and product accuracy may vary. Using GIS products for purposes other than those for which they were intended may yield inaccurate or misleading results.

b. Overview of Existing Conditions - Streams

This section presents an overview and summary of watershed conditions for all four affected sub-watershed Analysis Areas considered together. Subsequent sections will provide more detail of sub-watershed conditions, seperately for each of the four affected sub-watershed Analysis Areas. Throughout this section, reference is made to conditions at the "Site Scale", and "Watershed Scale" (see above). The Site Scale Analysis Area was inventoried during 2001 and 2002 by SE GROUP; a report (entitled *Wetland and Stream Survey of the Mt. Ashland Ski Area*) with additional detailed mapping is attached to this Final EIS as Appendix E, and is incorporated by reference to this analysis. This report presents the results of SE GROUP'S reconnaissance level delineation of the wetlands and other waters of the U.S. (hereafter referred to as "wetlands and streams") subject to the jurisdiction of the U.S. Army Corps of Engineers (ACOE) under Section 404 of the Clean Water Act of 1975 as amended in 1977.

Streams - Site Scale Analysis Area

Streams within the Site Scale Analysis Area were delineated consistently with the definitions of "Waters of the U.S." provided in 33 CFR 328.3 (a)(1-5). In applying these definitions to conditions encountered in the Analysis Area at the Site Scale, the following criteria for identifying streams were used: (1) continuous and distinct bed and bank features must be present, (2) evidence of annual scour must be present, and (3) landforms along streams must exhibit morphology indicative of stream processes. Diversion ditches created in uplands, swales (concave landforms), small rivulets, and other erosional features that were observed in the Site Scale Analysis Area were not identified as streams because these features did not meet the above criteria. These unmapped swales and erosional features are generally located on high gradient, convex, and/or sparsely vegetated surfaces, where spring snowmelt is the dominant hydrology source.

The total length of streams identified by the field investigation within the Site Scale Analysis Area is approximately 7.5 miles (39,503 linear feet). Table III-10 contains a summary of the streams delineated within each sub-watershed by stream type according to the Rosgen system. The Rosgen classification scheme utilizes major stream categories identified as A-G, as shown in Figure III-8. The Rosgen method outlines criteria for nine distinct Stream Types that are based on landscape morphology and stream reach characteristics (Rosgen 1996).

The streams in the Site Scale Analysis Area were classified as Stream Types Aa+, A, and E, which is typical for mountainous terrain. The stream length calculations are based on field observations, aerial-photograph interpretation, and analysis performed with GIS software. The streams identified within the Site Scale Analysis Area are displayed graphically in conjunction with wetlands on Map III-6.

Figure III-8. Rosgen Stream Classification System

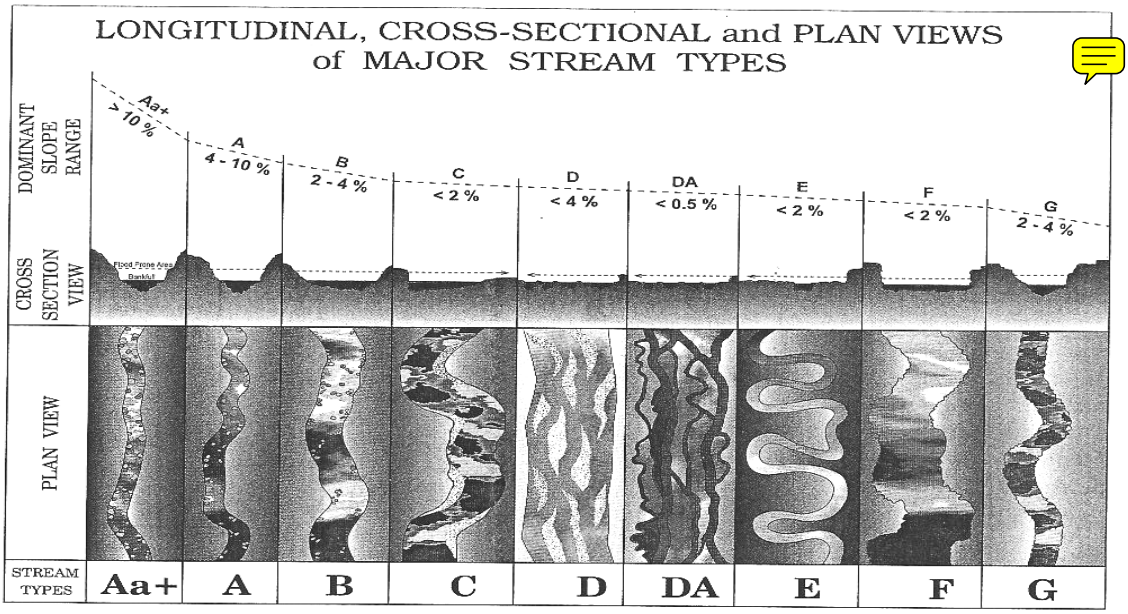


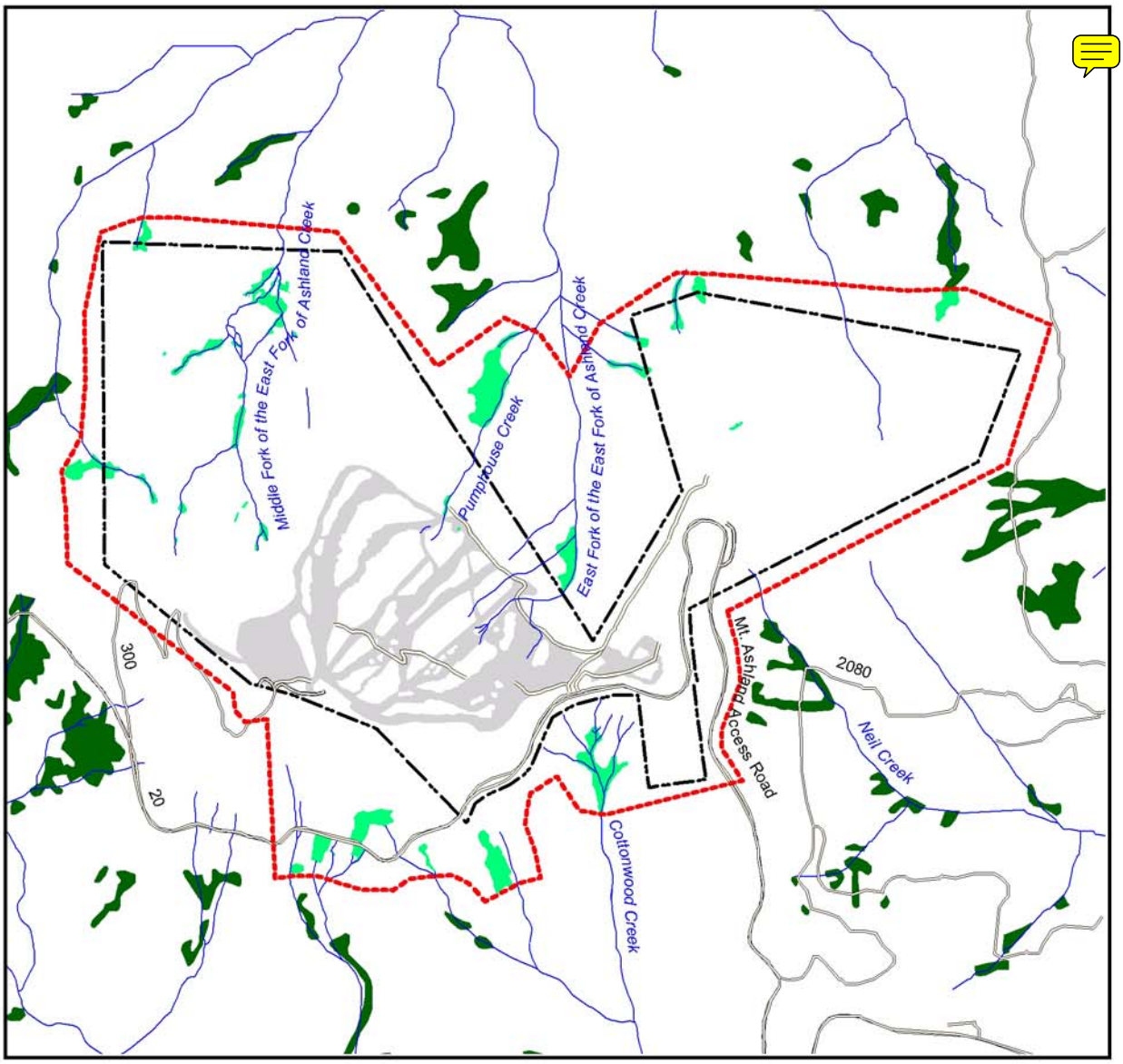
Table III-10. Summary of Streams Identified in the Site Scale Analysis Area

Watershed	Rosgen Stream (1) Classification	Total Length (miles)
Upper Ashland	Aa+ Stream Type	4.57
	A Stream Type	0.84
	E Stream Type	0.10
	Subtotal	5.51
Upper Neil	Aa+ Stream Type	0.07
	Subtotal	0.07
Upper Cottonwood	Aa+ Stream Type	1.26
	Subtotal	1.26
Grouse	Aa+ Stream Type	0.63
	Subtotal	0.63
	Total	7.47

(1) Streams in the Site Scale Analysis Area were classified using the Rosgen Stream Classification System (Rosgen 1996).

Comprising approximately 6.53 miles of the 7.47 mile stream network, stream Type Aa+ is the most common stream type in the Site Scale Analysis Area. Type Aa+ streams are characterized as debris transport streams with high gradients, and deeply entrenched channels that usually lack a floodplain. Type Aa+ streams in the Analysis Area are typically intermittent, headwaters streams located on steep, high erosion potential slopes. The primary hydrology source to most Aa+ streams in the Site Scale Analysis Area is groundwater discharge from slope wetlands, while the secondary source of hydrology to Aa+ streams is focused overland flow from snowmelt and storm events. Due to the steep channel gradient of Type Aa+ streams, channel sinuosity is very low and channel migration is naturally limited. Riffles and cascades are the dominant segment types, with pools and glides occurring very infrequently in the Analysis Area. Channel substrate (stream bed) in Type Aa+ streams in the Site Scale Analysis Area is considered typical for this stream type, and is dominated by sand and gravel in ephemeral reaches, and gravels and cobbles in intermittent and perennial reaches.

MAP III-6. Streams and Wetlands Identified at the Site Scale



MAP NOTES:

Wetlands within the site scale area were delineated according to the 1987 Manual. Wetlands outside the survey area are from the National Wetlands Inventory.

Streams displayed on this map include intermittent, ephemeral, and perrenial streamcourses as well as diches and culverted drainages.

Existing Roads
Streams
Special Use Permit Area Boundary
Site Scale Analysis Area
Surveyed Wetlands
National Wetlands Inventory Wetlands

500 0 500 1000 Feet

N

The USDA Forest Service uses the most current and complete data available. Existing resource data and existing and proposed boundary and facitlity locations are approximate. GIS data and product accuracy may vary. Using GIS products for purposes other than those for which they were intended may yield inaccurate or misleading results.

The 0.84 miles of Type A streams in the Site Scale Analysis Area have similar channel dimensions and patterns to the Aa+ Stream Type, but Type A streams are not as steep and slightly less confined. Type A streams are also located on steep, high erosion potential slopes, but are usually fed by Type Aa+ streams and can be either intermittent or perennial. The primary hydrologic input to Type A streams in the Analysis Area is surface flow from tributary streams. Groundwater discharge from adjacent wetlands and valley walls is the secondary hydrologic input for this stream type. The sinuosity of Type A streams in the Analysis Area is also low, and due to more moderate channel gradients, some channel migration may occur within the confines of the incised stream gullies. Step pools and riffles are the most common segment types, and channel substrate is dominated by gravels and cobbles. Type A streams also have a high sediment transport potential and a low sediment storage capacity due to the steep channel gradient and lack of pools, floodplains, and large woody material (LWM), defined as individual trees or pieces in a stream channel or on the forest floor that are greater than 24 inches in diameter (DBH) and greater than 50 feet long (*Bear Watershed Analysis* 1995). Type A streams in the Analysis Area are also susceptible to debris flows, but the risk is lower than Type Aa+ streams.

The Site Scale Analysis Area contains approximately 0.1 miles of Type E streams, which are intermittent, low gradient, unconfined channels with high sinuosity and an active floodplain. The Type E streams are in a wetland complex area on the Middle Fork of the East Fork portion of Ashland Creek. The Type E streams are very stable, because they transport suspended sediment and bedload very efficiently. However, this stream type is very sensitive to disturbance due to the limited sediment storage capacity and reliance on the adjacent floodplain for peak flow attenuation. LWM movement through Type E streams is also very limited because the stream power decreases with the decrease in slope and the small channel size physically restricts movement.

Human actions can adversely affect stream processes either directly (e.g., building dams, straightening channels, installing levees, withdrawing surface water, and with crossing structures), or indirectly though land use activities (e.g., road building, vegetation clearing, livestock grazing, soil grading), and creating impervious surfaces (e.g. parking lots, roofs, etc.). Direct impacts generally modify the physical conditions of the stream channel itself, which can modify the flow and sediment transport dynamics, change water quality conditions, and affect in-stream plant and animal habitat. Streams in the Site Scale Analysis Area have not been affected by dams, straightening, or levee construction. However, many of the streams in and around the Current Facility area have been directly or indirectly affected to some extent by road building, vegetation clearing, and creation of impervious surfaces (see Section 6, d, this Chapter).

The density of roads in a watershed can be used as a general measure of direct and indirect affects to the stream network, and the watershed as a whole. As discussed further under Cumulative Watershed Effects, Section 9, e, this Chapter, the Forest Service has utilized a methodology for assigning watershed conditions and determining the relative risk of cumulative watershed effects. Even though the cumulative watershed effects analysis for this Final EIS was performed, as intended, for the Watershed Scale Analysis Areas, applying components of this approach (e.g., road density) at the Site Scale can be informative.

Based on GIS analysis, the total road density in the Site Scale Analysis Area is 3.17 miles of roads per square mile of land area, which indicates a moderate watershed risk (see Table III-11). The road density calculations for each of the four sub-watersheds in the Site Scale Analysis Area ranges from 6.8 (Grouse Creek watershed) to 2.3 (Upper Ashland Creek watershed). The high variability of the road densities between watersheds at the Site Scale is due to the density calculation being heavily influenced by the size and location of the area calculated. The analysis of roads in this Final EIS includes all Forest Service, MAA, County, and private road networks. Roads do not include skid trails, landings, terraces, benches, or windrows.

Table III-11. Summary of Stream Characteristics within Site Scale Analysis Area

Parameter	Upper Ashland	Upper Neil	Upper Cottonwood	Grouse	Total
Watershed Area (acres - Site Scale)	1,065	154	156	94	1,469
Total Stream Length (miles)	5.51	0.07	1.26	0.63	7.47
Drainage Density (mi/mi^2)	3.31	0.29	5.17	4.29	3.25
Road length (miles)	3.86	1.30	1.12	1.00	7.28
Road Area (acres)	8.79	3.15	2.13	2.86	16.93
Road Density (mi/mi^2)	2.32	5.40	4.59	6.81	3.17
Number of Water Withdrawls	1	0	0	0	1
Number of Stream Crossings by Type:					
Roads	6	0	2	3	11
Ski Runs	7	0	0	0	7
Subtotal	13	0	2	3	18
Number Stream Crossings by Structure:					
Culverts	7	0	2	3	12
No structure, open channel	6	0	0	0	6
Subtotal	13	0	2	3	18

As indicated in the above table, there are 11 total road crossings of steams in the Site Scale Analysis Area, all of which contain culverts, and 7 ski run crossings of streams, one with a culvert and six without culverts. There are three roads constructed within the MASA at the Site scale Analysis Area. The other streams are crossed by Forest Service Roads 2000, 300, Bull Gap Trail, and Jackson County Road 1151. All of the existing stream crossings in the Site Scale Analysis area occur on Type Aa+ streams.

Type Aa+ streams in the Site Scale Analysis Area have very limited floodplain development, and therefore, the existing road crossings do not measurably affect floodplain connectivity. The indirect effects of road building include clearing of riparian vegetation, removal of SWM and LWM from blocked culverts, sediment runoff from the road surface, and increased potential for debris flows due to road failure at blocked culverts (Harr et al., 1975 and Naiman, R.J. and R. E. Bilby 1998).

As discussed in detail in Section B, 5 and 7, this Chapter, stormwater from roads and other impervious surfaces in the Current Facility area and on Forest Service roads are treated with a number of Best Management Practices (BMPs) to minimize erosion and to remove sediment from runoff before it is discharged to streams.

Bank erosion caused by headcutting, downcutting and subsequent widening, and lateral scouring during stream channel migration can also be a significant natural and/or human caused source of sediment to streams. The rate of sediment yield to streams from bank erosion is influenced by natural factors such as soil type, channel and valley slope, climate, and land cover, and can be affected by human activities such as vegetation clearing and road building. Dense forest and shrub cover along streams tends to limit bank erosion, while sparse shrub, grass and forb, and nonvegetated cover tends to accelerate bank erosion processes. As evidenced by the low sinuosity of Type Aa+ streams in the Analysis Area, bank erosion by lateral scouring is naturally limited by the steepness of the channel gradient of these streams.

Land cover mapping (vegetation condition) used for analysis in this Final EIS utilizes Landsat TM satellite imagery, digital elevation models, measured field data, local GIS data, and global positioning system (GPS) data. The detailed database associated with the land cover mapping describes canopy closure, average tree size, trees per acre, and percent hardwood, conifer, shrub, and grass (see Section 10, a, for more information on land cover mapping).

According to GIS analysis of land cover along Type Aa+ streams in the Site Scale Analysis Area, approximately 77 percent of the total stream length has vegetative cover, while 23 percent of the total stream length is composed of impervious surfaces (see Table III-12). It should be noted that field observations within the Site Scale Analysis Area revealed that removal of streamside vegetation did not substantially increase bank erosion from channel migration for Type Aa+ channels. However, removal of streamside vegetation may increase bank erosion and channel incision above background levels during large, non-winter peak flow events. Natural and human caused bank erosion during large peak flow events is reduced in the snow zone by the dampening effects of the snowpack on water infiltration.

Natural bank erosion rates from channel migration in Type A streams is generally greater than the Type Aa+ streams, but channel headcutting and downcutting is less than Type Aa+ streams (Rosgen 1996). The result is that Type A streams have relatively constant inputs of sediment from bank erosion during all flow conditions, and Type Aa+ streams have low bank erosion inputs during low flow and very high bank erosion rates during large peak flow events. Channel migration in Type A streams is heavily influenced by channel slope and channel confinement, and as such, rates of bank erosion may not increase substantially following removal of streamside vegetation relative to background bank erosion rates.

Land cover analysis of Type A streams in the Site Scale Analysis Area indicates that roughly 88 percent of the total stream length has vegetative cover, while 12 percent of streams is composed of impervious surfaces (see Table III-16). The high amount of vegetative cover along Type A streams in the Analysis Area increases the resistance of the channel to bank erosion and effects from debris flows.

Due to the unconfined nature of the Type E channels, channel migration and bank erosion could be accelerated if the shrub and grass species along the channel banks were removed. Like with the Type A channels in the Analysis Area, relatively continuous bank erosion occurs during all flow conditions. Due to the location of the Type E streams in a large alpine meadow, 90 percent of the Type E streams have vegetative cover (see Table III-12).

The risk of debris flows along these streams is very low because the channel gradient and slope of the floodplain is not sufficient to initiate these events. In the event that a debris flow from upgradient Type Aa+ streams encounters the Type E streams, large amounts of suspended sediment and debris flow material would likely be deposited in the floodplains of this stream type and would not be appreciably transported downstream, due to the low gradient.

Table III-12. Stream Bank Vegetation Cover - Site Scale Analysis Area

Parameter	Rosgen Stream Type (miles of stream)			
	Type Aa+	Type A	Type E	Total
Upper Ashland Watershed				
Vegetative Cover	3.93	0.74	0.01	4.68
Impervious Surfaces	0.64	0.10	0.09	0.83
Total	4.57	0.84	0.10	5.51
Upper Neil Watershed				
Vegetative Cover	0.02			0.02
Impervious Surfaces	0.05			0.05
Total	0.07			0.07
Upper Cottonwood Watershed				
Vegetative Cover	0.44			0.44
Impervious Surfaces	0.82			0.82
Total	1.26			1.26
Grouse Watershed				
Vegetative Cover	0.62			0.62
Impervious Surfaces	0.01			0.01
Total	0.63			0.63
GrandTtotal	6.54	0.84	0.10	7.47

While it is well documented in scientific literature that LWM plays a key rule in multiple stream ecosystem functions, LWM is not a dominant component of stream channel structure or function in alpine systems (Naiman, R.J. and R. E. Bilby 1998). This finding is supported by the conditions observed in the streams within the Site Scale Analysis Area, which contain approximately 2.3 pieces of LWM per mile, which is Poor, according to the channel condition rating procedures. The low LWM recruitment potential to stream channels is due to the fact that streams within the Site Scale Analysis Area are commonly located in meadows, where there are very few mature trees to provide LWM recruitment.

Even though Type Aa+ streams are characterized as debris transport systems, the Aa+ streams in the Analysis Area generally do not have sufficient channel dimensions or stream power to transport LWM that may be present in the channel to downgradient stream reaches. The streams in the Site Scale Analysis Area are buffered by snow when large flood events usually occur and would not be expected to transport LWM. Seven of the last eight largest peak flow storms since 1909 have occurred in December, January, or February. These large storms produce rains in the transient snow zone, at elevations ranging from 3,500 to 5,000 feet above sea level, in this area. The lowest elevation of proposed clearing for ski runs and lifts is approximately 5,800 feet. This makes the Site Scale Analysis Area above the transient snow zone and would typically be covered by thick blankets of snow, and during the time when rain on snow events occur, snow not rain would fall at these elevations and would not contribute to increased runoff associated with major flood events.

Generally, bank full discharge is much greater for Type A streams than Type Aa+ streams in the Analysis Area. However, transport of LWM is still very limited in Type A streams in the Site Scale Analysis Area because the stream power decreases with the decrease in slope and the entrenched channel morphology physically restricts movement. LWM does play a role in stream morphology in Type A streams in the Site Scale Analysis Area, but only under extreme circumstances would these streams contribute LWM to larger, fish bearing streams.

Streams - Watershed Scale Analysis Area

The analysis of streams at the Watershed ScaleAnalysis Area utilizes stream network information from the RR-SNF and KNF GIS databases, which were used to compile a master stream database for the Upper Ashland, Upper Neil, Upper Cottonwood, and Grouse Creek sub-watersheds**.** Since field surveys were not conducted throughout the four analysis watersheds for the Watershed Scale Analysis Area, the analysis of channel conditions is based primarily on GIS analysis with supplemental information provided by Forest Service stream surveys of the mainstem reaches of Ashland, Neil, and Grouse Creeks. The total length of streams identified using GIS analysis within the Watershed Scale Analysis Area is approximately 119.27 miles (see Table III-13).

GIS data that include channel slope, sinuosity, and valley morphology was used to classify the streams in the Watershed Scale Analysis Area, using the guidance for the Level I evaluation in the Rosgen stream classification method (Rosgen 1996). Similar to the stream types observed at the Site Scale, streams within the Watershed Scale Analysis Area were classified as Types Aa+ and A, which is typical for mountainous terrain. The Analysis Area also contains Type B streams, which are located in the lower portions of the four analysis sub-watersheds, where the channel gradients are more moderate, and the valley bottoms are less constrained. Table III-13 contains a summary of the streams identified within each watershed by Rosgen stream type. The stream length calculations are based on GIS databases, aerial-photograph interpretation, and analysis with GIS software. Streams identified within the Watershed Scale Analysis Area are displayed graphically on Map III-5.

Table III-13. Summary of Streams Identified in Watershed Scale Analysis Area

Watershed	Rosgen Stream Classification	Total Length (miles)
Upper Ashland	Aa+ Stream Type	25.53
	A Stream Type	20.65
	B Stream Type	0.63
	E Stream Type	0.10
	Subtotal	46.91
Upper Neil	Aa+ Stream Type	15.39
	A Stream Type	9.58
	B Stream Type	0.47
	Subtotal	25.45
Upper Cottonwood	Aa+ Stream Type	5.39
	A Stream Type	9.90
	B Stream Type	1.88
	Subtotal	17.16
Grouse	Aa+ Stream Type	16.07
	A Stream Type	12.30
	B Stream Type	1.38
	Subtotal	29.75
	Total	119.27

Stream Type Aa+ is the most common stream type in the Watershed Scale Analysis Area, accounting for 62.39 miles of the 119.27 mile (52%) drainage network within the four watersheds. The channel characteristics, hydrology sources, and sensitivity to disturbances of the Type Aa+ streams in the Watershed Scale Analysis Area are very similar to the Type Aa+ streams at the Site Scale. Due to steep channel gradients and lateral channel confinement, Type Aa+ streams throughout the Watershed Scale Analysis Area have very low in-channel sediment storage capacities and function primarily as sediment transport systems. Therefore, a large proportion of the natural and human induced sediment yield to Type Aa+ streams is transported to other stream types downstream.

The channel conditions of the 52.42 miles (44%) of Type A streams identified in the Watershed Scale Analysis Area are also very similar to Type A streams in the Site Scale Analysis Area. Type A streams are typically located in moderate gradient valley bottoms in the middle to low elevation portions of the watersheds. In comparison to Type Aa+ streams, channel gradient and pool frequency of Type A streams provide for increased sediment storage capacity in the active channel. Type A streams are still sediment transport systems, so even though Type A streams may store some of the sediment from Type Aa+ streams and adjacent upland areas, most of the sediment would still be transported downstream.

The 4.36 miles (4%) of Type B stream channels identified in the Watershed Scale Analysis Area are located in the lowest portions of the watersheds in relatively large valleys with gentle to moderate gradients. Type B streams are characterized as stable, moderate gradient streams, with moderate entrenchment, and usually some floodplain development. The primary hydrology source to most Aa+ streams in the Watershed Scale Analysis Area is surface flow from tributary streams. The channel sinuosity of Type B streams is generally low to moderate due to the moderate channel gradient but confined valley morphology. Channel bed morphology is dominated by riffles, with infrequently spaced pools.

The total area of roads within the Watershed Scale Analysis Area is 284 acres, which is approximately one percent of the total of Analysis Areas. The road density in the Watershed Scale Analysis Area is 2.43 miles/square mile, which according to the *CWE Methodology* indicates a low watershed risk (see Table III-14). GIS analysis indicates that there are a total of 106 stream crossings by roads and 7 crossings by ski runs in the total Watershed Scale Analysis Area. Approximately 75 percent of the 118 road crossings in the four analysis area watersheds occur on Type Aa+ streams, which may increase sediment yield to Type Aa+ streams and increase the already naturally high risk for debris flows.

Road crossings affect Type B streams differently than the Type Aa+ and A streams found higher in the sub-watersheds. The potential for debris flows is not substantially increased by road crossings on Type B streams as expected in Type Aa+ and A streams. Since Type B streams have larger, more active floodplains than the other stream types in the four analysis area watersheds, road crossings can have a much larger affect on the floodplain connectivity of Type B streams than the Type Aa+ and A streams. The two road crossings on Type B streams account for two percent of all road crossings in the Watershed Scale Analysis Area.

Table III-14. Summary of Existing Stream Characteristics in Watershed Scale Analysis Areas

Parameter	Upper Ashland	Upper Neil	Upper Cottonwood	Grouse	Total
Watershed Scale Analysis Area (acres)	12,700	6,715	4,797	6,526	30,738
Total Stream Length (miles)	46.91	25.45	17.16	29.75	119.27
Drainage Density (mi/mi^2)	2.36	2.43	2.29	2.92	2.48
Road length (miles)	37.66	28.82	18.06	32.12	116.66
Road Area (acres)	90.69	69.76	45.86	77.83	284.14
Road Density (mi/mi^2)	1.90	2.75	2.41	3.15	2.43
Number of Stream Crossings by Type:					
Roads	31	18	12	45	106
Ski Runs	7	0	0	0	7
Subtotal	38	18	12	45	113

Land cover analysis of riparian areas along Type Aa+ streams indicates that approximately 84 percent of the total stream length within the four analysis area watersheds is currently in a forested condition, while 16 percent is in a non-forested condition. The Type Aa+ streams in the Analysis Area have the lowest amount of vegetated cover out of all of the major stream types (78 %). As demonstrated by the low amount of vegetation cover along Type Aa+ streams in the Site Scale Analysis Area, forested cover is low along the headwaters of Type Aa+ streams in the high elevation portions of all of the analysis area watersheds. It is assumed that rates of bank erosion for Type Aa+ streams are within the natural range of variability because the limited forested cover at high elevations is a documented natural occurrence in many alpine environments (Naiman, R.J. and R. E. Bilby 1998).

The riparian areas along Type A streams at the Watershed Scale Analysis Area are dominated by forested cover for approximately 90 percent of their total length, and in the absence of roads, contribute less sediment to Type A streams relative to Type Aa+ streams. Bank erosion along Type B streams is low because the riparian areas are also dominated by a high amount of vegetative cover.

Although data for actual occurrence of LWM in stream channels is not available for all four analysis area watersheds, LWM data is included in the Upper Ashland Creek and Upper Neil Creek (see Section D, 12, this Chapter). The Aa+ streams in the Watershed Scale Analysis Area generally do not have sufficient channel dimensions or stream power to transport LWM that may be present in the channel to downgradient stream reaches. However, since Type Aa+ streams are susceptible to debris flows, it is expected that LWM would be transported downstream during these infrequent events.

The transport of LWM in the Type A streams in the higher elevation portions of the Watershed Scale Analysis Area is limited by channel size and stream power, but the larger Type A streams in the lower portions of the four analysis area watersheds more than likely transport LWM during peak flow events. Regardless of whether LWM is transported by Type A streams, LWM plays an active role in driving channel morphology, initiating scour pools, providing invertebrate habitat, and retaining sediment in Type A streams throughout the Watershed Scale Analysis Area. Although LWM counts are not available for all of the Type A streams in the four analysis area watersheds, it can be inferred that the channel condition rating for LWM is Good, based on the high recruitment potential adjacent to Type A streams (see Section D, 12, this Chapter).

The moderate channel gradients and less confined valley bottoms of Type B streams allow LWM to play an active role in stream ecosystem functions. Although LWM counts are not available for all of the Type B streams, it can be inferred that the channel condition rating for LWM is Good, based on the high recruitment potential adjacent to and upstream of Type B streams.

c. Overview of Existing Conditions - Wetlands

Wetlands - Site Scale Analysis Area

Executive Order (EO) 11990, Protection of Wetlands (Carter 1977), calls for the identification, assessment, and protection of wetlands by requiring Federal agencies to avoid, if possible and practicable, adverse impacts to wetlands and to preserve and enhance the natural and beneficial values of wetlands. In order to satisfy conditions of EO 11990, the wetlands in the Site Scale Analysis Area were identified consistently with the methodology outlined in the *Corps of Engineers Wetlands Delineation Manual* (USACE 1987). The methodology found in the *1987 Manual* was implemented with the benefit of current regulations and Regulatory Guidance Letters (RGL) and memoranda (USACE, RGL 82-2 and 86-9) (USACE, Memorandum 3-92). According to the *1987 Manual*, a three-parameter approach is used when making wetland determinations, wherein positive indicators of wetland hydrology, hydric soils, <u>and</u> hydrophytic vegetation all must be present in order to determine that an area is a jurisdictional wetland (USACE 1987).

The wetlands that were identified in the Site Scale Analysis Area were recorded using standard field mapping techniques that utilized aerial photo interpretation, physical measurements (with compass, clinometer, and field tape), and interpretation of topographic maps. Wetland and stream information that was recorded on field maps was digitized and converted into GIS shape files and database files. Additionally, Northwest Biological Consulting published the results of a wetland delineation of the area near the bottom terminal of the proposed LC-6 Chairlift on March 3, 1999. The wetland and stream boundaries were surveyed by Polaris Survey and the resulting digital map was converted from an AutoCAD format to a GIS format, and incorporated into the Site Scale wetland and stream mapping (see Map III-6).

The wetlands within the Site Scale Analysis Area were classified using the Hydrogeomorphic (HGM) approach to wetland classification, which uses seven major hydrogeomorphic wetland classes. These classes are depression, riverine, slope, flats (mineral soil and organic soil), and fringe (estuarine and lacustrine) (Brinson 1993). The HGM approach is based on four types of information: geomorphic setting, water source and transport vector, hydrodynamics, and water chemistry and soil properties. Classifying wetlands based on how they function narrows the focus of attention to a specific type or subclass of wetland, the functions that wetlands in that subclass are most likely to perform, and the landscape and ecosystem factors that are most likely to influence how wetlands in the subclass function.

In the course of the field investigation, 37 wetlands were identified within the Site Scale Analysis Area (Map III-6). It was determined that the total area of wetlands within the Site Scale Analysis Area is 42.5 acres. Table III-15 summarizes the area and hydrogeomorphic type of the wetlands delineated in the Site Scale Analysis Area by watershed location.

As indicated in Table II-15, the Upper Ashland Creek watershed contains the largest area of wetlands out of the four analysis area watersheds due to the fact that the Ashland Watershed also encompasses the most land area out of the four watersheds at the Site Scale. Conversely, no wetlands were encountered in the Neil Creek sub-watershed since the area surveyed only included a very small portion of the upper elevations of the watershed.

Table III-15. Summary of Wetlands Delineated in Site Scale Analysis Area

Watershed	Area of Riverine (1) Wetlands (acres)	Area of Slope (1) Wetlands (acres)	Total Area (acres)	Area of Watersheds within Analysis Area (acres)
Upper Ashland	5.36	23.13	28.49	1,065
Upper Neil	0.00	0.00	0.00	154
Upper Cottonwood	0.00	9.20	9.20	156
Grouse	0.00	4.83	4.83	94
Total	5.36	37.16	42.52	1,469

(1) Wetlands in the Site Scale Analysis Area were classified using the Hydrogeomorphic Method (Brinson 1993).

A total of 37.2 acres of slope wetlands were identified in the Site Scale Analysis Area. These wetlands are generally located in the middle to lower elevation portions of the Site Scale Analysis Area (see Map III-6). Slope wetlands are characterized by a groundwater hydrology source, unidirectional flow of water through the wetland and occur on sloping land. The primary hydrologic input to the slope wetlands in the Site Scale Analysis Area is shallow sub-surface groundwater flow that discharges at or near the surface in response to breaks in slope, slope failures, and/or soil texture changes. The composition of the soils observed in the slope wetlands ranged from mucky organic soils to mineral soils with sandy loam texture classes. Most of the mineral soils observed in the Site Scale Analysis Area contained very coarse sand that developed from decomposed fragments of the granitic parent material in this region. Vegetation in the slope wetlands is dominated by Shasta red fir (*Abies magnifica shatensis*), and mountain hemlock (*Tsuga mertensiana*) in the tree layer around the perimeter of the wetlands; Sitka alder (*Alnus sinuate*), black huckleberry (*Vaccinium membranaceum*), and Sitka willow (*Salix sitchensis*) in the shrub layer; and small-flowered bulrush (*Scirpus microcarpus*), arrow-leaved groundsel (*Senecio triangularis*), California false hellebore (*Veratrum californicum*), common marsh marigold (*Caltha palustris*), bluejoint grass (*Calamagrostis Canadensis*), and mountain arnica (*Arnica latifolia*) in the herb layer.

The 5.4 acres of riverine wetlands that were identified in the Site Scale Analysis Area are generally located on the floodplains adjacent to the Middle Fork of the East Fork of Ashland Creek in the lower elevation portions of the Analysis Area (see Map III-6). The primary hydrologic input to the riverine wetlands is surface water that flows from streams onto adjacent floodplains during high flow events (e.g., spring melt). Secondary hydrologic inputs include shallow sub-surface flow from up-gradient source areas (e.g., valley walls), and from direct precipitation. Riverine wetlands are generally found on active floodplains adjacent to perennial streams with moderate to low entrenchment (Rosgen Type “A” and “E” streams).

The soils observed in the riverine wetlands were generally mineral soils with loamy sand textures and occasionally a mucky mineral layer in the surface horizon. Soil stratification was commonly observed in the upper parts of the soil profile of riverine wetlands, due to the periodic peak flow events from adjacent streams. Vegetation in the riverine wetlands is very similar to the vegetation found in the slope wetlands, and is dominated by infrequent patches of Engelmann Spruce (*Picea engelmannii*), Shasta red fir (*Abies magnifica shatensis*), and mountain hemlock (*Tsuga mertensiana*) in the tree layer; black gooseberry (*Ribes lacustre*), Sitka alder (*Alnus sinuate*), and Sitka willow (*Salix sitchensis*) in the shrub layer; and arrow-leaved groundsel (*Senecio triangularis*), California false hellebore (*Veratrum californicum*), common marsh marigold (*Caltha palustris*), bluejoint grass (*Calamagrostis Canadensis*), and mountain arnica (*Arnica latifolia*) in the herb layer.

Wetlands provide numerous ecosystem functions including; reduction of peak flows due to surface and shallow subsurface water storage, maintenance of summer low flow in streams through moderation of groundwater flow, cycling of nutrients chemically and physically, water quality maintenance through retention of particulates (e.g. nutrients, sediment, etc.), export of organic carbon to downgradient aquatic systems, and maintenance of plant and wildlife habitat (Brinson 1993).

Many of wetland ecosystem functions also have a value to humans, including flood mitigation, maintenance of water quality, removal of pollutants from surface water, and viewing of wildlife (ecosystem services). Since wetland values are based on the human perception of wetland functions and their benefits to humans, the discussion in this section focuses on wetland functions.

All wetlands within a landscape are connected to some degree to downgradient stream and wetlands systems. This connection can be strong both temporally and spatially when a series of riverine wetlands are located in proximity to each other along the floodplain of the same stream. In this case, effects to the stream or one of the riverine wetlands can have an almost immediate effect on many of the functions of the other riverine wetlands. The connection can also be weak, wherein an isolated slope wetland is connected to a distant stream with riverine wetlands. Effects to the slope wetland may take months to years to affect the riverine wetlands downgradient, and only one or two wetland functions may be affected. Therefore, effects to individual wetlands usually result in delayed, indirect effects to the aquatic system and do not have the almost instantaneous cause-and-effect relationship that is observed from direct impacts to streams.

Within the Ashland Creek sub-watershed, maximum surface and ground water flows occur parallel to the stream channels. Soils within identified wetlands are prone to piping as well as rodent activity (Badura 1998). The process of piping, where shallow, high velocity subsurface water transports finer grained material is prevalent throughout the lower wetland in the Middle Fork area. Much of this “piping” is open to the surface.

Placing fill material in a portion of a wetland negates the functions in that area, and can also affect functions in the remaining parts of the wetland, such as uncharacteristic surface and shallow subsurface water storage, reduced moderation of groundwater flow, reduced retention of particulates, lack of export of organic carbon, and reduction in plant and wildlife habitat.

The approximately 37.2 acres of slope wetlands within the Site Scale Analysis Area are generally in an undisturbed condition, with shrub and herbaceous vegetation naturally occurring in most of the wetlands. Based on observation of undisturbed slope wetlands in the Analysis area and in other alpine environments in the region, forest dominated slope wetlands are uncommon in this landscape setting and are not considered the climax stage for undisturbed slope wetlands. Grazing may have affected some of the slope wetlands historically, but evidence of vegetation damage and compaction of soil through trampling was not observed in any of the wetlands in the Site Scale Analysis Area. Therefore, it is assumed that the undisturbed slope wetlands in the Site Scale Analysis Area are functioning at their full potential and within the range of natural variability.

There are approximately 5.4 acres of riverine wetlands in the Site Scale Analysis Area, all of which are located in the Upper Ashland Creek Watershed. The riverine wetlands are located on the small floodplains of the Middle Fork of the East Fork of Ashland Creek in two distinct groups in the middle and lower elevations of the Site Scale Analysis Area. Similar to the slope wetlands, the riverine wetlands may have been affected to some degree by grazing in the past, but no evidence of grazing impacts was observed in the field. Unlike the slope wetlands, the riverine wetlands commonly have trees growing in the wetland area, and in the adjacent upland areas. It is assumed that a forested wetland community is the climax vegetation type for the riverine wetlands in this landscape. Based on the undisturbed nature of the riverine wetlands in the Site Scale Analysis Area, it is assumed that the riverine wetlands are functioning at their full potential and within the range of natural variability.

Wetlands - Watershed Scale Analysis Area

The Watershed Scale analysis of wetlands utilizes information from the RRNF and KNF GIS databases as well as data acquired from the National Wetlands Inventory (NWI). The RRNF obtained NWI mapping in a digital format from the U.S. Fish and Wildlife Service in 1994. The U.S. Fish and Wildlife Service interpreted aerial photographs to map wetland areas and classify the wetlands based on the Cowardian classification system. This information was used to compile a master wetland database for the Upper Ashland, Upper Neil, Upper Cottonwood, and Grouse Creek Watersheds. Since field surveys were not conducted throughout the four analysis area watersheds at the Watershed Scale, the analysis of wetland conditions is based primarily on GIS analysis of land cover and disturbance history of the watersheds. The total area of wetlands identified using GIS analysis within the Watershed Scale Analysis Area is approximately 384.5 acres (see Table III-16).

The wetlands within the Watershed Scale Analysis Area were classifying according to the HGM approach using GIS data that included slope, land cover, stream locations, and valley morphology (Brinson 1993). The location and abundance of various wetland types at the Watershed Scale is very similar to conditions observed at the Site Scale.

The Watershed Scale Analysis Area contains approximately 368.9 acres of slope wetlands and 15.6 acres of riverine wetlands. Table III-16 contains a summary of the wetlands identified within each watershed by HGM type. The wetland area calculations are based on the RRNF and KNF GIS databases, aerial-photograph interpretation, and analysis performed with GIS software.

Table III-16. Summary of Wetlands at Watershed Scales

Watershed	Area of Riverine Wetlands (acres)	Area of Slope Wetlands (acres)	Total Area (acres)	Area of Watersheds (acres)
Upper Ashland	10.65	176.48	187.13	12,700
Upper Neil	1.30	80.56	81.86	6,715
Upper Cottonwood	0	20.15	20.15	4,797
Grouse	3.64	91.70	95.34	6,526
Total	15.59	368.89	384.48	30,738

d. Overview of Existing Conditions - Flow Regime

Under Executive Order 11988, "Floodplain Management," the term "floodplain" is defined as the lowland or relatively flat area adjoining inland waters, including at a minimum, "...that area subject to a one percent or greater chance of flooding in any given year." A one percent chance of flooding in any given year can also be defined as the 100-year recurrence interval, more commonly referred to as the "100-year flood." The concept of recurrence interval is used to describe the frequency of a particular flood event. Recurrence intervals are used as a means to estimate flooding probability and to determine the basis for structure design such as the proposed bridge at the lower Run 12 crossing.

At the larger watershed scales, maximum peak stream flows have typically resulted from rain-on-snow events. When rainfall and snowmelt are synchronized, there is often a substantial increase in peak flow, and flooding may occur. In comparison to summer thunderstorms, winter storms have historically brought the most devastating flooding in southwest Oregon. The most severe floods occurred in the winters of 1853, 1861, 1890, 1927, 1948, 1955, 1964, 1974, and 1997. The most recent flood (New Years Day 1997) was a 25 to 30 year event (a level or magnitude of flooding that would be expected to occur only once in 25-30 years).

The potential changes in stream flow conditions as a result of proposed expansion activities has been introduced as an issue during the public scoping process for the MASA expansion proposal. The 2000 DEIS for the MASA expansion proposal contained an engineering study that analyzed the potential changes in the 100-year flood event elevation for the purposes of designing the proposed bridge crossing of the Middle Fork of the East Fork of Ashland Creek (Philip Williams & Associates 1999). This study was appropriate for the design of the proposed bridge, however the small scale of this analysis does not provide information sufficient to address the issue of flow regime effects for the Upper Ashland Creek Watershed, nor did the model address the other three Watershed Scale Analysis Areas.

Another hydrologic investigation of the entire Upper Ashland Creek Watershed was performed using the Index Flood Method[5] in 1997 by Otak, Inc. However, the objective of this analysis was to determine the peak flow of Ashland Creek for different recurrence intervals (2-year, 5-year, 10-year, 25-year, 50-year, and 100-year peak flow events) and was not meant to be a predictive model (Otak, Inc. 1997). Therefore, the potential effects of the Proposed Action on various stream flow conditions in the Upper Ashland Creek Watershed cannot be adequately predicted with the Otak model because it does not account for land cover changes (e.g.. timber harvest, road construction, etc.), which can influence the timing, duration, and magnitude of low flow and peak flow conditions.

The previous stream flow analysis models that were performed on Ashland Creek would not adequately analyze the effects of the alternatives on the flow regime of Ashland Creek. As a result, a customized stream flow model was developed to estimate the potential changes in stream flow conditions due to land cover changes from the alternatives, within the four Watershed Scale analysis areas. The dominant land cover change that affects stream flow conditions is large-scale timber harvest, which increases residual soil moisture due to the excess water that would normally be used by trees through processes called transpiration and interception. The increased soil moisture contributes additional groundwater flow to streams in the treated area, especially in riparian areas adjacent to streams (Keppeler 1998). Research conducted in the Pacific Northwest indicates that timber harvest in small watersheds (60-300 acres) can increase annual water yield by as much as 26 to 43 percent in completely clear cut watersheds, and can increase annual water yield in partially cut watersheds by 3 to 15 percent (Harr et al. 1979; Harr et al. 1982; Keppeler 1998). However, large, damaging peak flows that transport most of the sediment were not significantly affected by logging in studies in Western Oregon (Harr, 1976; Rothacher, 1973).

The construction of impervious surfaces (e.g., roads and parking lots) can substantially increase storm flow by preventing rainfall from percolating into the soil, creating runoff that, depending on location, can contribute surface flow directly to streams (Wright et al. 1990). The effect that road building has on stream flow conditions has been studied at several locations in the Pacific Northwest in lower elevation, rain-dominated watersheds. One study documented storm flows in South Fork of Caspar Creek in northern California following road construction on 5% of the watershed. At this level of construction, no change in storm flow was seen (Ziemer 1981). In other studies, no increases in peak flow were found until roads and other impermeable areas totaled more than 12% of a watershed (Harr, et al. 1975, Harr, 1976).

Since stream flow conditions can be analyzed in several temporal and spatial scales, it is useful to describe changes in flow conditions at a few key recurrence intervals that are of most concern for a specific stream flow study. The concept of recurrence interval is commonly used to describe the statistical probability that a particular flow event will be exceeded in any given year. For the purposes of this Final EIS, the existing stream flow conditions were calculated and presented as annual low flow, average annual flow, and 2-year instaneous peak flow for the gauged watersheds in the Watershed Scale Analysis Areas.

[5] The Index Flood Method is the selected methodology for use in peak flow estimation in both this analysis and the 1997 hydrologic investigation conducted for the City of Ashland on Ashland Creek (Otak 1997). This method incorporates actual streamflow data from nearby gauged watersheds that are hydrologically similar to Ashland Creek, to estimate the stream flow of Ashland Creek at various flood events using multiple regression analysis.

These specific flow conditions were selected for analysis because, according to published literature, these are the flow conditions most likely to be affected at the Watershed Scale by land cover changes at the Site Scale from the implementation of the proposed actions (Beschta et al., 2000; Burton 1997; Keppeler 1998; Hicks et al., 1991).

The analysis of the existing conditions of the gauged streams at the Watershed Scale relative to the three analysis parameters are presented in subsequent sections in this Chapter. The analysis of the potential affects of the Proposed Action and alternatives on stream flow conditions at the Watershed Scale is presented in Chapter IV, Section C, 8, c.

East Fork of Ashland Creek

The U.S. Geological Survey (USGS) or the Forest Service has maintained a stream gaging station at the mouth of the East Fork of Ashland Creek intermittently since 1924. The period of record of the data for the East Fork gauge is 15 years, spanning three sets of sequential years from 1924 to 1982. The East Fork and the West Fork gauges were recently re-activated (September 2002) through additional funding support by the Forest Service and the City of Ashland.

The USGS provides statistical summaries of gauge data from all of the stations that they operate in annual water resources reports. The USGS calculated annual low flow, average annual flow, and the 2-year instantaneous peak flow for the East Fork of Ashland Creek watershed is presented below in Table III-17 (expressed in cubic feet per second (cfs)). Since the USGS operated gauges on the East Fork and the West Fork of Ashland Creek were both re-activated in 2002, there is an opportunity to use these stations to monitor the actual effects (if at sufficient levels to be detected) on the flow regime of the East Fork of Ashland Creek, should an expansion alternative be authorized.

Table III-17. Gauged Flow Conditions - East Fork of Ashland Creek

Annual Low Flow (cfs)	Average Annual Flow (cfs)	2-Year Peak Instantaneous Flow (cfs)
2.1	9.37	74
Source: U.S. Geological Survey Water-Data Report OR-82-2, 1982; 2-Year Instantaneous Peak Flow from Oregon Water Resources Department.		

Middle Fork of East Fork of Ashland Creek

Public and agency comments to the 2003 DEIS identified observations of substantial surface flow in the Middle Fork of the East Fork of Ashland Creek, as well as hydrated vegetation in the immediate vicinity of the creek in August 2003 in contrast to much lower flows and vegetation conditions outside riparian areas.

The wetlands along the Middle Fork of East Fork are readily seen. The ground is saturated and water can be seen flowing across an impervious surface in places where surface soil is exposed. While this is easily observed, quantification of the volume of water (flow) contributed by these areas is not easily calculated.

Public comments report a flow of around 10 cfs being observed in the Middle Fork East Fork in mid-August 2003. A check of the U.S. Geological Survey gaging station records for the East Fork of Ashland Creek just above Reeder Reservoir shows that the total flow downstream at this location at that time was about 3.9 cfs (8/19/03). Therefore the observed flow in (upstream) Middle Fork could not have been 10 cfs as reported.

On October 24, 2003, the Forest Service Permit Administrator and Forest Hydrologist made measurements of the flow in the Middle Fork East Fork Ashland Creek. At that time, the flow in this stream was measured at approximately 0.3 cfs. Flow on the East Fork Ashland Creek at the USGS gaging station on this date was 3.5 cfs. Therefore, the approximate contribution of the Middle Fork East Fork to the total flow in East Fork was 8.6%. Using this percentage as a base, with a flow of 3.9 cfs in East Fork Ashland Creek in mid-August, the contribution of Middle Fork East Fork would have been approximately 0.34 cfs. The drainage area for Middle Fork East Fork at its confluence with East Fork is about 515 acres, which is just slightly less than 10% of the 5,210-acre total drainage area for East Fork Ashland Creek at the gaging station. Given the errors in measurements of both flow and drainage area, it appears that the flow in Middle Fork of East Fork Ashland Creek is not inconsistent with its drainage area and that it contributes neither more nor less than would be expected from a drainage of its size.

Upper Neil Creek

No gauging station data is available for Neil Creek or its tributaries. A period of record of approximately 5 to 10 years would be required to develop the statistics necessary to estimate the three analysis parameters utilized in this analysis. Therefore, it is not practicable to install a stream gauge in the Upper Neil Creek watershed specifically for this EIS analysis. For the purposes of comparison, however, the three analysis parameters were roughly estimated by correlating discharge density data from the East Fork of Ashland Creek and West Fork of Ashland Creek gauges, to the Upper Neil Creek watershed, based on watershed area. The estimated annual low flow, average annual flow, and the 2-year instantaneous peak flow for the Upper Neil Creek watershed is presented in Table III-18.

Grouse Creek

As with Neil Creek, no gauged data is available for Grouse Creek or its tributaries. Likewise, it is not practicable to install a stream gauge in the Grouse Creek watershed specifically for this EIS analysis. For the purposes of comparison, however, the three analysis parameters where also roughly estimated by correlating discharge density data from the East Fork of Ashland Creek and West Fork of Ashland Creek gauges, to the Grouse Creek watershed, based on watershed area. The estimated annual low flow, average annual flow, and the 2-year instantaneous peak flow for the Grouse Creek watershed is presented below, in
Table III-18.

Upper Cottonwood Creek

As with Neil and Grouse Creeks, no gauged data is available for Cottonwood Creek or its tributaries. Likewise, it is not practicable to install a stream gauge in the Cottonwood Creek watershed specifically for this EIS analysis. For the purposes of comparison, however, the three analysis parameters where roughly estimated by correlating discharge density data from the East Fork of Ashland Creek and West Fork of Ashland Creek gauges, to the Upper Cottonwood Creek watershed, based on watershed area. The estimated annual low flow, average annual flow, and the 2-year instantaneous peak flow for the Upper Cottonwood Creek watershed is presented below, in Table III-18.

Table III-18. Estimated Flow Conditions in the Upper Neil Creek, Grouse Creek, and Upper Cottonwood Creek Watersheds

Watershed Analysis Area	Estimated Annual Low Flow(1) (cfs)	Estimated Average Annual Flow(1) (cfs)	Estimated 2-Year Instantaneous Peak Flow(1) (cfs)
Upper Neil	2.4	10.5	112
Grouse	2.3	10.2	119
Upper Cottonwood	1.7	7.5	78

(1) The flow estimates are not predictive, they are for comparative purposes only. Estimated stream flow is based loosely on discharge and drainage area relationships between ungauged data, and gauged data from the East Fork and West Fork of Ashland Creek. 2-Year Instantaneous Peak Flow from Oregon Water Resources Department.

e. Hydrologic Conditions - Upper Ashland Creek Watershed

The majority of the Site Scale Analysis Area is contained within the Upper Ashland Creek Watershed. The majority of the existing MASA lies within the Upper Ashland Creek Watershed. The Ashland Creek Watershed is the primary drinking water source for the City of Ashland and is a major tributary to Bear Creek, which is located within the Middle Rogue sub-basin of the Rogue Basin. According to the Bear Watershed Analysis, the Upper Ashland Creek Watershed is comprised by the East Fork sub-watershed and the West Fork sub-watershed. It is primarily within the East Fork sub-watershed where proposed disturbance would occur; there are no activities proposed in the West Fork sub-watershed.

Streams - Site Scale

The 1,065 acre Site Scale Analysis Area for the Upper Ashland Creek watershed contains approximately 5.51 miles of stream channels. The drainage density at the site scale is 3.31 miles of stream per square mile of land area. The Site Scale Analysis Area contains 3.86 miles of road, which on an acreage basis, represents approximately 0.8 percent of the Site Scale Analysis Area.

Approximately 58 percent of the road miles within the Site Scale are from Forest Service system roads, Bull Gap Trail, and Jackson County Road 1151, while the remaining 42 percent are MASA SUP roads (see Appendix G, Roads Analysis). The road density in the Upper Ashland Creek watershed at the Site Scale is 2.32 miles per square mile, which is considered Low, according to cumulative effects methodology (see Table III-11). There are three MASA roads with culverts that cross Type Aa+ streams in the Analysis Area and seven ski run crossings of streams, one of which contains a culvert. The remaining six ski run crossings of streams have not directly modified the stream channels, although SWM has been added to some crossings to prevent erosion from downcutting (see Table III-11). Three road crossings with culverts exist on Type A streams along the Bull Gap Trail.

As indicated in the overview of existing conditions, the areas that have been disturbed at the road and ski run crossings increase the potential for sediment delivery to streams. The potential for debris flows generated by culvert blockages and road failures is Low within the Site Scale because road crossings are located in the headwaters of ephemeral streams where stream power is generally insufficient to cause road failures.

The riparian areas along the streams in the Site Scale Analysis Area are dominated by vegetative cover (71 percent), and therefore, the overall potential for bank erosion in stream reaches without road crossings is Low (see Table III-11). The potential for bank erosion is increased at the six road crossings and one ski run crossing in the Site Scale Analysis Area due to increased scour at the inlet and outlet of the culverts. Although the culvert crossings are routinely maintained, implementation of additional erosion control measures would reduce bank erosion and sediment inputs from roadside ditches at these crossings**.**

Analysis of aerial photographs taken in the early 1960s indicated that three gully features were present near the current location of the Comer Chairlift, before MASA was developed. Historical grazing and clearing and grading associated with the construction of MASA appears to have increased bank erosion and channel downcutting in these gullies. Through revegetation and restoration projects by MASA, two of the gullies have been restored and rates of bank erosion have been greatly reduced. The observed abundance of LWM at the Site Scale is 2.7 pieces per mile; abundance is Poor. The channel dimensions of the Type Aa+, A, and E stream channels in the Analysis Area are too small to transport LWM to downstream reaches.

Streams - Watershed Scale

The Upper Ashland Creek Watershed is a 12,700-acre drainage that is steep and dissected with many small tributaries. From several springs on the north slope of Mt. Ashland, East Fork Ashland Creek flows 7.3 miles north to its confluence with the West Fork of Ashland Creek at Reeder Reservoir. Hosler Dam impounds Ashland Creek at the confluence of the East and West Forks, creating Reeder Reservoir. Elevations of the creek range from 2,900 feet at its mouth to 6,800 feet on Mt. Ashland. East Fork Ashland Creek is a third order stream with Bull Gap Creek as a major tributary, which contributes roughly 25 percent of the flow based on the size of the Bull Gap source area (Strahler 1957). Approximately sixteen other tributaries contribute flow to the East Fork of Ashland Creek.

The Upper Ashland Creek watershed contains approximately 46.91 miles of streams based on GIS analysis. The drainage density of streams in the Analysis Area is roughly 2.36 miles per square mile, which is an average density relative to the other three analysis watersheds. Classification of the streams in the Upper Ashland Creek watershed using the Rosgen method revealed that 54 percent of the total stream length is Type Aa+ streams, 44 percent are Type A streams, one percent are Type B streams, and less than one percent are Type E streams.

There are approximately 37.66 miles of roads within the Watershed Scale Analysis Area, which represents roughly one percent of the area of the watershed. The road density in the Analysis Area is 1.90 miles per square mile, which is considered a Low watershed risk and is the lowest road density of the four analysis watersheds. There are a total of 31 road crossings of streams and seven ski run crossings in the Upper Ashland Creek watershed. Approximately 65 percent of the road crossings are on Type Aa+ streams, 32 percent are on Type A streams, and one road crossing of a Type B stream, near Reeder Resevoir.

Based on GIS analysis of land cover by stream length, the streams in the Analysis Area have nine percent impervious surfaces along them and 91 percent have vegetative cover. The overall potential for bank erosion in stream reaches without road crossings is Low due to the high amount of streamside vegetation (see Table III-14). The increased potential for bank erosion and road failure initiated debris flows road crossings was demonstrated in the Analysis Area by numerous road failures that occurred during the flood of 1974. During the flood recovery effort, the Forest Service replaced road crossings with structures that were specially engineered to withstand large flood events; should culverts get blocked, water flows over the road.

The following paragraphs summarize channel conditions observed during detailed stream reach surveys that were performed for the 1995 *Bear Watershed Analysis* along the mainstem of the East Fork of Ashland Creek. The survey information does not necessarily correlate with the GIS analysis conducted for this EIS, due to the detailed nature of these surveys.

The Type A streams observed in the Watershed Scale Analysis Area are characterized as entrenched, steep gradient (4 to 10 percent), confined cascading step/pool streams, with a cobble substrate. The Type B streams observed in the Watershed Scale Analysis Area are characterized as moderately entrenched, moderate gradient (2 to 4 percent), riffle dominated, infrequently spaced pools, stable banks, and a cobble substrate. Three valley types dominate the Middle Fork area: alluvial, colluvial, and bedrock canyons (Frissell 1986). See the Fish Distribution and Aquatic Habitat section in the 1995 *Bear Watershed Analysis* for additional description of the stream channel and canyon types.

The width to depth ratios for the East Fork of Ashland Creek are in the range of 7-11 for all reaches surveyed, with an average of 9.4. The expected range of width to depth ratios for the natural range of variability for Rosgen Type A streams is 12 and for Type B Streams 12-30. Similar data indicating moderate entrenchment and low width to depth ratios were also found in a 1990 survey of Ashland Creek, indicating that it is the normal condition over the past decade and not the result of the 1997 New Year's Day Flood. Width to depth ratios and channel types are within natural ranges and site potential for East Fork of Ashland Creek.

All surveyed reaches of the East Fork of Ashland Creek have moderate entrenchment ratios that range from 1.6 to 2.1. The entrenchment ratio is calculated by dividing the width of the flood prone area by the bankfull width of the channel (Rosgen 1996). The expected entrenchment ratio for Type A stream is less than 1.4. Entrenchment ratios were higher than anticipated, although the channel does not appear to be disconnected from floodplains when they were present. This indicator is considered an inappropriate measure of channel condition for streams in the Upper Ashland watershed due to very steep channel gradients with narrow and confined valleys.

At the Watershed Scale, Upper Ashland Creek contains appropriate amounts of LWM in the mainstem channel relative to surveys of undisturbed streams in the Siskiyou Mountains on NFSL. The abundance of LWM in the mainstem of the West Fork and the East Fork of Ashland Creek averaged 180 pieces per mile with a range of 51 to 326 pieces per mile; LWM abundance is Good, along the mainstem of the West Fork and East Fork of Ashland Creek. The absence of timber harvest in this restricted watershed is largely responsible for the high abundance of LWM in the channel (*Bear Watershed Analysis* 1995).

Wetlands -Site Scale
The portion of the Upper Ashland Creek Watershed within the Site Scale Analysis Area contains 23.1 acres of slope wetlands and 5.4 acres of riverine wetlands. As stated in the overview section, all of the riverine wetlands at the Site Scale are located within the Upper Ashland Creek watershed and are functioning appropriately. One slope wetland on Pumphouse creek is located directly downgradient of a road fill, which may have affected the upgradient portion of the wetland when the road was installed. Based on observation of the local topography, it is estimated that the wetland impact, if any, was to approximately 500 square feet (0.01 acre). The remaining 0.32 acre of this slope wetland has relatively undisturbed plant communities, relatively stable rates of sediment input and retention (vegetation not smothered by sediment), and a mostly forested upland community around it. A water withdrawl used for drinking water for the ski area is located in the lower part of the wetland. The export of water from this wetland by the withdrawl does not appear to be affecting the plant community and the wetland boundary was observed to be stable.

Two unintentionally created slope wetlands totaling 0.06 acre in size are located within the Current Facility area, near the bottom terminal of the Ariel Chairlift, and adjacent to the midpoint of the Comer Lift. It appears that these wetlands were created when shallow groundwater was encountered during past grading activities. Due to the disturbed condition of these slope wetlands, they have a low level of function. However, since these wetlands are human-made, they represent a net increase in function for the aquatic system as a whole.

f. Hydrologic Conditions - Upper Neil Creek Watershed

Neil Creek flows northeasterly from Mt. Ashland, to its confluence with Emigrant Creek. Here, the two streams form the headwaters of Bear Creek at river mile 26.2, near the City of Ashland. The Upper Neil Creek watershed encompasses about 6,715 acres (10.5 square miles). Neil Creek is approximatley 11.8 miles long and a major tributary of Bear creek. Elevations within the Neil Creek watershed range from 6,690 feet above sea level near the top of the Sonnet Lift, to 1,840 feet at its confluence with Bear Creek.

The RRNF manages much of the lands within the Upper Neil Creek watershed, while the lower watershed is on private land in timber production and residential use. Approximately 75 percent of the lands in the Upper Neil Creek watershed are within the NFSL boundary and are administered by the RRNF, with the remainder in other ownership. The Upper Neil Creek watershed is not a Key Watershed under the Northwest Forest Plan.

Streams - Site Scale
One short segment (360 linear feet) of a Type Aa+ stream was identified in the 154 acre Analysis Area. The road density in the Upper Neil Creek Watershed is High at the site scale (4.9 miles per square mile), due primarily to the location and small size of the Analysis Area. There are no road or ski run crossings of this stream in the Analysis Area. No LWM was observed in the stream channel within the Site Scale Analysis Area.

Streams - Watershed Scale

Analysis of the Upper Neil Creek watershed using GIS software indicates that 25.45 miles of stream are present in the 6,715 acre watershed, resulting in a drainage density of 2.43 miles per square mile. Classification of the streams in the Upper Neil Creek watershed revealed that 60 percent of the total stream length is Type Aa+ streams, 38 percent are Type A streams, and two percent are Type B streams. The road density in the Upper Neil Creek watershed is 2.8 miles/square mile, which is considered a Low watershed risk and is very similar to the road density of the Upper Cottonwood Creek watershed (USDA FS 1993). There are 21 road crossings of streams and no ski run crossings in the Upper Neil Creek watershed, 86 percent of which are on Type Aa+ streams.

The Upper Neil Creek sub-watershed contains the largest number of clear cut units (20) being harvested within the Bear Creek fifth-field watershed over the past twenty-five years, which increases the likelihood of accelerating landslide movements over time (*Bear Watershed Analysis* 1995). According to GIS analysis, the Type Aa+ streams have 2 percent impervious surfaces along them and 98 percent as vegetative cover. The potential for stream bank erosion and localized mass wasting is relatively high in the Upper Neil Creek watershed due to the combination of road crossings on steep Type Aa+ streams and lack of vegetative cover in riparian areas to retain sediment and anchor stream banks.

The following paragraphs summarize channel conditions observed during detailed stream reach surveys that were performed for the 1995 *Bear Watershed Analysis* along the mainstem of Neil Creek. The survey information may not correlate with information obtained through GIS analysis, due to the detailed nature of these surveys. The upper reach (Reach 5) of Neil Creek alternates between steep gradient, colluvial and/or bedrock canyons. Reach 5 is classified as a Rosgen stream Type Aa+ with average 12 percent gradient. Middle reaches 3 and 4 are classified as a Rosgen stream Type A with an averaged 8 percent gradient. On lower reaches 1and 2, average gradient is 4 percent and are classified as a Rosgen stream Type B. Downstream of NFSL, the stream is a Rosgen stream Type B, 2-4 percent gradient with inclusions of a stream Type C channel, less than 2 percent gradient. No known data exists for existing channel conditions of Neil Creek on private lands.

Bankfull width to depth ratio ranges from approximately 18 in Reaches 1, 3, and 4; 34 in Reach 2; and 15 in Reach 5. Expected range for a Rosgen Type B stream channel, is a 12 to 30 width to depth ratio, and Rosgen stream Types A and Aa+ is less than a 12 width to depth ratio. The data collected on NFSL within the Upper Neil Creek watershed displays generally wide and shallow stream channels, classified overall as not within the natural range of variability for width to depth ratio.

Expected conditions for streams in the Upper Neil Creek watershed is an entrenchment ratio of 1.4 to 2.2 for stream Type B, and less than 1.4 for stream Types A and Aa+ (Rosgen, 1996). Entrenchment ratios were within the expected range for a B stream type in Reach 1 (1.5) and Reach 2 (1.8). Reaches 4 and 5 had entrenchment ratios that were higher than anticipated, 2.1 and 1.7 respectively. Reach 3, stream Type A, was within the expected range (1.3). The channel appears to be connected to its floodplain within these reaches, however, floodplain development is naturally limited by the narrow valley bottom.

At the Watershed Scale, Neil Creek contains relatively low amounts of LWM in the mainstem channel, relative to the Upper Ashland watershed, and surveys of undisturbed streams in the Siskiyou Mountains on NFSL. The abundance of LWM in the mainstem of the Neil Creek averaged 55 pieces per mile with a range of 19 to 82 pieces per mile. Even though LWM abundance in Neil Creek is in the lower range of expected conditions, LWM abundance is considered good. Past timber management activities are responsible for the removal of some LWM from the channel, particularly on private lands.

Wetlands - Site Scale

There were no wetlands delineated in the Site Scale Analysis Area within the Upper Neil Creek watershed. This is primarily due to the small size of the Site Scale Analysis Area for this watershed (154 acres), which is located entirely within the headwaters of Neil Creek near the crest of the watershed divide.

g. Hydrologic Conditions - Grouse Creek Watershed

The Grouse Creek watershed is approximately 10.20 square miles (6,526 acres) in area, and is primarily located on NFSL that is administered by the KNF (85 percent), with some Bureau of Land Management (BLM) land (four percent), and the remaining 11 percent owned by private entities. Grouse Creek flows into Cow Creek approximately 7.5 miles from its headwaters where the two creeks become Beaver Creek. The Beaver Creek watershed encompasses 69,700 acres, with 64 percent on Federal lands and 36 percent on private lands. This south-facing watershed is subject to summer thunderstorms and winter rain-on-snow events, typical of other watersheds throughout the region. Although most precipitation falls in winter through spring, there may be substantial rainfall from intense summer thunderstorm cells generated on the south side of Mt. Ashland. The upper end of this watershed lies within the high elevation snow zone, having deep infiltration and slow precipitation release.

This watershed is highly roaded providing easy access for human uses and for fire suppression. The high volume of roads within the Grouse Creek watershed contribute to the majority of current accelerated erosion and mass wasting, especially within Grouse Creek, which has a very high soil erodability index due to the predominantly granitic soils (*Beaver Creek Ecosystem Analysis* 1996b).

Streams - Site Scale

The 94 acre portion of the Grouse Creek watershed within the Site Scale Analysis Area contains six segments of Type Aa+ streams, totaling 0.63 miles of stream channels. The road density in the Grouse Creek watershed is high at the Site Scale (5.7 miles/square mile), and similar to Neil and Cottonwood Creeks, due primarily to the ridge-top location and small size of the Analysis Area. There are three road crossings of Type Aa+ streams and no ski run crossings of streams in the Site Scale Analysis Area. The riparian areas along the streams in the Analysis Area are dominated by bank destabilizing cover, and therefore, the potential for bank erosion and gully formation and extension is high. No LWM was observed in the stream channel in the Site Scale Analysis Area.

Streams - Watershed Scale

There are approximately 29.75 miles of streams in the Grouse Creek watershed, with a drainage density of 2.92 miles per square mile. GIS analysis indicates that that 54 percent of the total stream length is Type Aa+ streams, 41 percent are Type A streams, and five percent are Type B streams. The road density at the Watershed Scale of 3.15 miles per square mile indicates a high watershed risk. As expected by the combination of the high road density and the high drainage density, there are 48 road crossings of streams in the Grouse Creek watershed. Approximately 81 percent of the road crossings of streams are on Type Aa+ streams, with the remaining 19 percent on Type A streams. The high elevation portions of the Grouse Creek watershed are dominated by shrub and grass cover, and as a result, the Type Aa+ streams at the Watershed Scale have 9 percent bank destabilizing cover and 91 percent as bank stabilizing cover along their stream length.

As indicated in the 1996 *Beaver Creek Ecosystem Analysis*, the sediment yield to Grouse Creek from erosion and mass wasting is 330 percent above undisturbed levels due to the combination of timber harvest, high road density and crossings, and naturally highly erodible ganitic soils. Since erosion and mass wasting in the Grouse Creek watershed is over 200% above undisturbed levels, the watershed is considered "over threshold" and has been identified as an "Area with Watershed Concerns". The following paragraphs summarize information contained in the *Beaver Creek Ecosystem Analysis*, which is based on channel conditions observed during detailed stream reach surveys.

Physical habitat inventories and biological surveys were conducted in Beaver Creek and some tributaries in 1989. The portion of Grouse Creek located within the Grouse Creek sub-watershed was not surveyed. Stream survey data from the main stem Beaver Creek was used for the current conditions, to give a general overview of conditions within the analysis area.

No data exists within Beaver Creek watershed for width depth ratios and entrenchment ratios by stream type. No data exists for the Beaver Creek watershed regarding floodplain connectivity. Most channels in the Grouse Creek watershed have been classified as either Rosgen Type A or B stream types based on GIS analysis and professional experience (USDA FS, Kilgore, pers. com. 2002). Floodplain connectivity is not as relevant for these steep gradient streams where floodplain development is confined in narrow valleys.

The disturbances that contribute to the majority of current accelerated erosion are roads and timber harvest. Roads through granitic soils are the most susceptible to erosion. Most roads in the Grouse Creek Watershed have well vegetated cuts and fills and many roads have been treated in recent years (outsloped, narrowed, inboard ditches removed, rock armored) to reduce road erosion. The greatest channel erosion caused by roads occurs when a road-caused debris torrent scours a channel below the debris source, often when a culvert plugs and high water washes out the road fill over the culvert. Preliminary surveys indicated that many culverts in the Beaver Creek watershed are undersized and may fail during large flood events (*Beaver Creek Ecosystem Analysis* 1996).

Recent Watershed Improvement Needs (WIN) inventories identified several hundred projects to help decrease erosion from roads in the Beaver Creek Watershed. The majority of these improvement projects involve decreasing erosion (mostly gullying) on road cut and fill slopes. A large number of the projects are intended to decrease damage to the road surface while decreasing erosion (*Beaver Creek Ecosystem Analysis* 1996). These sites are not within or adjacent to the SUP or Site Scale Analysis Area.

Wetlands - Site Scale
The Grouse Creek watershed contains 4.83 acres of slope wetlands and no riverine wetlands at the Site Scale. Slope wetlands are dominated by shrub and herbaceous vegetation and do not currently appear to be impacted by grazing. Three of the slope wetlands in the Grouse Creek watershed have been bisected by Forest Road 20. Due to the location of the road in the middle of these wetlands, and since they are located on steep slopes, the road affects the storage of surface and shallow subsurface flow, increases sediment inputs, limits the ability of the wetland to moderate groundwater flow, and reduces available plant and animal habitat. Overall, the slope wetlands in the Grouse Creek watershed have a Moderate level of function.

h. Hydrologic Conditions - Upper Cottonwood Creek Watershed

Upper Cottonwood Creek drains an area of about 7.5 square miles (4,797 acres) and enters the Klamath River near the town of Hornbrook, California. The City of Hornbrook uses Rancheria Gulch, a tributary of Cottonwood Creek to the west of town, for municipal water supply in addition to two wells. The majority of the flow is captured at the water plant west of Interstate 5. The Upper Cottonwood Creek watershed is also subject to summer thunderstorms and winter rain-on-snow events. Although most precipitation falls in winter through spring, there may be substantial rainfall from intense summer thunderstorm cells generated on the south side of Mt. Ashland.

Upper Cottonwood Creek includes a mix of interspersed private and Federally managed lands. The main stem of Cottonwood Creek is almost entirely within private ownership, and supports anadromous fish in its lowest reaches. Federal lands within the Cottonwood Creek Watershed are not designated as Key Watershed.

Streams - Site Scale
The Site Scale Analysis Area for the Upper Cottonwood Creek watershed is 156 acres in size. The Site Scale Analysis Area contains a complex of 11 Type Aa+ stream segments and 4 wetlands, totaling 1.26 miles of stream channels. The road density in the Upper Cottonwood Creek watershed is High at the Site Scale (3.7 miles per square mile), and similar to Neil and Grouse Creeks, due primarily to the ridge-top location and small size of the Analysis Area. There are 2 road crossings of Type Aa+ streams and no ski run crossings of streams in the Site Scale Analysis Area.

The riparian areas along the streams in the Analysis Area are dominated by impervious surfaces (65 percent), and therefore, the potential for bank erosion and gully formation and extension is High. The observed abundance of LWM at the Site Scale is 2.3 pieces per mile; abundance is Poor. The channel dimensions of the Type Aa+ stream channels in the Site Scale Analysis Area are too small to transport LWM to downstream reaches.

Streams - Watershed Scale
The Upper Cottonwood Creek watershed contains approximately 17.16 miles of stream according to GIS analysis. The drainage density of this 4,797 acre watershed is 2.29 miles per square mile, which is the lowest drainage density of the four analysis watersheds. In contrast to the other three analysis watersheds, Type A streams are the most abundant stream type in the Upper Cottonwood Creek watershed (58 percent), 31 percent are Type Aa+ streams, and 11 percent are Type B streams.

The road density in the Upper Cottonwood Creek watershed is 2.41 miles per square mile, which is considered a Moderate watershed risk. There are 21 road crossings of streams and no ski run crossings in the Upper Cottonwood Creek watershed. Approximately 67 percent of the road crossings are on Type Aa+ streams and the remaining 33 percent of crossings are on Type A streams. The analysis of land cover indicates that the Type Aa+ and A streams have 6 percent impervious surfaces, and 94 percent vegetative cover along their stream length. The potential for stream bank erosion and localized mass wasting is Moderate in the Upper Cottonwood Creek watershed, due to the moderate road density and the dominance of bank stabilizing cover in riparian areas.

Wetlands - Site Scale

The Upper Cottonwood Creek watershed contains 9.2 acres of slope wetlands and no riverine wetlands at the Site Scale Analysis Area. Similar to the Grouse Creek watershed, slope wetlands are dominated by shrub and herbaceous vegetation and do not currently appear to be impacted by grazing. The slope wetlands in the Upper Cottonwood Creek watershed do not have any direct road impacts. Highly erodible granitic terrain combined with historical gully erosion from the MASA parking lot fill slopes, have previously contributed sediment to the slope wetland located approximately 500 feet downgradient of the existing parking lot adjacent to the Base Lodge.

Cooperative restoration efforts with the MAA, KNF, and RR-SNF have reduced gully erosion and sediment input into the wetland. Overall, the slope wetlands in the Grouse Creek watershed have a Moderate level of function.

9. Water Quality

Water quality in the State of Oregon is regulated by the Oregon Department of Environmental Quality (ODEQ) under authority granted by the Clean Water Act (1972), and subsequent amendments. The North Coast Regional Water Quality Control Board (NCRWQCB) regulates water quality in the northern region of the State of California. Water quality attributes that are considered under the Clean Water Act include traditional physical and chemical constituents such as pH, bacteria concentration, temperature, discharge, and chemical pollutants. The Forest Service is the responsible management agency for water quality on the lands it manages, as described in a memoranda of understanding (MOU) with ODEQ. This MOU requires the agency to meet water quality standards, monitor activities to assure they meet standards, report results to the state, and periodically recertify Best Management Practices (BMPs). The primary mechanisms for regulating and controlling non-point sources of pollution are (1) Best Management Practices (2) numeric and narrative water quality standards, and (3) the antidegradation policy (40 CFR 131). This Federal CFR is applicable to the states, for establishment of water quality standards. In Oregon, the ODEQ has policy, permitting and monitoring responsibility and requirements in place, in compliance with the Antidegradation Policy.

Currently, there are numerous watershed restoration projects occurring throughout Upper Ashland, Upper Neil, Upper Cottonwood, and Grouse Creek sub-watersheds that may improve water quality for some of the parameters listed above (see Section B, 7, this Chapter).

Surface waters in portions of the Site Scale and Watershed Scale Analysis Areas have been monitored for a variety of water quality parameters over the past several years. Turbidity, fecal coliform, and bacteria have been monitored in Ashland Creek, downstream of Reeder Rervoir. Comparatively little data has been collected on the Upper Neil and Upper Cottonwood Creek sub-watersheds. A limited amount of water quality data is available for the Grouse Creek Watershed, which is discussed in the Grouse Creek Watershed Section. The water quality in the Grouse, Upper Cottonwood, and Upper Neil Creek watersheds is believed to be similar to the Upper Ashland Creek Watershed, as these watersheds have similar soil and climate conditions and disturbance histories.

Due to the differences in the type and detail of data available for the four analysis watersheds, all of the available information regarding the existing water quality conditions is located in the sections described for each watershed. The following paragraphs introduce the water quality parameters that are most likely to be affected by the Action Alternatives, and outline general information about the selected parameters.

Surface waters within the Site Scale Analysis Area include a number of small streams, springs, and wetlands. In several locations, these small streams serve as the headwaters for larger streams including Grouse, Cottonwood, Neil, and Ashland Creeks. These waters are generally considered to be in Good condition, however there are elevated levels of suspended sediment in all streams during storm events, due in part to the highly erosive granitic soils of the area, and to historical disturbances such as timber harvest, grazing, and high road density, in all sub-watersheds except Ashland Creek.

Elevated water temperatures as a result of management activities can be a water quality issue as indicated by in-stream temperature standards set by ODEQ and NCRWQCB. Stream channel shading by vegetation is an important control of water temperature in streams. Water temperatures that are too high can exceed water quality criteria and may cause stress to fish and other animals living in the stream. The Oregon State water quality standards administered by the ODEQ have set current standards for summer temperature at a maximum seven-day moving average daily temperature threshold of 64 degrees F.

Dissolved oxygen (DO) refers to the volume of oxygen that is contained in water. The amount of oxygen that can be held by water depends on the water temperature, salinity, and pressure. Gas solubility increases with decreasing temperature (colder water holds more oxygen). Gas solubility increases with decreasing salinity (freshwater holds more oxygen than does saltwater). Both the partial pressure and the degree of saturation of oxygen will change with altitude. Finally, gas solubility decreases as pressure decreases. Thus, the amount of oxygen absorbed in water decreases as altitude increases, because of the decrease in relative pressure.

pH is a measure of the acidity or alkalinity of a solution. One of the most important environmental factors of pH is the affect that it has on the solubility and thus the bioavailability of other substances. This process is important in surface waters. Runoff from agricultural, domestic, and industrial areas may contain iron, lead, chromium, ammonia, mercury or other elements. The pH of water affects the toxicity of these substances. In the case of construction, pH can be affected from concrete poured near streams. Soluble cement constituents, such as lime, can raise pH in stormwater runoff.

Oil and grease from parking lots and ski area vehicle fleets can be transported by stormwater runoff into streams and wetlands. These substances can affect water quality in a variety of ways. Macroinvertebrates are especially sensitive to the influx of oil and grease. Unlike turbidity and fecal coliform contamination, which reflect some combination of natural and management-related causes, oil and grease contamination is entirely management-related.

The presence of fecal coliform bacteria in aquatic environments indicates that the water has been contaminated with the fecal material of humans or other animals. The fecal matter may also be carrying pathogens or disease producing bacteria or viruses that were present in the source water ingested by the human or animal. The presence of fecal contamination is an indicator that a potential health risk exists for individuals exposed to this water. Fecal coliform bacteria may occur in ambient water as a result of the overflow of domestic sewage (drainfields), or nonpoint sources of human and animal waste.

a. Water Quality Conditions in Upper Ashland Creek

An underground spring near the bottom of the existing Ariel Chairlift provides the ski area with drinking water. Its flow is estimated at 12 gallons per minute. Water is collected in perforated pipes buried in trenches approximately 6 feet below ground, wrapped with geotextile fabric. The perforated pipes are located in an area of groundwater discharge (springflow) approximately 20 feet from a small seasonal stream. The perforated pipes are connected to solid pipe, which gravity flows down to a buried cistern. Two submersible, metered pumps are installed in the cistern, which pump the water up to a buried 15,000 gallon storage tank located approximately 200 feet higher than the MASA base area facilities. Water from the 15,000-gallon tank gravity flows down to the facilities.

Because the water entering the perforated pipe is groundwater (below the land surface), the Oregon Water Resources Department finds that MASA is entitled to various exempt groundwater amounts. Oregon Revised Statutes (ORS) 537.545 (1) exempts several uses of groundwater from registration or permitting requirements. These uses include stockwatering, irrigation of any lawn or noncommercial garden not exceeding one-half acre in area, single or group domestic not exceeding 15,000 gallons a day, down-hole heat exchange purposes, and any single industrial or commercial purpose in an amount not exceeding 5,000 gallons a day, and land application.

Because the ski area is a commercial operation, MASA is entitled to the 5,000 gallon per day limit. Irrigation is limited to one-half acre; the amount of water used for irrigation is in addition to the 5,000 gallon per day commercial exemption.

Based on analysis by an independent laboratory, the existing water quality is excellent from a microbiological, radiological, and chemical standpoint. Because of the high water quality, it is not treated prior to use by the ski area. Tests are conducted every two weeks during the ski season, as well as before and after each season.

Watershed Scale
Reeder Reservoir is currently listed as a water quality limited (WQL) waterbody for sedimentation under Section 303(d) of the Federal Clean Water Act. As a tributary, Upper Ashland Creek is considered impaired, although it is not listed. Because Reeder Reservoir is listed, a Water Quality Management Plan (WQMP) is required by the ODEQ to provide a strategy for reducing sedimentation to acceptable background levels. In coordination with the Forest Service and the BLM, ODEQ is currently developing a Water Quality Management Plan (WQMP) to address the 303(d) listed non-point sources of pollution for the entire fifth-field Bear Creek Watershed. Completion of this plan is the responsibility of ODEQ and is now anticipated to be completed in 2005 (ODEQ website).

Hosler Dam impounds the waters of Ashland Creek creating Reeder Reservoir, providing the domestic water supply for the City of Ashland. The reservoir functions as a sediment trap, releasing clearer water downstream (*Bear Watershed Analysis* 1995). Landslide debris and channel erosion, primarily naturally occurring and to a smaller extent, road-related, are the primary sources of sediment to Ashland Creek. After the 1974 flood, it was found that 94% of the landslides originated below the 5000-foot elevation. The highest natural or human-caused landslide originated at the 5200-foot elevation (Hicks and Wilson 1975). Both natural and human development related surface erosion represent the primary sources of sediment within this Watershed. Roads are a major human impact on the forest environment within the Ashland Watershed. Impacts from roads fall in to three major areas: introduced sediment into streams, snowmelt re-direction and concentration, and surface flow production (*Bear Watershed Analysis* 1995).

b. Water Quality Conditions in Upper Neil Creek

Neil Creek is a State of Oregon 303(d) listed WQL waterbody from its mouth to Interstate 5 (limiting parameters are summer stream temperatures and disolved oxygen). Bear Creek is listed WQL from its mouth to Neil Creek for summer temperatures and high bacterial levels (ODEQ 2003). Summer low flows in Neil Creek are affected by irrigation diversions and residential water use. These water withdrawals can exacerbate high stream temperatures during the summer.

c. Water Quality Conditions in Grouse Creek

The headwaters of Grouse Creek, located on the south facing slope of the Siskiyou Crest Zone, provide cool water, high dissolved oxygen levels, and moderate to low gradients, all of which creates excellent habitat for a variety of amphibian wildlife species (*Beaver Creek Ecosystem Analysis* 1996).

Most of the Grouse Creek watershed lies outside of the Site Scale Analysis Area. However, Grouse Creek is considered by the KNF LRMP to be an Area With Watershed Concerns (AWWC) because it has a large proportion of granitic soils combined with a considerable amount of disturbance.

Grouse Creek annually contributes tons of sediment to Beaver Creek, which is a tributary to the Klamath River. Localized flooding in 1989 resulted in a debris torrent down Grouse Creek, with impacts to Beaver Creek, all the way to the Klamath River. The cause of this debris torrent was a severe summer thunderstorm falling on a recently harvested section on granitic soils, which greatly magnified the impacts of the storm. High levels of sediment are still impacting water quality and fish habitat in Beaver Cree, in part due to this event. Grouse Creek contains unstable banks, and even with a constructed settling pond catching sediment, annually contributing large amounts of sand to Beaver Creek (*Beaver Creek Ecosystem Analysis* 1996). Of greatest importance is the high channel sensitivity of Grouse Creek. The stream channel has residual instability concerns from the 1989 debris torrent. Barren, eroding areas on the crest also add sediment to the stream. KNF LRMP has recommended that additional timber harvest within the Grouse Creek Watershed should not occur until the area has recovered (*Beaver Creek Ecosystem Analysis* 1996).

Watershed conditions were further analyzed under a NEPA process conducted for *The Beaver Creek Project - Environmental Assessment*, October 2002. This analysis focuses on a proposed action that would implement management actions that are designed to move the Beaver Creek watershed closer to the desired conditions identified in the KNF LRMP and the 1996 Watershed Analysis.

d. Water Quality Conditions in Upper Cottonwood Creek

Specific water quality data for Upper Cottonwood Creek is not available, however, Cottonwood Creek has been annually observed to run turbid during intense or prolonged rainfall events. Heavy rains during late fall, winter, and spring months result in high turbidity for the duration of the storm and the follow-up runoff response period. Short duration, intense, summer thunderstorms within the watershed can also result in turbid stream conditions. Data for the affected tributary of Cottonwood Creek is unknown.

The NCRWQB has issued a Clean Water Act, Section 303 (d) List of Waterbodies in the North Coast Region with listed pollutants and estimated completion dates for the development of Total Maximum Daily Loads (TMDLs). The Klamath River from Iron Gate Dam to Scott River is a listed waterbody with nutrients and temperature as the targeted pollutants. The NCRWQCB has advised that all tributaries to a listed waterbody are also considered impaired; this would include Cottonwood Creek as a tributary to the Klamath River. The estimated completion date for development of TMDLs in the Cottonwood Creek Watershed is the year 2004. As of June 2004, TMDLs had not been established.

The upper portion of Cottonwood Creek is in Oregon (including the portion within the Site Scale Analysis Area); Cottonwood Creek is not included on Oregons's 303(d) list of water quality limited streams.

It has been observed that high temperatures (above State water quality standards) in the mainstem of Cottonwood Creek (below the Upper and West Forks of Cottonwood Creek, primarily located on private land) are due to the wide, shallow channel and open canopy cover along some downstream reaches (pers. com. California State Department of Fish and Game (CDFG) 1999). CDFG is also aware of three, screened diversions on the mainstem of Cottonwood Creek which takes the majority of flow during the low flow portion of the season. These diversions also have an effect on increasing in-stream temperatures.

e. Cumulative Watershed Effects Analysis Processes

A cumulative watershed effect is any response to multiple land-use activities that is caused by, or results in, altered watershed function. The process generating a cumulative watershed effects analysis is complicated by the variety of land-use activities that may cause effects, and by the multitude of philosophical and economic values affected. However, land-use activities can directly change only a few water quality characteristics: vegetation, topography, soil properties, water distribution, erosion and mass wasting rates, and chemical inputs. Indirect cumulative watershed effects accrue if effects of proposed activities are transported through a basin. The effects usually manifest as changes in the rate, mode, or timing of the transport of water, sediment, organic matter, chemicals, or heat. These offsite impacts result directly or indirectly from changes in transport (Naiman R. J. and R. E. Bilby, 1998, Reid 1989).

Recent environmental analyses completed by the RR-SNF has utilized a methodology referred to as the *CWE Methodology*. This model, sometimes referred to as the "Section 7" model, was used to aid in agency consultation with the National Marine Fisheries Service (NMFS - now NOAA Fisheries) under Section 7 of the Endangered Species Act. The Forest Service developed the CWE Methodology for assessing the relative risk of adverse cumulative watershed effects for in response to a request from NMFS (USDA FS 1993). This methodology has been commonly used in Forest Service Region 6.

On the KNF (Forest Service Region 5), an approach entitled the *Equivalent Roaded Area (ERA) Methodology* (UDSA FS 1999) was developed for assessing relative risk of cumulative watershed effects. It is important to note that the scope of the analysis of existing conditions at the Watershed Scale is dependant on the nature of the historical and ongoing effects and the availability of data for the watershed being analyzed.

In order to provide a consistent analysis for the entire Watershed Scale analysis area, the *ERA Methodology* was used to assess the cumulative watershed effects of past, present, and reasonably foreseeable future activities in the Upper Ashland Creek, Upper Neil Creek, Grouse Creek, and Upper Cottonwood Creek Watershed Analysis Areas. This method was selected because the data needed to run the *ERA* model was available and consistent throughout the watershed analysis areas. Data needed to run the *CWE* model is not consistently available for all four watersheds at this time.

In the cumulative effects analysis for the Draft EIS, the *CWE* method was compared with results from the *ERA* method. Based on the analysis conducted and documented for the Draft EIS, the two models yielded similar results for the Upper Ashland Creek Watershed Scale analysis area. For the Final EIS, only the ERA Methodology is used to assess past, current, and future activities.

ERA Methodology

The *ERA Methodology* utilizes GIS analysis of land use activities to convert road, timber harvest, fire, and other disturbances within each watershed to equivalent roaded areas based on predetermined coefficients that are regionally specific. The resulting equivalent roaded area within each watershed is divided by the area of each watershed to calculate a relative disturbance rating, which is called the percent ERA. Then, the percent ERA is compared to the Threshold of Concern (TOC) for each watershed. Finally, the calculated TOC is compared to the percent ERA for each watershed to determine a watershed Risk Ratio.

Detailed documentation of cumulative watershed effects analysis completed for the Upper Ashland Creek, Upper Neil Creek, Grouse Creek, and Upper Cottonwood Creek Watershed Analysis Areas is contained in FEIS Appendix C, which is incorporated by reference. As stated above, the *ERA Methodology* was used to assess the relative risk of adverse effects relating to sedimentation, physical integrity, and stability of stream channels; the results of the cumulative watershed effects analysis is presented in the consequences chapter, Final EIS Chapter IV. However, it is recommended the reader refer to FEIS Appendix C to gain a better understanding of the somewhat complex and integrated analysis methodology used to determine relative risk of adverse cumulative watershed effects.

10. Aquatic Conservation Strategy

According to the Northwest Forest Plan *Standards and Guidelines*, the Aquatic Conservation Strategy (ACS) was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands. The strategy would protect salmon and steelhead habitat on Federal lands managed by the Forest Service and U.S. Bureau of Land Management within the range of Pacific Ocean anadromy (NWFP 1994, page B-9). The four primary components of the ACS are designed to operate together to maintain and restore the productivity and resiliency of riparian and aquatic ecosystems:

1) **Riparian Reserves**: Riparian Reserves are lands along streams, wetlands, and lakes, and unstable and potentially unstable areas where special standards and guidelines direct land use (Riparian Reserves are mapped and described in Sub-section a, below).

2) **Key Watersheds**: Key Watersheds are a system of large refugia comprising watersheds that are crucial to at-risk fish species and stocks and provide high quality water. The Site Scale and Watershed Scale Analysis Areas do not contain any Tier 1 or Tier 2 Key Watersheds.

3) **Watershed Analysis**: The Northwest Forest Plan *Standards and Guidelines* contain procedures for conducting watershed analysis that evaluates geomorphic and ecologic processes operating in specific watersheds. This analysis should enable watershed planning that achieves Aquatic Conservation Strategy Objectives (ACSOs). Watershed Analysis also provides the basis for monitoring and restoration programs. Discussion of the watershed analysis conducted for the Watershed Analysis Area is contained in Sub-section b**.**

4) **Watershed Restoration**: A comprehensive, long-term program of watershed restoration to restore watershed health and aquatic ecosystems, including the habitats supporting fish and other aquatic and riparian-dependent organisms. Watershed Restoration is discussed in Sub-section c.

The four components of the ACS employ several tactics to approach the goal of maintaining the natural disturbance regime. Land use activities need to be limited or excluded in those parts of a watershed prone to instability. The distribution of land use activities, such as timber harvest or roads, must minimize increases in peak streamflows. Headwater riparian areas need to be protected, so that when debris slides and flows occur they contain LWM and boulders necessary for creating habitat farther downstream. Riparian areas along larger channels need protection to limit bank erosion, ensure an adequate and continuous supply of LWM to channels, and provide shade and microclimate protection.

Any species-specific strategy aimed at defining explicit standards for habitat-elements would be insufficient for protecting even the targeted species. The ACS must strive to maintain and improve ecosystem health at watershed and landscape scales to protect habitat for fish and other riparian-dependent species and resources and restore currently degraded habitats. This approach seeks to prevent further degradation and restore habitat over broad landscapes as opposed to individual projects or small watersheds. Because it is based on natural disturbance processes, it may take decades, possibly more than a century, to accomplish all of its objectives. Some improvements in aquatic ecosystems, however, can be expected in 10 to 20 years (NWFP 1994, page B-9).

Since 1994, Northwest Forest Plan timber harvest and restoration projects have been delayed or stopped due to recent court interpretations of certain passages in the ACS. The ACS has been interpreted to mean that every project must achieve all ACS objectives at all spatial and temporal scales (site or project, watershed, province, region). This interpretation suggests land managers must demonstrate that a project will maintain existing conditions (or lead to improved conditions) at every spatial and temporal scale. Any project that may result in site-level disturbance to aquatic or riparian habitat, no matter how localized or short-term, could be precluded under this interpretation.

The Secretaries of Agriculture and the Interior proposed limited changes to language about how to implement the ACS. These changes would amend Forest Service and Bureau of Land Management plans throughout the Northwest Forest Plan area. USDA Forest Service and USDI Bureau of Land Management jointly prepared a Final Supplemental Environmental Impact Statement for Clarification of Language in the 1994 Record of Decision for the Northwest Forest Plan "Proposal To Amend Wording About The Aquatic Conservation Strategy." This FSEIS was completed in October 2003. A Record of Decision was signed by Mark Rey, Under Secretary for Natural Resources and the Environment, USDA; and Rebecca Watson, Assistant Secretary for Land and Minerals Management, USDI, on March 22, 2004.

These limited changes clarify that the proper scale for federal land managers to evaluate progress toward achievement of the ACS objectives is the fifth-field watershed and broader scales. The change also clarifies documentation requirements for land managers to demonstrate that projects follow the ACS. It would remove the expectation that all projects must achieve all ACS objectives, but would reinforce the role of watershed analysis in providing context for project planning. The decision clarifies that the nine ACS objectives would be attained at the fifth-field watershed scale and not at the project or site level. All site-scale projects would continue to meet the protective measures in the Standards and Guidelines such as Riparian Reserve widths.

a. Overview of Existing Conditions - Riparian Reserves

Disturbance History

All four watershed Analysis Areas have experienced logging to varying degrees throughout the last century. Road construction, associated with timber harvest, recreation, and other activities, has had major impacts upon riparian areas (*Beaver Creek Ecosystem Analysis* 1996, and *Bear Watershed Analysis* 1995). Roads are considered to be the major cause of bank erosion, sedimentation, and mass wasting within all four watersheds. Multiple stream crossings by roads within the watershed have contributed sediment to streams and accelerated erosion during intense storms, which can reduce floodplain area (*Beaver Creek Ecosystem Analysis* 1996, and *Bear Watershed Analysis* 1995).

Irrigation ditches, diversion structures, and reservoirs have reduced stream flow, and affected channel morphology, and reduced available nutrients in riparian areas. Fire suppression efforts have changed plant communities by altering species composition, increasing stand densities, and increasing competition of differed plant community types.

Excess use and unauthorized grazing within the analysis area watersheds has been an ongoing concern, especially in the open ridge tops and along roads, where fencing is infeasible (*Beaver Creek Ecosystem Analysis* 1996). Historical mining, both hydraulic and mechanical, within some watersheds have stripped vegetation from portions of streams and affected channel and floodplain morphology (*Beaver Creek Ecosystem Analysis* 1996, and *Bear Watershed Analysis* 1995).

Timber harvest has decreased the function of riparian areas located within the four watershed Analysis Areas (*Beaver Creek Ecosystem Analysis* 1996 and *Bear Watershed Analysis* 1995). Within the Grouse and Upper Cottonwood analysis watersheds, livestock utilize riparian vegetation types such as meadow, shrub, and open canopy forest communities. These areas provide forage for livestock and wildlife, and bank stability and shading needed by wildlife and fish. An area of concern exists along the Siskiyou Crest south of Mt. Ashland, where historical and ongoing timber harvest on private lands is extensive. The Siskiyou Crest has some of the highest recreational use in the analysis area watersheds.

Riparian Reserves - Site Scale

The width of the Riparian Reserves for wetlands and streams on the RRRNF and the KNF in the Site Scale Analysis Area was determined based on the rationale presented in Table III-19. Areas of Riparian Reserves within each watershed of the Site Scale Analysis Area are summarized in Table III-20. Streams in the Site Scale Analysis Area were classified in the field as perennial, intermittent, or ephemeral in order to assign the appropriate Riparian Reserve width according to the Northwest Forest Plan (USDA, USDI 1994). The areas of Riparian Reserves for each wetland and stream within the Site Scale Analysis Area (and portions of the Watershed Scale Analysis Area) are displayed graphically on Map III-7.

Landslide Hazard Zonation (LHZ) is a technique used by Forest Service Geologists to assess slope stability of the terrain of the Site Scale Analysis Area. Landslides were mapped using the process documented in *Landslide Mapping on the Rogue River National Forest*, which appeared in the journal *Environmental, Groundwater and Engineering Geology: Applications from Oregon* (Hicks and Sitton 1998). This paper includes descriptions and definitions of activity levels, landslide hazard levels and risks evaluation discussed herein.

Landslide Hazard Zone 1 is the highest risk terrain for landslides, and includes steep slopes (70% and higher), active landslides, and over-steepened creek banks (see Section C, 3, c, this Chapter). For the purposes of this analysis, this zone is classified as unstable and potentially unstable terrain and is designated as Riparian Reserve Category 5 (see below). The Riparian Reserve only includes the extent of the unstable terrain.

Table III-19. Summary of Riparian Reserve Categories, Classification Rationale, and Riparian Reserve Widths for Site Scale and Watershed Scale Analysis Areas

Water Body	Riparian Reserve Category	Rationale	Designated Reserve Width (1)	Rationale
Streams	1	Fish-bearing streams	300 feet each side of stream	300 feet slope distance from edges of stream channel is greater than the distance equal to the height of two site-potential trees (292 ft.) the outer edges of 100-year floodplain, the top of the inner gorge, and the outer edges of riparian vegetation.
Streams	2	Permanently flowing nonfish-bearing streams	150 feet each side of stream	150 feet slope distance is greater than the distance equal to the height of one site-potential tree (146 ft.), the outer edges of 100-year floodplain, the top of the inner gorge, and the outer edges of riparian vegetation.
Ponds & wetlands	3	Constructed ponds, reservoirs, & wetlands >1 acre	150 feet from edge of riparian vegetation	150 feet slope distance is greater than one site potential tree height (146 ft.), the extent of seasonally saturated soil, and the outer edges of riparian vegetation.
Lakes & ponds	4	Lakes and natural ponds	300 feet from edge of riparian vegetation	300 feet slope distance from edges of body of water is greater than the distance equal to height of two site-potential trees (292 ft.), the extent of seasonally saturated soil, the extent of unstable and potentially unstable areas, and the extent of riparian vegetation.
Streams	5	Seasonally flowing/ intermittent streams	150 feet each side of stream	The distance equal to the height of one site-potential tree (146 ft.) is greater than 100 feet slope distance, the extent of unstable and potentially unstable areas, the outer edge of riparian vegetation, and the top of the inner gorge; 150 feet is used for this analysis.
Wetlands	5	Wetlands <1 acre	0 feet	The wetland boundary is defined, in part, as the outer edge of riparian vegetation (hydrophytic), so the Riparian Reserve includes the wetland only.
Unstable Areas	5	Unstable & potentially unstable areas	0 feet	The Riparian Reserve includes the unstable areas only since a Riparian Reserve buffer is not required outside of the unstable areas.

(1) The determination of Riparian Reserve widths for the Siskiyou Zone of the RRNF is detailed in Forest White Paper Number 36, May 3, 1994. Riparian Reserve widths on the KNF were determined using guidance in the LRMP; for analysis purposes, the same widths are designated on the KNF watersheds as utilized on the RRNF.

NOTE: MASA Site Scale Analysis Area does not contain Category 1 (fish bearing streams, or Category 4, lakes and natural ponds); LHZ 1 is defined as equivalent to Riparian Reserve; LHZ 2 is not.

MAP III-7. Riparian Reserves - Site Scale

The USDA Forest Service uses the most current and complete data available. Existing resource data and existing and proposed boundary and facility locations are approximate. GIS data and product accuracy may vary. Using GIS products for purposes other than those for which they were intended may yield inaccurate or misleading results.

Table III-20. Riparian Reserves within Site Scale Analysis Area

Watershed Analysis Area	Riparian Reserve Area (acres)	Site Scale Analysis Area (acres)	Ratio of Riparian Reserve to Watershed
Upper Ashland	249	1,065	23 %
Upper Neil	4	154	3 %
Upper Cottonwood	51	156	33 %
Grouse	29	94	31 %
Total	333	1,469	23 %

In both naturally forested and naturally shrub dominated areas, primary functions of riparian vegetation include providing habitat for riparian dependant animal species, filtering fine sediment from upland sources, providing fine litter inputs (e.g., small leaves and twigs) to the stream, stabilizing streambanks via root structure, and stream shading to moderate water temperatures. In naturally forested areas, additional primary functions of riparian vegetation include providing LWM to the stream channel, providing shade from the forest canopy, and attenuating microclimatic variation. In areas where the stream gradient is sufficient to initiate or propagate debris flows (i.e., Type Aa+, A channel types), riparian forest vegetation may also help to reduce the frequency and magnitude of debris flows and to attenuate debris flow impacts once they occur. The Site Scale Analysis Area contains Riparian Reserves that exist in a natural condition, but are dominated by shrub or grass communities or are barren due to slope aspect, exposure to wind, and/or poor soil conditions. Riparian Reserves that are dominated by grass and forb communities may provide some riparian functions such as sediment filtration, bank stabilization, and forage for wildlife. Riparian Reserves that are dominated by naturally non-vegetated areas are assumed to not be performing any of the above identified Riparian Reserve functions.

Riparian Reserves in natural vegetation condition include all riparian areas covered in natural forest and natural non-forest vegetation types. Riparian Reserves cover approximately 333 acres (see Table III-20). Within these Riparian Reserves, riparian functions are determined primarily by whether the Riparian Reserves is composed of forested or non-forest (impervious) vegetation. Approximately 10.1 acres of Riparian Reserves in the Site Scale Analysis Area are non-forested, which represents 3 percent of the Riparian Reserves. Natural disturbance to riparian vegetation from avalanches and debris flows is common along steep stream channels (e.g. Type Aa+ and A streams) in alpine environments (Naiman, R.J. and R. E. Bilby 1998). The combination of relatively frequent natural disturbances and naturally occurring alpine meadows in riparian areas is the most likely explanation for the naturally non-forested Riparian Reserves within the Site Scale Analysis Area. Further explanation of these natural disturbances to streamside vegetation and the specific effects on stream channel processes are discussed in Section C, 8 and 10, Chapter IV.

Riparian Reserves in modified vegetation condition are areas where the dominant plant community has been altered by human actions; examples include thinning a closed canopy forest to create an open canopy forest, converting a forested areas to a shrub or grass dominated area, or converting natural plant communities to an impervious surface (e.g., a parking lot). Riparian Reserves in a modified condition do not function like forested Riparian Reserves, rather, they function in a very similar fashion to the naturally shrub and grass dominated Riparian Reserves described above.

Similar to Riparian Reserves in a naturally non-vegetated condition, naturally forested or shrub and grass dominated Riparian Reserves that are converted to a non-vegetated or impervious condition, do not perform any of the typical Riparian Reserve functions. Some areas that are modified by management activities retain undisturbed soil conditions, while grading in other areas can degrade soil conditions and increase the potential for erosion and sediment affecting streams.

Land Cover Characteristics

For this analysis, land cover condition (i.e., vegetation condition information) was separated into classes according to forest stand structure (size and canopy closure). The vegetation classes utilized for this analysis are defined in Section C, 3, this Chapter. For the analysis below, these land cover classes were further combined as follows:

- **Closed Canopy Forest:** includes **late (**trees greater than 24 inches in diameter and greater than 60% canopy closure, **mature** (trees between 11 and 24 inches in diameter and greater than 60% canopy closure, and **immature** (trees between 6 and 11 inches in diameter and greater than 60% canopy closure)
- **Open Canopy Forest:** includes **late (**trees greater than 24 inches in diameter and less than 60% canopy closure, **mature** (trees between 11 and 24 inches in diameter and less than 60% canopy closure, and **immature** (trees between 6 and 11 inches in diameter and less than 60% canopy closure
- **Sapling/Shrub:** trees less than 6 inches in diameter, and seedling class and shrub class
- **Grass/Forb**
- **Barren, Non-vegetated**
- **Impervious includes:** Erodible and Non-erodible Surfaces

Table III-21. Land Cover Conditions of Riparian Reserves - Site Scale Analysis Area

Watershed	Existing Land Cover Condition (Acres)						Total Acres
	Closed Canopy Forest	Open Canopy Forest	Sapling/ Shrub	Grass/ Forb	Barren, Non-vegetated	Impervious	
Upper Ashland	179.8	14.9	34.2	15.2	3.9	1.5	249.5
Upper Neil	1.8	0.6	0.5	1.0	0.1	0.0	4.0
Upper Cottonwood	11.5	5.0	12.3	19.2	2.3	1.0	51.3
Grouse	2.2	2.9	21.6	0.7	0.8	0.6	28.8
Total	195.3	23.4	68.6	36.1	7.1	3.1	333.6

As discussed in detail in Watershed Resources, Section C, 8, instream LWM provides a wide array of stream ecosystem functions, including but not limited to, driving channel morphology by creating pools, gravel bars, and side channels, increasing sediment storage, providing substrate and nutrients for aquatic invertebrates, and increasing fish habitat and cover. The presence of standing and downed LWM in Riparian Reserves can provide habitat and food for wildlife and terrestrial invertebrates, provide germination sites for certain species of conifer trees, and provide organic matter and nutrients to the soil through decay.

The process by which live and dead trees (i.e., LWM) are delivered to stream channels is referred to as recruitment. The analysis contained in this EIS utilizes the land cover and plant community information presented in Table III-21 to determine the LWM recruitment potential of Riparian Reserves throughout the Analysis Area. For the purposes of this analysis, a Low recruitment potential is assigned to riparian areas dominated by non-vegetated, grass and forb, or shrub cover. A High recruitment potential is assigned to riparian areas that are dominated open and closed canopy forest.

In all, 218.7 acres (66 percent) of the Riparian Reserves in the Site Scale Analysis Area have High recruitment potential. Nearly all of these Riparian Reserves are adjacent to Type Aa+ streams, which are steep intermittent and pernenial non-fish-bearing streams. As discussed in Section 8, these streams do not generally have the channel size or stream power to transport LWM to downstream reaches. However, LWM in these channels can provide sediment storage and aquatic invertebrate substrate functions. Additionally, large riparian trees along the stream channel have the greatest potential to attenuate debris flows along steep stream channels. The remaining 34 percent of the Riparian Reserves in the Site Scale Analysis Area have Low recruitment potential.

Stream temperatures and riparian shade were not directly measured by field instrumentation in the Site Scale Analysis Area (except at two locations in the East Fork of Ashland Creek[6]). Instead, riparian shade was estimated based on historic and proposed changes in land cover within Riparian Reserves using GIS analysis. Analysis indicates that historically forested (i.e. pre-ski area development) riparian areas have been converted to various non-forested land cover types. The streams in the Site Scale Analysis Area have very high gradients; thus, stream temperatures are likely to decrease with increasing distance downstream from areas that lack shade because of evaporative cooling in turbulent cascades, riffles, and falls.

Riparian Reserves - Watershed Scale

The RRNF has assigned stream classes to all primary streams at the Watershed Scale. These stream classes have been based on the hydrologic classification done in the early 1970s and refined based on definitions in the Forest Service Manual R6 Supplement 2500-90-1, dated 8/1/90. The four stream classes are based on the hydrologic definitions wherein present and foreseeable uses made of the water and the potential effects of on-site changes on downstream uses are the criteria for defining stream classes.

The RRNF's stream Class 1, 2, and 3 streams are all assumed to be fish-bearing. The Class 1 and 2 streams are known to support fish, or there is a very high probability that they support fish. The remainder of the perennial streams (Class 2 and 3), unless surveyed to prove otherwise, are assumed to support fish. Class 4 (intermittent) streams are assumed to be non-fish bearing since by definition they will be dry for a portion of the year and are not known to be used for spawning, rearing, or refuge.

[6] Additional stream temperature monitoring began in the summer of 2004.

The determination of Riparian Reserve widths of 150 feet for nonfish-bearing, intermittent streams and 300 feet for fish-bearing streams of the Siskiyou Zone of the RRNF is detailed in Forest White Paper Number 36, May 3, 1994. RRNF's Stream Class 1, 2, and 3 streams receive a 300-foot Riparian Reserve because they are considered perennial. Class 4 streams receive a 150-foot (to be consistent with other designations) Riparian Reserve because they are intermittent and a site potential tree height (146 feet) is greater than 100 feet. Reservoirs and wetlands greater than one acre receive a 150-foot wide Riparian Reserve, and wetlands less than one acre receive a Reserve designation to the extent of wetland vegetation only.

Riparian Reserve widths on the KNF were determined using guidance in the KNF LRMP; the same widths are designated on the KNF watersheds for Riparian Reserves as utilized on the RRNF for this FEIS analysis, to be consistent and to assume a conservative position (less width was prescribed in the 1996 *Beaver Creek Ecosystem Analysis*).

Table III-22. Riparian Reserves - Watershed Scale Analysis Area

Watershed Analysis Area	Riparian Reserve Area (acres)	Watershed Analysis Area (acres)	Ratio of Riparian Reserve to Watershed
Upper Ashland	2,363	12,700	19%
Upper Neil	771	6,715	11%
Upper Cottonwood	542	4,797	11%
Grouse	1,266	6,526	19%
Total	4,942	30,738	16%

Riparian Reserves in a forested condition cover approximately 4,135 acres within the four analysis watersheds, which is approximately 84 percent of the total Riparian Reserve acreage in the Watershed Scale Analysis Area (as seen in Table III-22). Approximately 609 acres of Riparian Reserves in the Analysis Area are comprised of sapling and shrub vegetation, which represents roughly 12 percent of the total Riparian Reserve acreage in the Analysis Area. Approximately 122 acres of the Riparian Reserves at the Watershed Scale are dominated by grass and forb cover, which is 2.5 percent of the total Riparian Reserve acreage. The remaining 1.5 percent of the of Riparian Reserves in the Watershed Scale Analysis Area are non-vegetated, with 42 acres as non-vegetated soils and 34 acres as impervious surfaces (roads and parking lots). Disturbance to streamside vegetation and the specific effects on stream channel processes are presented in Section C, 8 and 10, Chapter IV.

Based on land cover analysis of the Riparian Reserves at the Watershed Scale, 84 percent of the Riparian Reserves have a High recruitment potential (see Table III-23). The remaining 16 percent of the Riparian Reserves within the Watershed Scale Analysis Area have a Low recruitment potential. Due in large part to their headwaters location in the watersheds, roughly 22 percent of the Riparian Reserves along Type Aa+ streams have a Low recruitment potential. In addition, it is inferred that the overall recruitment potential of Riparian Reserves along the Type Aa+ stream channels in the high elevation portions of the four analysis watersheds is Low. The overall recruitment potential of Riparian Reserves along Type A streams is High throughout the four analysis watersheds as 90 percent of the Riparian Reserves along these streams are dominated by forested cover. The Riparian Reserves along Type B streams in the Watershed Scale Analysis Area are dominated by forested cover (91 percent), and based on the large percentage of generally continuous forested cover, these streams have an overall High recruitment potential.

Limited temperature data is available for the four analysis watersheds at the Watershed Scale. An analysis of riparian shade was not performed at the Watershed Scale because the potential direct impacts to stream temperatures from the Action Alternatives only take place within the Site Scale Analysis Area, however, this parameter is considered in the cumulative watershed effects modeling.

Table III-23. Land Cover Conditions of Riparian Reserves - Watershed Scale Analysis Area

Watershed	Existing Land Cover Condition (Acres)						Total Acres
	Closed Canopy Forest	Open Canopy Forest	Sapling/ Shrub	Grass/ Forb	Barren, Non-vegetated	Impervious	
Upper Ashland	1,915	162	235	25	13	13	2,363
Upper Neil	607	64	90	4	2	4	771
Upper Cottonwood	353	83	68	30	4	4	542
Grouse	756	195	216	63	23	13	1,266
Total	3,631	504	609	122	42	34	4,942

b. Key Watersheds and Watershed Analysis

Key Watersheds are a system of large refugia comprising watersheds that are crucial to at-risk fish species and stocks and provide high quality water. The Site Scale and Watershed Scale Analysis Areas do not contain any Federally-designated Tier 1 or Tier 2 Key Watersheds.

Watershed Analysis, as described in the Northwest Forest Plan, focuses on implementing the Aquatic Conservation Strategy. The broader role of Watershed Analysis in relation to implementing the ecosystem management objectives described by Standards and Guidelines is described in the Northwest Forest Plan. Watershed Analysis is one of the principal analyses that will be used in making decisions on implementation of the Aquatic Conservation Strategy.

The current status of Watershed Analysis for the four watershed analysis areas is discussed in Chapter I, Section I, 1. For Cottonwood Creek, no Watershed Analysis has been completed. However, site-specific analysis of conditions associated with the MASA SUP was conducted as part of the analysis for this Final EIS and in support of restoration needs and projects being proposed. This analysis is documented herein and contained in FEIS Appendix F.

c. Watershed Restoration

Watershed restoration is essential to the enhancement and sustainability of Riparian Reserves and the watershed as a whole. Healthy Riparian Reserves provide habitat and connectivity for wildlife species, thermal regulation, nutrient filtering, and help stabilize streambanks.

In addition to and concurrent with expanded ski terrain and facilities, all Action Alternatives include the development and implementation of various watershed restoration projects, as well as structural and non-structural erosion and sediment controls. These watershed restoration projects would be designed to assist in maintaining or improving the trend toward watershed recovery in the Ashland Creek, Neil Creek, Cottonwood Creek and Grouse Creek watersheds. These restoration projects were developed in conjunction with Forest Service and consultant resource specialists during the development of the MASA proposal and environmental analysis.

These restoration projects are presented in more detail (including a map), in Chapter II, Section E, 7. Also see Section B, 7, this Chapter for a discussion on past and present restoration practices that have occured within the Site and Watershed Scale Analysis Areas, as well as in adjacent or other relevant watersheds, located elsewhere and used as reference examples.

11. Air Quality

Air quality is a concern in the Upper Bear Creek Valley (hereafter referred to as the Rogue Valley) where the surrounding mountains tend to hold in pollutants produced by industrial plants, woodstoves, motor vehicles, and other sources. Consideration for potential air quality consequences resulting from implementation of the alternatives is important for the health of local residents and for retention of visual values in southwest Oregon and northwest California.

a. Air Quality Standards

National Ambient Air Quality Standards (NAAQS) were established by the Clean Air Act (CAA) of 1963 and subsequently amended (as amended, at 42 USCA 7401 to 7671(q)). Primary air quality standards were established under the act to protect public health; secondary standards were established to protect public welfare from any known or anticipated adverse effects associated with the presence of ambient air pollutants.

The CAA and its implementing regulations also establish air pollution emission standards for a variety of stationary sources. The Environmental Protection Agency (EPA) retains oversight authority, but has delegated enforcement of the CAA to the states. In Oregon, the Department of Environmental Quality (ODEQ) acts as the lead agency. The State, in turn, is required to develop and administer air pollution prevention and control programs. State standards must be either the same as, or more stringent than the CAA standards.

In Oregon, the State has adopted a more stringent standard for sulfur dioxide, and retained the standard for Total Suspended Particulates (TSP) previously rescinded from the CAA. State standards have also been established for lime dust and particulate fallout, but will not be discussed further in this FEIS since they are not considered likely to be a problem, and no monitoring data is available for the area.

Federal and State ambient air quality standards have been established for six criteria air pollutants. These are sulfur dioxide (SO_2)[7], carbon monoxide (CO)[8], ozone (O_3)[9], lead (Pb)[10], nitrogen dioxide (NO_2)[11], and particulate matter (TSP, PM_{10} and $PM_{2.5}$)[12]. Recent amendments to the regulations implementing the Clean Air Act expanded requirements to include particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), in addition to the previous regulatory standard applying to particulates 10 microns in diameter or smaller (PM_{10}) (Federal Register, July 18, 1997). Ambient air quality standards are shown in Table III-24.

Table III-24. Ambient Air Quality Standards

Pollutant	Averaging Time	Federal Standard	State Standard
SO_2	Annual	80 μg/m³ (0.03 ppm)	52 μg/m³ (0.02 ppm)
	24-hour	365 μg/m³ (0.14 ppm)	260 μg/m³ (0.10 ppm)
	3-hour	1,300 μg/m³ (0.50 ppm) [A]	1,300 μg/m³ (0.50 ppm)
$PM_{2.5}$	Annual	15 μg/m³	-
	24-hour	65 μg/m³	-
PM_{10}	Annual	50 μg/m³	50 μg/m³
	24-hour	150 μg/m³	150 μg/m³
TSP	Annual	-	60 μg/m³
	24-hour	-	150 μg/m³
O_3	1-hour	235 μg/m³ (0.12 ppm)	235 μg/m³ (0.12 ppm)
CO	8-hour	10,000 μg/m³ (9.0 ppm)	10,000 μg/m³ (9.0 ppm)
	1-hour	40,000 μg/m³ (35 ppm)	40,000 μg/m³ (35 ppm)
NO_2	Annual	100 μg/m³ (0.053 ppm)	100 μg/m³ (0.053 ppm)
Pb	Quarterly	1.5 μg/m³	1.5 μg/m³

μg/m³ = micrograms per cubic meter

[A] Secondary standard, all others are primary standards

Source: 40 CFR 50; OAR 340-202-0060 through 0130

[7] SO_2 is a colorless, irritating gas primarily emitted by coal or oil burning power plants and industries, as well as refineries. It is converted in the atmosphere into particulate sulfuric acid droplets, and to solid metallic sulfates. The hazards to human health of such sulfates include increases lung disease and breathing problems for asthmatics.

[8] CO is a colorless, odorless and tasteless gas. It is produced primarily during the incomplete combustion of organic fuels. CO is also created during refuse and agricultural burning and as a byproduct of some industrial processes. CO affects the central nervous system by depriving the body of oxygen, resulting in symptoms including chest pain, headaches, and reduced mental alertness.

[9] O_3 is a highly unstable form of oxygen. O_3 is not emitted directly from a source, as are other pollutants, but forms as a secondary pollutant through a chemical reaction with sunlight. Reactive hydrocarbons typically related to the creation of O_3 include automobile exhaust, gasoline, and oil storage and transfer facilities. O_3 production is generally highest during summer months. In the summer, more intense sunlight and comparatively stagnant meteorological conditions combine to increase O_3 production. Exposure to elevated levels of O_3 has been linked to respiratory problems.

[10] Ambient lead levels have decreased over the past decade, largely due to the decreased reliance on lead as an additive to gasoline. Today, almost three-quarters of all lead emissions are related to industrial processes. Lead exposure can result from ingestion or inhalation. Excessive exposure has been linked to neurological deficits.

[11] As an air pollutant, NO_2 is a virtually odorless, and colorless, but can be irritating to the eyes and throat. Nationwide, the majority of NO_2 emissions come from combustion and transportation, with minor amounts from industrial emissions and other miscellaneous sources. Elevated levels of NO_2 can cause respiratory distress; degradation of clothing, visibility, and vegetation; and increased acid deposition.

[12] Particulate matter includes tiny particles suspended in the atmosphere. Larger particles tend to settle out of the air and are not considered to have a significant health effect. Particulate matter 10 microns in diameter or less are considered inhalable and can pose an adverse health risk. Fugitive dust is the primary contributory to elevated levels of particulate matter, however, burning of fossil fuels also contributes to particulate levels. Effects of elevated particulates depend on the size of the particle. Particles less than 2.5 microns in diameter are a major cause of visibility problems. Inhaled particulates can result in increased incidence of respiratory ailments. These effects tend to be most acute in the elderly and other at risk populations.

There are no major sources of SO_2, O_3, or Pb in the vicinity of MASA. The primary sources of CO and NO_2 are direct vehicle tail-pipe emissions and wood burning. The main sources of PM_{10} are vehicular re-entrained road dust (dust that is emitted into the atmosphere by the mechanical action of moving vehicles stirring up dust from roads) and wood burning. PM_{10} and NO_2 are the primary pollutants of concern due to the topography, level of development, meteorological conditions in the vicinity of MASA, and their effects on visibility. Monitoring has been undertaken for $PM_{2.5}$ which is primarily the result of vehicle and wood stove emissions. Since 1998, ODEQ has been monitoring $PM_{2.5}$ and existing Fedral standards have not been exceeded, although the levels can get close to the standards (Collier 2003). New NAAQS for $PM_{2.5}$ may be finalized and administratively implemented in the next several years (US EPA 2003).

The Forest Plan follows Federal and State guidelines and regulations by establishing the following goal for air quality: "Maintain air quality at a level that is adequate for the protection and use of National Forest Resources, and that meets or exceeds applicable Federal and State standards and regulations." (RRNF LRMP, page 4-1)

b. Medford Air Quality Management Area (AQMA)

The Rogue Valley, from the Rogue River (Eagle Point to the Gold Ray Dam vicinity) to Emigrant Lake has been designated as the Medford AQMA. AQMAs are designated based on failure to attain Federal or State standards. A non-attainment area is a geographic area in which the ambient level of one or more criteria pollutants exceed Federal or State standards. An area may have an acceptable level for one pollutant and an unacceptable level for others. Thus, an area can be in attainment for one or more criteria pollutants while being designated as a non-attainment area for one or more other pollutants.

A maintenance area is a non-attainment area that has improved its air quality to a degree that meets Federal and State standards and regulations for the criteria pollutant but that has not been re-designated as an attainment area. A maintenance plan is developed by ODEQ for all maintenance areas within the State and must be approved by the EPA. This plan must conclusively demonstrate how air quality standards will be met for at least 10-20 years. Maintenance plans are on file, and available from ODEQ.

The Medford AQMA is classified as non-attainment for particulate matter less than 10 microns in size (PM_{10}); wood smoke, wind-blown dust and industrial emissions are the most common sources of particulate matter. A review of EPA's Aerometric Information Retrieval System (AIRS) data and discussions with ODEQ indicated that NAAQS for PM_{10} were not exceeded in either Jackson County, Oregon, or Siskiyou County, California, between 1991 and 2002 (per.com. ODEQ, Drake 2003 and Collier 2003). A plan is currently in development to redesignate the Medford AQMA as an attainment area for $PM_{10.}$

The Medford AQMA was formerly classified as non-attainment for carbon monoxide (CO). Cars and trucks produce up to 90 percent of urban CO emissions. In the Medford area, national health standards for CO were violated 35 times in 1985, more than all other Oregon cities combined. After ODEQ's mandatory vehicle inspection program began in 1986, CO pollution levels declined, and just two violations occurred in 1988. There have been no violations of the standards for CO in Medford since 1991.

A review of EPA's AIRS data for 1994 through September of 1999 indicated that NAAQS for CO have not been exceeded in either Jackson County, Oregon, or Siskiyou County, California during that period. In 1998, ODEQ submitted a maintenance plan for CO to EPA that was approved in 2001 (ODEQ, 2003). This allowed for re-designation of the Medford AQMA as an attainment area for CO.

Ground level ozone (O_3) is commonly referred to as smog and is a secondary pollutant formed from the reaction of volatile organic compounds with nitrogen oxides (NO_x) in the presence of sunlight. NO_x and smog are primarily a product of regional (urban) motor vehicle traffic. Unlike carbon monoxide, ozone does not reach its peak level closest to the emissions source, but rather at downwind locations after the primary pollutants have had time to mix and react under sunlight. One exceedence of the NAAQS for O_3 was reported in the Town of Talent during 1996, and an additional exceedence was reported at the same site in 1998. Single exceedences within one calendar year do not constitute a violation of NAAQS standards. No other exceedences have been recorded in Jackson County, Oregon between 1994 and September 1999. No exceedences have been recorded in Siskiyou County, California over the same period of time. The Medford AQMA is in attainment for ozone.

Sulfur dioxide (SO_2) is a product of coal and oil burning (primarily in the eastern United States) and industrial processes (e. g., paper and metal manufacturing). No major sources of SO_2 were identified within the SUP area, therefore SO_2 is not considered to be a pollutant of significant concern. Lead (Pb) sources include leaded gasoline (being phased out), paint (houses, cars), smelters (metal refineries), and the manufacture of lead storage batteries.

Monitoring of Pb levels has been undertaken at the Medford County Courthouse without any evidence of exceedence of NAAQS between 1994 and 1998. No major sources of Pb emissions were identified within the SUP area, therefore Pb is not considered to be a pollutant of concern. No other monitoring sites for volatile organic compounds, nitrogen oxides, sulfur dioxide, or lead are located within either Jackson County, Oregon or Siskiyou County, California. The lack of monitoring sites indicates that these pollutants are not believed to exist in sufficient quantities to make any exceedence of NAAQS likely, or warrant the expense of monitoring. There is no reason to believe that any of these criteria pollutants pose a risk to attainment of either primary or secondary standards.

c. Atmospheric Stability and Inversions

Air quality is important for the health and welfare of local residents, and for retention of visual values in southwest Oregon and northwest California. Air quality is a concern in the Rogue Valley where the surrounding mountains and temperature inversions can trap pollutants produced by industrial plants, wood stoves, motor vehicles, and other sources.

Air quality in the Rogue Valley deteriorates during periods of atmospheric stability. When conditions are stable, the lack of wind and temperature changes can limit air mixing, and pollutants can remain trapped at or near the valley floor. Atmospheric stability can occur independent of, or in conjunction with inversions. Inversions occur when a layer of cool air is trapped by a layer of warm air and is unable to rise. Inversions spread polluted air horizontally rather than vertically, so that contaminating substances cannot be dispersed. The upper inversion layer within the Rogue Valley rarely extends above 5,000 feet (USDA FS 2001a).

While air quality is an important consideration for actions occurring in the Rogue Valley, it has not proven to be a major concern along high elevation topographic features such as the MASA[13] . MASA is located between 6,200-7,500 feet, and the base elevation for the proposed LC-6 Chairlift is at approximately 5,925 feet. Mt. Ashland, the highest point in Oregon west of the Cascades, is located above most inversion layers that form in southern Oregon and northernmost California. As an exposed feature located at high elevation where winds can be strong, air emissions are readily dispersed. Furthermore, the majority of emissions associated with ski area operations occur during daytime hours when down-valley drainage is least likely (USDA FS FEIS, *Ashland Watershed Protection Project* 2001a). Due to its location, topography, hours of heaviest operation, and common meteorological conditions, emissions from MASA are unlikely to contribute to inversion related air quality in the Rogue Valley.

d. Prevention of Significant Deterioration

In addition to the NAAQS discussed above, the EPA has promulgated regulations to protect and enhance air quality. The Prevention of Significant Deterioration (PSD) regulations (42 USCA 7470 to 7479) are intended to help maintain air quality in areas which attain national standards, and to provide special protections for national parks, Federally designated Wildernesses areas, National Monuments, National Seashores, and other areas of special natural, recreational, scenic, or historical value. These areas are generally designated as Class I Airsheds.

Class I designation applies to select pristine airsheds. These areas include National Parks larger than 6,000 acres and most national Wilderness areas greater than 5,000 acres. Class I areas in southern Oregon include Crater Lake National Park (60 miles northeast of Mt. Ashland) and two Wilderness areas, Kalmiopsis (50 miles west) and Mountain Lakes (32 miles northeast). In California, Marble Mountain Wilderness (37 miles southwest) is also designated as Class I.

Class II is the designation for clean air areas where a moderate amount of development could be permitted. In Oregon, Sky Lakes Wilderness (30 miles northeast of Mt. Ashland) and Red Buttes Wilderness (26 miles southwest of Mt. Ashland) are Class II areas. The Siskiyou Wilderness (45 miles southwest of Mt. Ashland) in California is also a Class II area. Class II wilderness areas are generally smaller in size, and/or were more recently designated. Class II areas also include all areas in attainment of NAAQS and not designated as Class I Airsheds.

The PSD regulations stipulate that new sources must: 1) not cause a decline in ambient air quality, and 2) use best available control technology to limit emissions. PSD permits are required for, “major emitting facilities” which emit, or have the potential to emit 100 tons or more per year of any air pollutant (42 USCA 7475(a), 7479(1)). EPA regulations specifically list the sources that are considered, “major emitting facilities” – this list does not include ski areas (42 USCA 7479(1)).

[13] Mt. Ashland is not considered a “background site” by the Oregon Department of Environmental Quality (ODEQ) as stated in the 1991 FEIS on page III-15 (Finneran 1999). Background sites are geographic areas where Congress has set goals that replicate visibility in the absence of man-made air pollution. Additionally, in the winter months, typical Rogue Valley inversions usually establish from the Valley floor to 4,000-5,000 feet in elevation instead of “1,500-2,200 feet” as stated in 1991.

However, the regulations note that the term, “major emitting facilities” also includes, “any other source with the potential to emit two hundred and fifty tons per year or more of any air pollutant” (42 USCA 7479(1)). A PSD permit is not required for MASA because ski areas are not classified as stationary sources, and MASA does not have the potential to emit over 250 tons of any air pollutant. No PSD permit would be required for any of the Action Alternatives (pers. com. ODEQ, Tong 1999).

e. Visibility

Visibility is the maximum distance that an object can be perceived against the background sky; it also includes the clarity with which the form and texture of objects can be seen. Visibility impairment in Oregon is most often related to fine particulates and nitrogen oxide in the atmosphere; these emissions either scatter or absorb light, obscuring vision. The most common anthropogenic sources for these particulates in the MASA area are wood burning, and vehicular emissions.

Visibility is an important air quality value for scenic and recreational areas, and is generally considered to be a more sensitive criterion because it can be more easily impacted. Clean Air Act section 169A(a)(1) requires the EPA to develop regulations for the “prevention of any future and remedying of any existing impairment of visibility in mandatory Class I Federal areas which impairment results from man-made air pollution.” Thus far, visibility efforts have focused on large sources that have obvious adverse effects on visibility. Obvious impacts mean visual plumes extending from a large source to the area of visibility impairment. Visual plume impacts associated with the Action Alternatives were modeled using the VISCREEN computer model and are discussed in Environmental Consequences, Chapter IV. Topographic features, wind patterns, and humidity are all related to the incidence of visibility problems. The frequent high winds experienced along many mountain ridges improve dispersion and mixing, and therefore reduce the likelihood of visibility problems at MASA.

f. MASA Ongoing Operations

Emission sources associated with the MASA include (1) passenger vehicles and buses idling or warming up in the parking lot, as well as those traveling to and from the ski area and the associated re-entrained dust from paved roads, (2) snow-grooming vehicles (groomers), snowmobiles and ATVs used by MASA employees, emergency diesel engines used as emergency backup for chairlifts and night lighting, and (3) a kitchen stack and propane-powered heating furnace and fireplace.

Vehicles produce the greatest amount of air pollutants relative to the other sources at MASA. Based on one-time per day MASA vehicle counts for the 150-day 1998-99 season and an estimated turnover rate of 1.3, approximately 39,000 vehicle trips were made to MASA for day skiing and other winter activities. Vehicle counts included all users of the Mt. Ashland parking lot (Nordic skiers, sightseers, etc.). The average daily count, incorporating the turnover rate, was 260 and the largest single count was 919 vehicles on November 28, 1999.

MASA was also open for night skiing Thursdays through Saturdays from Thanksgiving through the end of March. Approximately 5,661 vehicle trips were made to MASA on the 54 nights that night skiing was offered in the 1998-99 season. In addition, approximately 200 bus trips were made to the ski area during the season, for both night and day skiing. Combined night and day figures equal approximately 44,661 trips for the 150-day season.

For comparative purposes, at Crater Lake Highway near Interstate 5 in Medford, the average daily traffic count is 33,200 (12,118,000 per year). The Medford Viaduct on Interstate 5 carries 41,200 vehicles per day (15,038,000 annually). Further south on Interstate 5 near the North Ashland and Mt. Ashland exits, respective traffic counts are 28,700 daily (10,475,500 annually) and 12,400 daily (4,526,000 annually) (Rogue Valley Council of Governments 1999). The average traffic counts at Biddle Road and McAndrews Road in Medford was 51,300 (18,724,500 per year) in 2000 (Smith 2001). Peak season traffic at MASA therefore represents roughly 0.3 to one percent of the annual traffic experienced at other regional thoroughfares.

Diesel-powered groomers operate approximately (on average), 16 hours per day throughout the operating season. Gas-powered snowmobiles and ATVs operate around four hours per day, while back-up emergency diesel engines run about one hour per week. The kitchen is open seven days a week and operates for approximately six hours per day four days a week and ten hours per day the remaining three days of the week. The propane-powered furnace and fireplace operates 24 hours a day throughout the operating season.

Unlike many ski areas, MASA is not a four-season resort. The area is closed from about mid-April to early December each year (average opening date over the last 30 years is December 10). Most summer activity is centered on maintenance of buildings, ski trails, vehicles, and lifts, as well as administrative use by staff. Emission sources are limited to vehicles used for commuting (a large capacity van is often used) and for access to lifts, road dust from vehicle use within the ski area, and occasional welding and chainsaw operations.

D. BIOLOGICAL ENVIRONMENT

1. Landscape Ecology

The following summary and references provide a perspective on temporal and spatial scales and an overview of how the Ashland area interacts within the Klamath Province and Pacific Northwest Region.

Appearing in an article in the *Friends of the Greensprings Newsletter*, submitted by Dr. Tom Atzet, Area Ecologist for the Forest Service (now retired), the following gross overview is provided:

> *Imagine yourself soaring high above the Pacific Northwest, high enough that only the major rivers and mountain ranges stand out. The Cascade-Sierra chain and the California-Oregon coast ranges appear as north-south parallel tracks, with the Cascades punctuated by occasional white-capped volcanic peaks. The Siskiyou Mountains, of the Klamath Geologic Province, stand out as a link joining the tracks, like the cross-bar of a gigantic capital "H." The Columbia and Klamath Rivers seem to be deep, winding scars allowing water, air, spores, seeds, fish, and other animals lowland passage through the mountain barriers, effectively joining east with west, sagebrush and juniper with Sitka spruce and shore pine. If you remained aloft long enough you will see north-south migrations of plants and animals down the river corridors. You would see how the Siskiyous act as an "intersection" for the western fauna and flora. Note also, before you descend, how the Siskiyous act as a barrier to lowland north-south migration. Only at Siskiyou Summit, the lowest point of the "crossbar," do species pour over into the adjoining valleys, the Rogue and the Shasta River Valleys. Back at ground level, there is another concept to consider. Compare the Siskiyou mountains to a home computer with its four major functions: input, output, storage, and processing. Over the last 60 million years species, like data, have been input from six different directions: the Oregon and California coast ranges, the Sierras and Cascades, influx from the Klamath River corridor and lowland chaparral species straining to reach the pass. Their variety of habitats have provided a home or refuge for species over the years. Since the area has not been covered with ice, ash or lava, it has acted as a storage disk for genetic information (species). Moreover, species interact or process (processing is the recombination of genes from sources around the western states) before they are output again to recolonize.*
>
> *If the Siskiyous store and process species for dispersal across the Western states, then the pathways, particularly the "intersections" are of prime importance. They should allow species to migrate and disperse. This function affects the health of composition of ecosystems throughout the west.*
>
> *The Siskiyou Crest-Greensprings area is one of the more important "intersections" in the northwest. Its high plant and animal diversity indicate the eons of storage, processing and exchange. Akin to an international airport where you find a diversity of cultures, you find a diversity of species from a variety of different sources: juniper, aspen, big sagebrush, and mountain mahogany from the east; manzanita, California black oak, snowbrush, sugar pine and Shasta red fir from the south; mountain hemlock, huckleberry and baneberry from the north; and alder, madrone, and maple from the west.*

Whittaker (1960), Detling (1961), and Atzet (1979, 1982, 1984, and 1996), the *Mt. Ashland Late-Successional Reserve Assessment* (1996a), and others have recognized the Klamath Province as uniquely diverse and a key link in Northwest migration and evolution. The 200,000,000-year-old Klamath province hosted the evolution of the older conifers (redwood, yew, cypress, and torreya), the newer conifers (pine, fir, and spruce), supported the development of local flowering plants as the Old Cascades developed, and has acted as both a *depository* and *source* of genetic materials for the western states, and specifically the Pacific Northwest.

Although the Klamath Province (at that time an island arc) was initially isolated by oceans at about 20 degrees north latitude, it presently links the Cascades, Sierras, and Coastal mountain ranges, intermixing a diversity of species (see page 7 of the 1996 *Mt. Ashland Late-Successional Reserve Assessment*). During climatic fluctuation, animals and plants have used the ridges and drainages to migrate, survive, reproduce and evolve. The last few recent events, the Pleistocene glaciation [the last advance ending about 10,000 years before present (YBP) the Xerothermic period (about 8,000 to 4,000 YBP) and the Little Ice Age (about 1350 to 1800 AD)], have affected species composition and landscape pattern. The cooler cycles, allowed southern migration of Engelmann spruce, subalpine fir, mountain hemlock and Alaska yellow cedar (just a few examples). Engelmann spruce and subalpine fir, are glacial relicts. The eastward migration of big sagebrush, mountain mahogany, western juniper and aspen, and northward migration of manzanita, pine and oak occurred during the warmer periods. These species likely used the Klamath River basin and Sierras to migrate and find a niche high on the hotter south slopes of Mt. Ashland. The 1994 *Applegate Adaptive Management Area (AMA) Ecosystem Health Assessment* lists major corridors and nodes within the Applegate AMA, pages 12 and 13 (USDI BLM and USDA FS 1994).

a. Late-Successional Reserve Network

The Late-Successional Reserve (LSR) network associated with the Northwest Forest Plan (including the Mt. Ashland LSR) provides a “coarse filter,” for maintaining species associated with late-successional habitats. Each reserve was designed to absorb landscape scale disturbance processes (“natural” hazards), while maintaining some varying proportion of late successional habitat. The general strategy for the goal of LSRs was to reduce, but not eliminate, exposure to “natural” and human-caused hazards.

On June 9, 2000, President William J. Clinton established the Cascade Siskiyou National Monument (CSNM) by presidential proclamation under the provisions of the Antiquities Act of 1906. The CSNM was established to protect an array of biological, geological, hydrological, archeological and historic objects. A Resource Management Plan and FEIS are currently being prepared to guide the long-term management of the CSNM. Although the CSNM designation supercedes all prior designations, the monument will continue to contribute toward the overall goal of maintaining, protecting, and enhancing late-successional and old-growth habitats consistent with the Northwest Forest Plan.

The Friends of Greensprings and the Siskiyou-Cascade Crest Initiative groups are working to encourage private owners to manage for dispersal, migration, and habitat, consistent with NWFP objectives for maintaining connectivity. The “pass” is split by Interstate Highway 5. Interstate 5, along with the needs of increasing population density, are hazards that may interfere with dispersal processes.

Detling (1961), Waring (1969), Axelrod (1976) and Atzet (1979, 1982, 1984, and 1996) provide information on present-day local plant diversity. Several inventories, Research Natural Area information, and plots collected by the Area Ecology program (Ecology plots, or "ecoplots" 1975-85), only provide a decade of time separation; this is not enough to provide trend information, but does provide information on species composition, structure and landscape pattern. More time series data is needed to determine change and evaluate cause as change is detected.

b. Engelmann Spruce

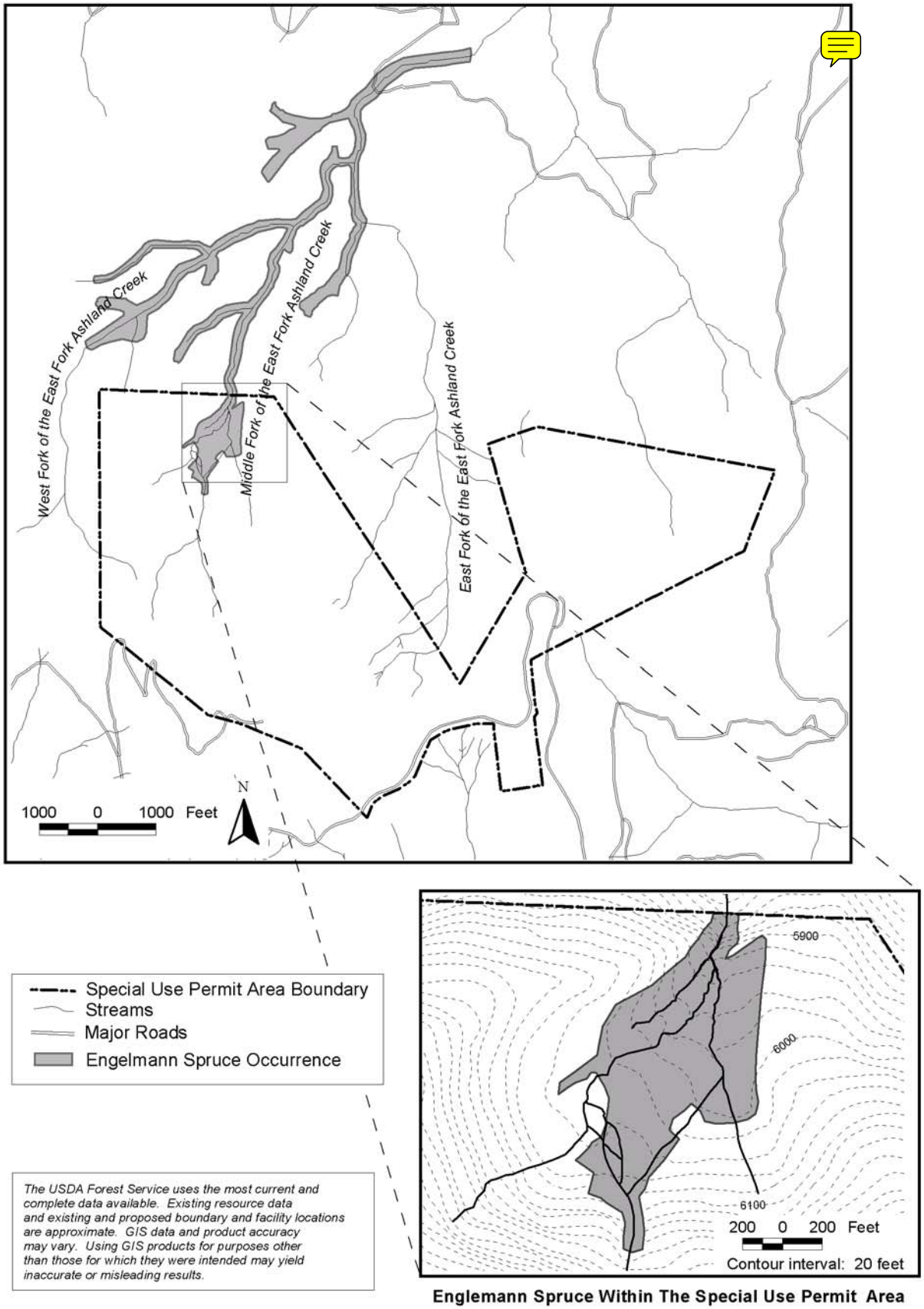
At the Site Scale, an Engelmann spruce stand and associated wetland is present within the Middle Fork area. As mentioned above, this species extended its southern range during the Ice Ages, and may have become isolated during the Xerothermic period. The relative cool of the Little Ice Age kept it competitive, and its possible important genetic differences in populations may have developed. However, there is no data on whether the stands in southwest Oregon and northern California interact. At the landscape scale, distribution is typically patchy.

A portion of this stand of concern is located in the Lower Wetland area, and is approximately 18.2 acres in size within the Middle Fork portion of the SUP area. It is a mixed stand of Engelmann spruce, Shasta red fir, and white fir, with spruce especially common in the wetter areas along the stream and several seeps adjacent to it. It is a mixed age stand with trees of all size classes up to about 50 inches DBH represented. The Engelmann spruce here and in additional stands in the East Fork drainage represent the only Engelmann spruce populations in the Siskiyou Mountains. This Engelmann spruce stand and its extent in relation to the SUP and Ashland Creek watershed is portrayed on Map III-8.

Currently, Engelmann spruce is found in 21 Forest Service inventory "ecoplots" in southwest Oregon. One is the East Fork of Ashland Creek in the Klamath Geological Province. Forty four percent of the Engelmann spruce plots are in the White Fir Series, 28% in the Mountain Hemlock Series, 11% in the Silver Fir Series, and 17% in the Western Hemlock Series. It occurs in nine plant associations and it has wide ecological amplitude.

Ecoplot information shows a higher cover of regeneration in the stand understory, than cover in the stand overstory. Cascade and Siskiyou plots are similar and generally reflect the condition of the stands sampled in the East Fork of Ashland Creek. The species seems to be regenerating well as a tolerant co-climax species. It occurs in areas where fire is less frequent and less severe than in adjacent stands. An increased frequency of high severity fires may decrease its ability to compete.

MAP III-8. Engelmann Spruce



The USDA Forest Service uses the most current and complete data available. Existing resource data and existing and proposed boundary and facility locations are approximate. GIS data and product accuracy may vary. Using GIS products for purposes other than those for which they were intended may yield inaccurate or misleading results.

Englemann Spruce Within The Special Use Permit Area

Insects and Pathogens

Forest Service plant pathologists and entomologists from the Southwest Oregon Forest Insect and Disease Service Center field reviewed conditions in this stand. They observed that substantial impacts due to insects and diseases have occurred in the stand of concern for some time. Windthrow and stem breakage is common, especially among the larger spruces. Small pockets of standing dead and obviously declining spruces of all sizes at several locations are present in the stand.

Agents associated with decline, mortality, stem breakage, and windthrow include several species of root disease fungi, including *Phellinus weirii* (cause of laminated root rot), *Armillaria* sp. (probably *A. ostoyae* cause of Armillaria root disease), *Inonotus tomentosus* (cause of tomentosus root disease), and an unidentified white rot fungus that is associated with stem breakage just above ground level on some trees. Both windthrown and standing dead spruce have been infested by spruce beetles (*Dendroctonus rufipennis*) and woodborers in the families *Cerambycidae* and *Buprestidae*.

All of the root disease organisms identified in the area of concern are well known to be persistent in infection centers and are considered to be more or less permanent disturbance agents on infested sites, as long as susceptible hosts are present. The fungi involved survive for many years in root systems of dead trees, or in root fragments left in the soil when infected trees are windthrown. They colonize new hosts by growing across contacts between infected material and roots of yet-uninfected hosts, by growing short distances through soil between infected material and new host roots, or via wind disbursed spores that infect new hosts through wounds. *P. weirii* is known to survive for 50 years in large infected stumps and infects new hosts across root contacts. *A. ostoyae* can survive for at least 30 years in infected roots and infects new hosts both via root contacts and by growing as much as a foot through the soil. *I tomentosus* can survive in infected roots for 30 years and infects new hosts via root contacts or by airborne spores that colonize wounds. *P. weirii* and *I. tomentosus* decay host roots causing trees to decline and die due to inability to take up water and nutrients, pre-disposing them to bark beetle attack, or causing loss of structural integrity resulting in windthrow. *A. ostoyae* can act in the same way as the other root pathogens, or can kill the host cambium around the root collar resulting in more rapid host death.

Highly susceptible hosts of *P. weirii* include Douglas-fir, the true firs, and mountain hemlock; the spruces are damaged by this fungus but are considered to be less susceptible than the above mentioned species. *A. ostoyae* infects all species of conifers; true firs are considered to be most susceptible but in some areas, Douglas-fir and spruce are also highly susceptible. *I tomentosus* is primarily a pathogen of spruce though it may infect Douglas-fir and true firs on occasion.

Endemic populations of spruce beetles infest primarily injured, diseased, or windthrown spruce. However, if large numbers of weakened or windthrown hosts are available in a given year, populations of spruce beetles may build to high levels. Once this happens, beetles may infest and kill substantial numbers of green standing hosts. Population build-ups are especially likely to be tied to substantial windthrow events (windstorms) when many large trees are blown over in the same year and brood production is great.

Annosus root disease, caused by *Heterobasidion annosum*, was not detected in the spruce grove, but has the potential to cause mortality, butt decay, and stem breakage of Engelmann spruce, if stumps and wounds are created within or along the edge of the stand. Fungus inoculum is present in adjacent stands. *H. annosum* can be spread over long distances via windborne spores that infect through freshly-cut stumps. The fungus grows through stump roots and crosses root contacts to infect adjacent trees. As root and stems decay their ability to absorb water and nutrients is impaired, anchorage is diminished, and trees become vulnerable to bark beetle attack. Mortality and windthrow are commonly associated with annosus root disease. If trees are cut in or at the edge of the spruce stand, sporax treatment would prevent infection of cut stumps by *Heterobasidion annosum* (cause of annosus root disease); see Mitigation Measures, Chapter II, Section 8.

All of the insects and pathogens identified in the stand of concern are native organisms. Given the age, condition, and distribution of the Engelmann spruce in this stand, the presence, wide distribution, and persistence of the root disease pathogens, and the occurrence of spruce beetle, which can be very aggressive when associated with large amounts of windthrow, it is believed that natural mortality, stem breakage, and blowdown will continue, especially among the larger, older trees.

2. Ecological Classification

Ecological classification in southwest Oregon is based on the concept of potential natural vegetation. The potential natural vegetation for a site is the vegetation that would be present under climax conditions. Climax would occur if the site were allowed to grow, undisturbed by fire, insects, diseases, flood, wind, erosion, or humans, in approximately 500 years. Theoretically, a steady state condition in vegetative composition would be reached after this time, which is characteristic of the site potential. This is rarely reached in southwest Oregon, however, due to the frequent fire disturbance regime.

Southwest Oregon's classification utilized by the Forest Service includes two-levels: series and plant associations. Series is the broadest division and is based on the dominant, most shade tolerant, regenerating tree species on the site. Each series is further subdivided into plant associations.

In the vicinity of Mt. Ashland, approximately ten ecoplots have been established. Analysis of these plots show that three main series are found in the area: Mountain Hemlock (*Tsuga mertensiana*), Shasta Red Fir (*Abies magnifica shastensis*), and White Fir (*Abies concolor*). In these three Series, four different plant associations are found: Mountain Hemlock/Herb, Shasta Red Fir/Mountain Sweet-root (*Osmorhiza chilensis*), White Fir-Shasta Red Fir/Common Prince's-pine (*Chimaphila umbellata*)-Three leaf Anemone (*Anemone deltoidea*), and White fir/Dwarf Oregon grape (*Berberis nervosa*).

Table III-25. Series and Plant Associations in the Mt. Ashland Vicinity

Series	Plant Association
Mountain Hemlock	Mountain Hemlock/Herb
Shasta Red Fir	Shasta Red Fir/Mountain Sweet-root
White Fir	White Fir-Shasta Red Fir/Common Prince's-Pine-Three leaf Anemone White Fir/Dwarf Oregon-grape

a. Series

The Mountain Hemlock Series is the highest elevation forested series in southern Oregon (approximately 4,000 to 7,300 feet). In the southern Oregon Cascades, it occurs as a fairly continuous band, but in the Siskiyou Mountains it is fragmented, found only on northerly aspects of the higher peaks and ridges. The Mountain Hemlock Series is replaced at lower elevations by the Shasta Red Fir Series, and at higher elevations by subalpine meadows. This Series generally occurs in areas that are cool to cold, and wet. Mountain hemlock and Shasta red fir are the dominant trees in the overstory, and mountain hemlock is dominant in the understory. Shasta red fir frequently occurs in the understory.

The Shasta Red Fir Series is generally found at higher elevations, greater than 4,000 feet, and in areas that are cool to cold and moist. This series is replaced by the White Fir Series at lower elevations and by the Mountain Hemlock Series at higher elevations. Shasta red fir is generally the dominant tree in the overstory and is abundant in the understory. On warmer sites, white fir is present, and on cooler sites, mountain hemlock is present.

The White Fir Series is found at lower elevations when compared to the Shasta Red Fir Series and the Mountain Hemlock Series. It covers a wide elevational band, with an average of approximately 4,300 feet, and generally occurs on cooler sites. Douglas-fir (*Pseudotsuga menziesii*) is generally the dominant overstory species in the White Fir Series, due to frequent disturbance. In colder areas, Shasta red fir may be dominant in the overstory. White fir is the dominant understory species.

b. Plant Associations

The Mountain Hemlock/Herb Plant Association is found at cold temperatures and low precipitation relative to the other plant associations in the Series. The elevation averages 6,710 feet, and it occurs on northwest to east aspects. Tree species found in this association consist of mountain hemlock and Shasta red fir. Very few shrubs are found. Herbs and grasses are abundant, as is indicated by the name of the association. Total species richness (average number of plant species present) is intermediate for the series, averaging 17.

The Shasta Red Fir/Mountain Sweet-root Plant Association in found at cool temperatures and low precipitation, relative to other plant associations in the Shasta Red Fir Series. Elevation averages 6,360 feet and occurs on all aspects. Shasta red fir dominates the overstory and the understory, with white fir the only other commonly occurring tree species. The shrub layer is sparse, but the herb layer is rich with a wide variety of species. Total species richness is intermediate for the series, averaging 26.

The White Fir-Shasta Red Fir/Common Prince's-Pine-Three-leaf Anemone Plant Association occurs at high elevations on cold sites. Elevation averages 5,420 feet and the aspect is predominantly west to northwest. Shasta red fir is a major component of the stand in both the overstory and the understory. Douglas fir is also frequently found in both layers. Total species richness is intermediate for the series, averaging 33.

The White Fir/Dwarf Oregon-grape Plant Association is found on drier sites with moderate temperatures. The presence of dwarf Oregon grape suggests higher productivity. Elevation averages 4,570 feet and it occurs on all aspects. White fir and Douglas-fir are almost always present in both layers. Species richness is intermediate for the series, averaging 35.

3. Current Vegetation Conditions

Land cover mapping (vegetation condition) used for this analysis was completed by Geographic Resource Solutions (GRS) in Arcata, California in 1993. This mapping utilized Landsat TM satellite imagery, digital elevation models, measured field data, local Geographic Information Systems (GIS) data, and global positioning system (GPS) data (Hill 1996). The detailed database associated with the imagery describes, in part, canopy closure, average tree size, trees per acre, and percent hardwood, conifer, shrub, and grass as continuous estimates, rather than the traditional approach which utilizes categorical classes or groupings. Continuous estimates of vegetation characteristics were used because the data can later be adapted to any series of classes, depending on the need of the analysis. Due to changes in vegetation since the imagery was obtained, field surveys and site-specific knowledge of conditions have been utilized to adjust the mapping.

For this FEIS analysis, data from the satellite imagery was separated into land cover classes according to primarily forest stand structure (size and canopy closure). The land cover classes used for this analysis are described as follows:

- **Late Forest, Closed Canopy**: forested stands with an average diameter greater than 24 inches and greater than 60% canopy closure.
- **Late Forest, Open Canopy**: forested stands with an average diameter greater than 24 inches and less than 60% canopy closure.
- **Mature Forest, Closed Canopy**: forested stands with an average diameter between 11 and 24 inches and greater than 60% canopy closure.
- **Mature Forest, Open Canopy**: forested stands with an average diameter between 11 and 24 inches and less than 60% canopy closure.
- **Immature Forest, Closed Canopy**: forested stands with an average diameter between 6 and 11 inches and greater than 60% canopy closure.
- **Immature Forest, Open Canopy**: forested stands with an average diameter between 6 and 11 inches and less than 60% canopy closure.
- **Seedling/Sapling**: forested stands with an average diameter less than 6 inches.
- **Shrub**
- **Grass/Forb**
- **Non-vegetated**: includes bare soil, rock.
- **Impervious, Erodible Surface**: includes roads with native or aggregate surface.
- **Impervious, Non-erodible Surface**: areas covered with asphalt (paved roads).

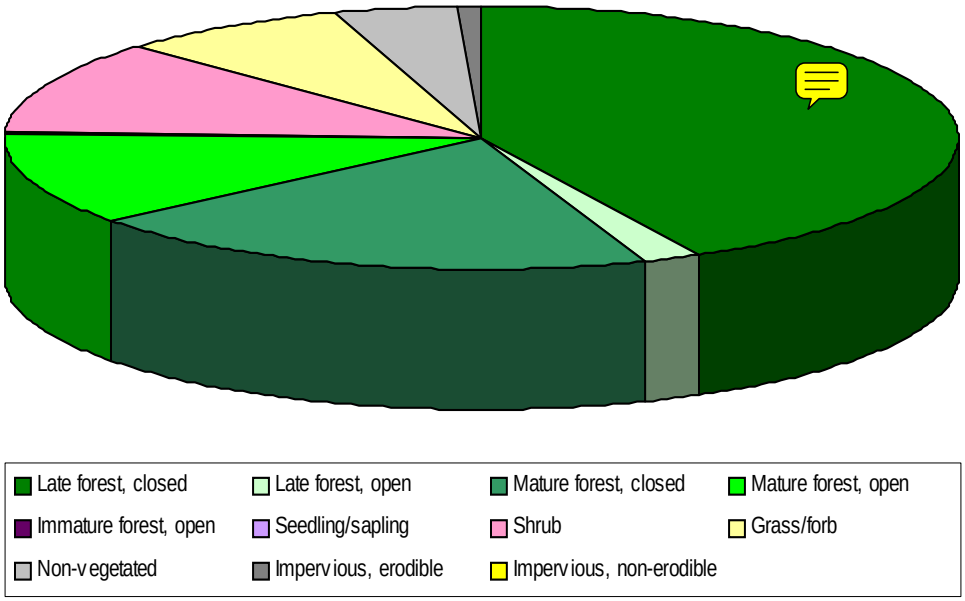
a. Special Use Permit Area and Site Scale Analysis Area

The following table and figure displays current condition acres by land cover class and distribution for the SUP area, and for the Site Scale Analysis Area:

Table III-26. Land Cover Acres Within the SUP Area and Site Scale Analysis Area

Land Cover Class	Total acres within Special Use Permit Area	Total acres within Site Scale Analysis Area
Late Forest, Closed	358	570
Late Forest, Open	20	24
Mature Forest, Closed	171	253
Mature Forest, Open	120	152
Immature Forest, Closed	0	0
Immature Forest, Open	1	4
Seedling/Sapling	1	1
Shrub	151	261
Grass/Forb	72	114
Non-vegetated	50	68
Impervious, Erodible	9	13
Impervious, Non-erodible	8	9
Total	960	1,469

Figure III-9. Distribution of Land Cover Within SUP Area



Much of the area within the boundaries of the SUP area consists of older forest with a closed canopy (see orthographic photo, part of the base for Map II-2, Alternative 1). The majority of the existing ski runs are vegetated with shrub (manzanita) and grasses with areas of bare ground interspersed. Most of the late forest lies within the northern portions of the SUP area, in the Ashland and Neil Creek watersheds. The majority of the SUP area within the Grouse Creek and Cottonwood Creek watersheds is dominated by shrubs and grass/forbs, due to the southern exposure and rocky soils.

b. Watershed Scale Analysis Area

Many analyses have used successional stages to describe vegetation. Ecologically, succession is classed as early successional, with the stand being composed primarily of pioneer species, the mid-successional stage, when the climax species begin colonizing stands and produce a lower tree layer. Late successional stands are characterized by the dominance of the climax species, and the decline of the pioneer species, and climax stands are composed of climax, shade tolerant species. Stages typically include early, mid, late, and non-forest.

Note: Open canopy forests (defined here as those forested areas with less than 60% canopy closure) occur in a variety of conditions. Although these stands may function as habitat for some late-successional species, for analysis purposes, they are being combined with early-successional stands, due to the open canopy conditions.

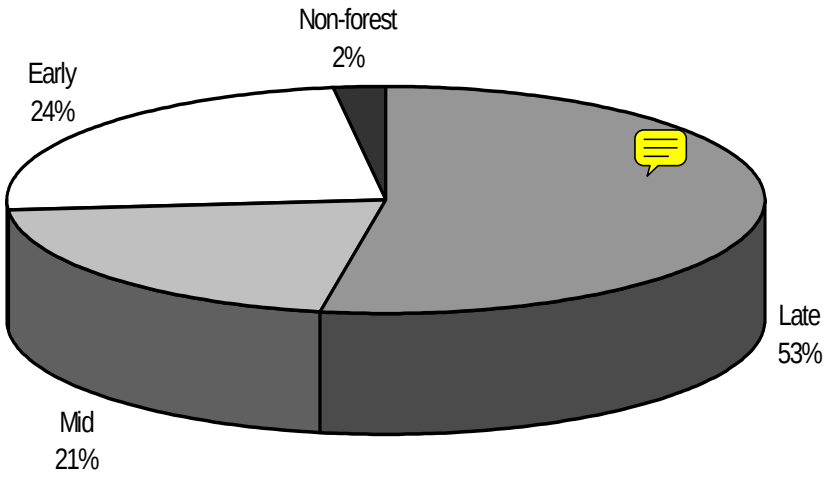
For habitat analysis at the Watershed Scale Analysis Area (the geographic extent of the Watershed Scale Analysis Area is displayed on Map III-5), land cover classes described above are further combined into successional stage classes as follows:

- **Late-successional**: Late forest, closed.
- **Mid-successional**: Mature forest, closed and Immature forest, closed.
- **Early-successional**: Late forest, open; Mature forest, open; Immature forest, open; Seedling/sapling; Shrub; and Grass/forb.
- **Non-forest**: Non-vegetated; Impervious, erodible; and Impervious, non-erodible.

Table III-27. Habitat Successional Stages by Watershed Scale Analysis Area

Successional Stage	Upper Ashland	Upper Neil	Grouse	Upper Cottonwood	Total Acres
Late-successional	8,290	3,318	2,662	1,987	16,247
Mid-successional	2,398	1,717	1,159	1,131	6,405
Early-successional	1,830	1,559	2,431	1,565	7,385
Non-forest	183	121	275	122	700
Total	12,701	6,715	6,527	4,795	30,737

Figure III-10. Distribution of Successional Stages Within Watershed Scale Analysis Area



c. Forest Health

Forest Service plant pathologists and entomologists from the Southwest Oregon Forest Insect and Disease Service Center also field reviewed conditions within the overall SUP area. Pockets of tree mortality and windthrow in mixed white fir/Shasta red fir stands ranging from a few trees to several acres in size occur across the entire SUP area. The majority of the mortality is due to laminated root rot caused by the fungus *Phellinus weirii* and its bark beetle associates, predominantly fir engravers *(Scolytus ventralis)*. The largest disease centers (several acres) occur north and west of an alder glade, west of the Middle Fork of the East Fork of Ashland Creek, and along the route of the proposed "Skiway" or R-18 (IE-1 route under Alternative 6). Another large disease center occurs at the Knoll, in the vicinity of proposed Run 6 and 7, below the Bull Gap Trail.

Laminated root rot occurs widely in forests of the Pacific Northwest and is the most damaging of all root diseases. It is a disease of the site, affecting succeeding host generations in areas where infection occurs. The fungus may remain viable in the wood of infected roots for up to 50 years. Trees become infected when roots of a susceptible species come into contact with infected material underground. Young hosts are killed standing, but older trees are often windthrown while crowns are still green. Many trees are pre-disposed to infestation by bark beetles. Spread is usually slow, on the order of 1 to 2 feet per year. Trees do not often show crown symptoms until a high proportion of roots become infected and colonized by the fungus.

Conifers range widely in their susceptibility to the fungus. Individual tree vigor does not influence infection. Douglas-fir, white fir, and mountain hemlock are considered highly susceptible hosts; they are readily infected and killed. As a general rule, Shasta red fir and western hemlock occurring in disease centers are often infected and usually not killed. However; Shasta red fir in disease pockets within the SUP area are being killed. Most often these intermediately susceptible hosts develop butt rot as a result of infection, and are prone to breakage. Pines and incense cedar are considered resistant; they are seldom infected and almost never killed. Hardwood species are immune.

Trees with laminated root rot have a very high potential for failure. Failure would involve medium to large tree parts or entire trees. Opening heavily infested stands to wind exposure could lead to increased failure, particularly in the first years after the opening is created. Occurrence of laminated root rot along any clearing that might be developed in the SUP area is of concern.

Annosus root disease, caused by *Heterobasidion annosum*, is also present in a few small pockets and along with its bark beetle associates, causing mortality and stem breakage of white fir and some Shasta red fir. While *H. annosum* currently does not dominate as a disturbance agent within the SUP area, its potential to cause disease, including extensive butt and stem decay and mortality, would increase as stands are opened and stumps are created. *H. annosum* can be spread over long distances via windborne spores that infect through freshly-cut stumps. The fungus grows through stump roots and crosses root contacts to infect adjacent trees. As root and stems decay, their ability to absorb water and nutrients is impaired, anchorage is diminished, and trees become vulnerable to bark beetle attack. Mortality and windthrow are commonly associated with *annosus* root disease.

White pine blister rust, caused by the fungus *Cronartium ribicola*, is a virulent exotic disease that was introduced into western North America in 1910 from Europe. It was first observed in southern Oregon in the mid 1920s. *C. ribicola* affects all five needle pines, including western white, sugar, and whitebark pine in Southwest Oregon and also occurs on alternate hosts in the genus *Ribes*. Blister rust kills small pine hosts directly by producing resinous lesions that girdle their stems. Large trees usually suffer branch dieback and topkill rather than whole tree mortality but may be predisposed by heavy infections to attack by bark beetles.

Surveys done in Southwest Oregon indicate that blister rust infection levels are high on all pine hosts growing on favorable sites. The disease is favored by cool moist conditions in late summer and early fall. Higher elevation sites, especially those in saddles on ridges can be particularly favorable for *C. ribicola*.

Surveys done in the western white pine stands on Red Mountain (just west of Mt. Ashland) show very high levels of blister rust infection. Blister rust has been observed in the small population of whitebark pine at Mt. Ashland (pers. com. Wayne Rolle) but how much infection is present there is unknown.

d. Fire Risk and Hazard

Public comment on the 2003 DEIS identified a concern and need for discussion of the current fire risks and hazards associated with ski area expansion. Current fire hazard and risk were not highlighted in the DEIS because the inherent hazard and risk of the Special Use Permit and surrounding area is very low.

Fire risk is defined as: the chance of various ignition sources (lightning or human-caused) causing a fire that threatens valuable resources, property, and/or life. Fire hazard is defined as: vegetation by the kind, arrangement, volume, condition and location that *forms a* special threat of ignition, spread and difficulty of control.

In December of 2003, the Forest Service released an assessment of fire risk and hazard conditions in its *2003 Upper Bear* Assessment (USDA FS 2003d). According to this assessment, the MASA is within Plant Association Group described as Moist or Cool Mountain Hemlock and is in Fire Regime IVb or IVc, where stand replacement events occur at interval of 100-200 years. The Fire Condition Class is 1, which is within the natural fire return interval. The fire occurrence is very low, with no fire greater than 1 acre being recorded adjacent to the Special Use Permit since 1960. The Fire Risk is identified as "Low", and the current Fuel Models are 1, 2, 5, 8, 10, and 11.

While the overall Fire Hazard is predicted as Moderate-High according to the 2003 Assessment, it is low relative to and in comparison with the lower elevations of the Ashland Watershed and Upper Bear Analysis Area. There is an increased risk of fire associated with human presence and ski area operations and maintenance. Since the ski area is most heavily used in the winter when the area is covered with snow, this risk is very low. A greater risk would occur during the summer, during operational and maintenance activities. These activities are infrequent during normal maintenance and mitigation measures are employed to manage these risks.

4. Forest Service Sensitive Plants

A Biological Evaluation process was conducted for Threatened, Endangered, and Sensitive (TES) Plant species; all information and findings are included within this Final EIS. This Section discusses species that occur within the SUP area; consequence discussion in Chapter IV analyzes project effects on the viability of plant species and provides a summary of the Biological Evaluation conclusion of effects.

No plants listed as Threatened or Endangered under the Endangered Species Act occur within the SUP area. Four Forest Service Region 6 Sensitive plant species are present in the SUP area, they are: *Lupinus lepidus var. Ashlandensis* **(Mt. Ashland Lupine**), *Horkelia hendersonii* (**Henderson's horkelia**), *Carex nervina* (**nerved sedge**), and *Hazardia whitneyi ssp. discoidea* (**Whitney's haplopappus**).

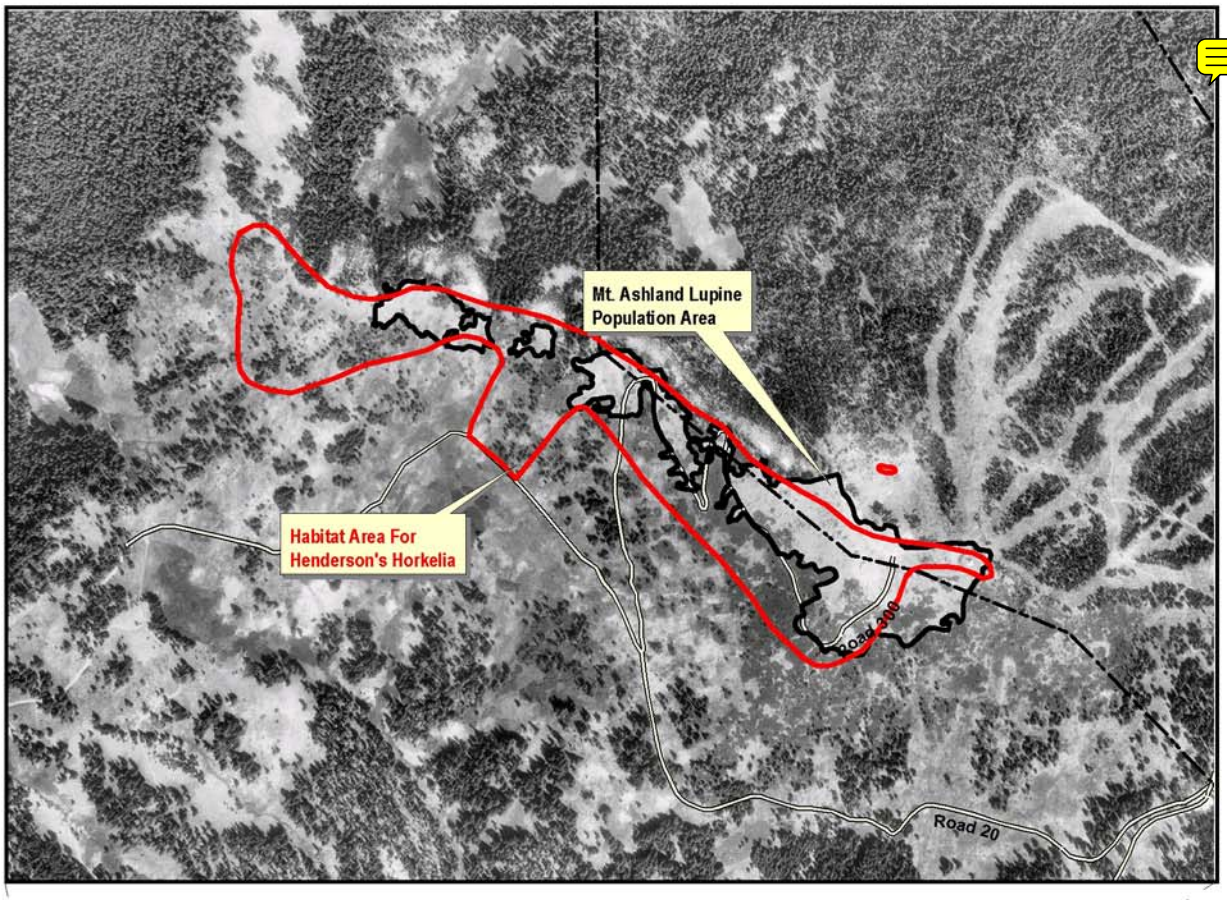
a. Mt. Ashland Lupine and Henderson's Horkelia

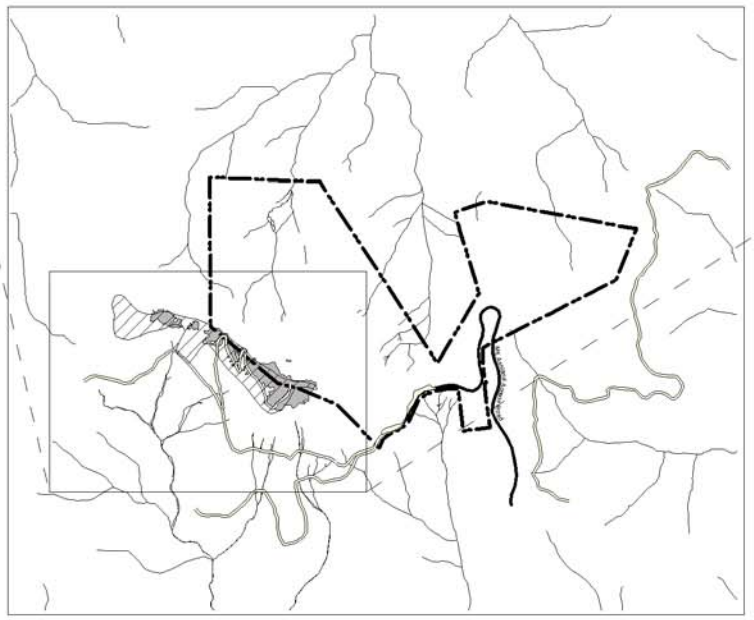
Lupinus lepidus var. Ashlandensis **(Mt. Ashland Lupine**): Endemic to Mt. Ashland (found nowhere else). There is only one large population located on the summit and west slope of the mountain. The population covers roughly 43 acres and has about 36,000 individuals. The population occupies natural openings. The Mt. Ashland lupine grows on southern, western, or flat aspects. It is not found in any of the north-facing openings. It becomes scarce or absent on those portions of the summit and west slope where the aspect turns toward the northwest or north. Map III-9 shows the approximate location of the occurrence of Mt. Ashland Lupine within the SUP area.

Horkelia hendersonii (**Henderson's horkelia**): Endemic to the eastern Siskiyous from Mt. Ashland to Dry Lake Lookout south of Condrey Mountain (17 miles southwest of Mt. Ashland). Six populations are known. The Mt. Ashland population probably has the greatest number of plants. An extended population in the Dutchman Peak/Observation Peak area spreads across more acres but probably contains fewer plants.

The Mt. Ashland population occupies roughly the same area on the summit and west slope as the Mt. Ashland lupine population, with notable extensions on the west and southwest sides. A few plants occur on the terminal moraine at the bottom of the Bowl. Individual horkelia plants cannot be reliably counted because the plant spreads vegetatively as well as by seed, but Henderson's horkelia is abundant within many parts of the area occupied by the Mt. Ashland population. Map III-9 also shows the approximate location of the occurrence of Henderson's horkelia within the SUP area.

MAP III-9. Mt. Ashland Lupine and Henderson's Horkelia





Special Use Permit Area Boundary
Major Roads
National Forest Boundary
Mt. Ashland Lupine Population Area
Habitat Area For Henderson's Horkelia

N

1000 0 1000 2000 Feet

The USDA Forest Service uses the most current and complete data available. Existing resource data and existing and proposed boundary and facility locations are approximate. GIS data and product accuracy may vary. Using GIS products for purposes other than those for which they were intended may yield inaccurate or misleading results.

Note: In summer 1999, the US Fish and Wildlife Service (USFWS) received two separate petitions, both dated September 9, 1999, from the Rogue Group Sierra Club to list *Lupinus aridus spp. ashlandensis* (Mount Ashland lupine) and *Horkelia hendersonli* (Henderson's horkelia) as endangered or threatened throughout their range, and to designate critical habitat. On June 13, 2000, the USFWS published a 90-day finding for these two species in the Federal Register (65 FR 37108). They found that the petitions presented substantial information indicating that listing may be warranted. At that time, they initiated a review of the species' status within their historical range. On January 26, 2003, a 12-month finding was made in accordance with the judicially approved settlement agreement requiring the USFWS to submit a final listing decision on these species to the Federal Register by February 1, 2003 (Sierra Club v. Norton et al. Civ. No. 01-1804--BR).

USFWS reviewed the petition, the literature cited in the petition, other available literature and information, and consulted with biologists and researchers familiar with *Lupinus aridus spp. ashlandensis* and *Horkelia hendersonii*. On the basis of the best scientific and commercial information available, the USFWS found the petitioned action to not be warranted. The USFWS found that the overall imminence and magnitude of threats to *Lupinus lepidus var. ashiandensis* and *Horkelia hendersonii* is relatively low. Both species occur exclusively on lands managed by the Forest Service, and their distribution has historically been limited. The population distributions and numbers are thought to relate closely to their original extents.

The USFWS will continue to monitor the status of these species. Should an emergency situation develop with one or both of these species, the USFWS will act to provide immediate protection, if warranted (68 FR 6498-6500).

The Forest Service and the USFWS developed a Conservation Agreement (CA) for both species across their ranges; this agreement was finalized on October 29, 2002. This effort was initiated in 1995 as a cooperative agreement with the Oregon Natural Heritage Program, to develop conservation agreements for selected high priority candidate species. The management goal of the CA is to maintain stable or increasing populations of *Lupinus lepidus var. ashlandensis* and *Horkelia hendersonli* across their known ranges.

This CA is to remain in effect in perpetuity. Development of the CA was based on the June 13, 2000 USFWS and NOAA Draft Policy for Evaluation of Conservation Efforts (PECE policy) (65 FR 37102). The conservation efforts that the parties have agreed to, are identified in the CA, along with details indicating anticipated staffing, funding levels and source, and other resources necessary to implement projects to protect and monitor the species. This CA is incorporated by reference to this FEIS analysis.

The USFWS found overall, threats to these species and their habitat are generally low in magnitude. The trampling of habitat and individual plants, and soil compaction, both associated with summer activities, are occurring in only small areas of occupied habitat. Under the CA, the Forest Service is currently implementing actions to reduce or remove any remaining impacts to these species and their habitat.

A recent and concurrent example is the Lupine and Horkelia Habitat Improvement Project (2002). This project was authorized under NEPA with a Decision Memo on February 7, 2003; this document is incorporated by reference to this analysis. This project on the summit and west slope of Mt. Ashland includes:

- Delineation of an existing parking area at Rabbit Ears, and at the summit. Large granite boulders will be used to make obvious to the public where to park, turn around, confine vehicles to existing roadways, and driveways. Boulder placement will not occur on existing vegetation. Boulders will come from a stockpile of boulders in the vicinity. Boulders that are placed at the summit of Mt. Ashland will have a height restriction so they would pose no obstruction to skiers during the winter recreation season.
- An overnight camping closure at Rabbit Ears and the Summit of Mt. Ashland.
- Installation of signs at Rabbit Ears and the summit explaining the need to protect the rare plant habitat from vehicles and over-use by visitors.
- Stabilization of gullies at five locations, using hand built-check dams, erosion control fabrics, straw bales, rocks, logs, branches, mulch, native plants, seeds of native plants, and fertilizers. All actions will vary according to the site needs.
- Installation of a series of drain dips (self maintaining drainage structure that facilitate runoff) across a road to move water out of gullies into a wide spread area, and to prevent gullies from forming.

These actions were designed to be consistent with activities and management outlined in the Conservation Agreement between USFWS and the Forest Service (discussed above).

As part of increased monitoring of the lupine and horkelia population, the Forest Service and MAA jointly established a skier count at the top of the Circe Run in January 2003. An electronic counter was placed at the entrance to Circe. Skiers who cross this point are immediately within the rare plant population. Over a period of 54 days from January 11 through March 5, skier counts were obtained on 41 days (average of 6.36 hours per day). Skier counts were not taken 13 of the 54 days for three reasons: (1) counter malfunction, (2) ski run closure, or (3) lack of time by MAA or Forest Service personnel to properly install and maintain the counter. On the 41 days when reliable data could be obtained, 9,829 skier trips (average of 240 trips per day) were recorded over the population at the top of Circe between Ariel, and the first chute of the Bowl (distance of approximately 150 feet). As skiers progress west over the populations, their numbers decrease because they have choices of skiing into the Bowl or to the South Side outside of the lupine and horkela habitat area. It is estimated that approximately 2,000 skiers (roughly 25 percent) actually skied over a portion of the snow-covered populations in the West Ridge area.

b. Nerved Sedge and Whitney's Haplopappus

Carex nervina (**nerved sedge**): This forested wetland sedge occurs in a number of western states. In Oregon, populations are known along the West and Middle Forks of the East fork of Ashland Creek above 5,600 ft., along Split Rock Creek in the Little Applegate watershed, and several sites in the Silver Fork watershed on the Applegate Ranger District. At Mt. Ashland, this species is abundant throughout the large spruce-dominated wetland in the lower part of the Middle Fork area. It is not present in other wetlands within the SUP area.

Hazardia whitneyi ssp. discoidea (**Whitney's haplopappus**): This compact perennial in the sunflower family grows on open rocky slopes and ridges, at upper elevations in the Klamath mountains and southern Oregon Cascades. In Oregon, populations occur in the Siskiyou Mountains, along the Rogue/Umpqua divide, in the Sky Lakes Wilderness, Mt. Thielsen Wilderness, and other locations in the high Cascades. The taxon is more abundant in California and has no rare plant status there. On Mt. Ashland, one clump is present in the proposed ski run (R-1) east of the Knoll. About 75 clumps are also in a ¼ acre area just south of Blossom ski run, in the existing ski area. The hazardia is also present along the McDonald Ridge, to the west of Mt. Ashland.

5. Northwest Forest Plan Botanical Species

a. Vascular plants

There are no NWFP vascular plants present within the SUP area or that would be affected by proposed expansion activities.

b. Bryophytes

The moss, *Buxbaumia viridis*, is present in the Engelmann spruce stand. It was found in this moist shady environment on three large well-decayed logs, its typical substrate. It was not found on any of the logs where the proposed ski run intersects the spruce stand. This species is known from several other sites on the RRNF and a few others around SW Oregon, as well as elsewhere in the Pacific Northwest. Its status as a NWFP species only applies south of the California border.

The liverwort *Ptilidium californicum* was found on three large boulders in one of the proposed ski runs north of the Knoll. This species is usually found on older white firs and is uncommon in the Oregon Siskiyous. It is common in the Cascades of Oregon. Its status as a NWFP species only applies south of the California border.

c. Lichens

No NWFP lichens have been found during surveys conducted for those species.

d. Fungi

A false morel, *Gyromitra californica,* was found growing around moist dark cavities near the perennial stream that runs into the spruce wetland. This location is not near any proposed lifts or ski runs, but suitable habitat exists for this fungus throughout the spruce wetland. Two other locations in SW Oregon are known.

A snowmelt fungus, *Mycena monticola,* was found in the SUP area in a location outside of any proposed ski runs or lift corridors. It was also found in the nearby West Fork of the East Fork of Ashland Creek, outside the SUP area. It is known from at least one other location on Rogue River NF. It is common in the Cascades on the Winema National Forest (Sarah Malaby, Klamath Ranger District botanist, pers. com. April 2004).

6. Species Locally Important to Biodiversity

Species discussed under this Section do not have special status under ESA or the Northwest Forest Plan, and Forest Service policy does not require active reconnaissance or special protection for these species. These species are discussed as they are determined by the Forest Service to be important local elements of biological diversity.

Pinus albicaulis (**whitebark pine**): In late August 2003, a whitebark pine tree was discovered by Dr. Frank Lang on the northeast side of the Bowl. Soon thereafter, Dr. James Duncan discovered another mature whitebark pine, a short distance away from the first one, on the west edge of upper Caliban ski run. Both trees are near or in the path of existing and proposed ski runs, chairlifts, and buildings under various alternatives (see consequences, Chapter IV). After these discoveries, genetic tests of suspect younger trees on Mt. Ashland revealed a third whitebark pine, on the southwest side of the summit, where no activities are proposed.

This high elevation 5-needle pine species is common at high elevations in many parts of western North America including the Pacific states. Locally, it is present on the higher peaks in the Cascades and in the Klamath Mountains farther south in California. It is not currently known to exist in any other locations in the Siskiyou Mountains. Old reports of whitebark pine in the Siskiyous exist (Lieberg 1900, Sudworth 1908, Little 1971). Frank Callahan found personal notes about whitebark pine on Mt. Ashland from the 1970s and recalls dendrologist Oliver Matthews talking or writing about it being there decades before. No herbarium collections could be located in west coast herbaria. Botanists and Forest Service personnel looking for this tree on Mt. Ashland over the last several decades had not found it. Floras and checklists compiled for Mt. Ashland make no mention of it (see FEIS Chapter V, References).

Immediately after the two whitebark pines were discovered (i.e., re-discovered), the Forest Service and volunteers located all small and young 5-needle pines that have morphological and needle features closely resembling whitebark pine, in the vicinity of the two whitebark pines. Twelve trees met these criteria. This search was particularly thorough around the moraine at the bottom of the Bowl where proposed new buildings, ski runs and ski lifts converge under several alternatives. Twig samples were taken from each of the twelve non-cone-bearing trees and sent to two different labs for independent genetic tests to determine species identity.

The tests were conducted by Dr. David Oline at Southern Oregon University in Ashland Oregon, and by the National Forest Genetic Electrophoresis Lab (NFGEL) in Placerville, California. Different DNA analyses (and isozyme analysis at NFGEL) were used at each lab. By using reference samples from Mt. McLoughlin, Mt. Ashland, and Boulder Peak in the Marble Mountains, and unpublished data from professional colleagues, both labs correctly identified six blind samples. **Both labs independently reached the same conclusion that 11 of the 12 Mt. Ashland unknowns were western white pine and one, from the southwest side of the summit, was whitebark pine.** These genetic reports are available from the Ashland Ranger Station or the Supervisor's Office in Medford.

A number of mature 5-needle pines on Mt. Ashland also have bark and needle features, and growth forms, closely resembling whitebark pines. However, 2003 was a big cone-producing year for 5-needle pines and all the mature 5-needle pine trees (except the two whitebarks) bore the distinctive cones of *Pinus monticola* (western white pine), the more common related species. White pine blister rust is an introduced pathogen that adversely affects the health and survival of all 5-needle pines in North America on a relatively constant basis. It is presumed that this pathogen is potentially affecting Mt. Ashland's whitebark pines as well (see Section D, 3, c., this Chapter).

Picea engelmannii (**Engelmann spruce**): On the west coast, this species is common in riparian and wetland habitats in the Cascades as far south as the Dead Indian Plateau located on the east side of the Ashland Ranger District. An extensive population in the East Fork Ashland Creek Watershed is the only one known in the Siskiyou Mountains. A few smaller occurrences are farther south in California, within the Russian Peak Wilderness, and a few other locations in Siskiyou, Trinity, and Shasta Counties. The species is also found throughout the Rocky Mountains from British Columbia south to Arizona and New Mexico. Engelmann spruce is also discussed in Section D, 1, b**,** this Chapter, and Map III-8 shows the approximate location of the occurrence of Engelmann spruce within the SUP area, in the Middle Fork portion.

In 1997, MAA contracted an Engelmann Spruce Survey on stream reaches and wetlands in the East Fork (of Ashland Creek) watershed. The contractor (Noel Chatroux) completed a report showing Engelmann spruce to be more extensive in the East Fork watershed than was previously known. His survey data also confirmed what had earlier been suspected; that the large spruce stand within the Middle Fork area has the greatest number of large spruce trees and along with one other grove, is the most obvious example in the Ashland watershed of a stand headed toward spruce-dominated ecological climax. The primary funtion of this survey was to determine the extent of Engelmann spruce along stream reaches in the East Fork watershed. This aspect of the survey was accurate, however the intent of the survey was not to categorize every tree, or exact number of trees in each stand. Therefore, the error factor relative to the number of trees is estimated at $\pm$ 50%. Map III-8 is redrawn from Mr. Chatroux's spruce distribution map, with some refinements made to the portion within the SUP area.

Climacocystis borealis (**a polypore fungus**): It was thought in 1997 that the Survey and Manage polypore fungus *Bondarzewia montana* had been found, but it turned out to be a misidentification. What is present is a large, multi-capped cream-colored polypore that fruits annually in the Engelmann spruce stand in late summer and fall. It is now thought that this heart-rotting fungus of Engelmann spruce is *Climacocystis borealis*. It is otherwise unknown from SW Oregon and is considered an unusual and important element of local biological diversity.

Sporocarps have been found in four spots in the spruce grove, one of which is very close to proposed ski Run 12, and one of which is close to the proposed LC-6 lift line corridor. It is probably present throughout the spruce stand but is not producing sporocarps (hence is not visible).

Abies lasiocarpa (**subalpine fir**): Widespread in colder parts of North America and southward at higher elevations in the mountains. In the Pacific states, subalpine fir reaches its southern extent in the Cascades on Brown Mountain, located on the east side of the Ashland Ranger District. The single stand at the top of the bowl at Mt. Ashland is the only occurrence in the Siskiyou Mountains. There is another, larger, disjunct occurrence farther south in California, within the Russian Peak Wilderness.

The Mt. Ashland population occupies about 0.1 acre, within an area of deep snow deposition, and appears to be reproducing by layering rather than from seed. Layering is a process of forming adventitious roots on stems pressed prostrate on the ground, in this case by the snow load. In the past, this population was assumed to be a Pleistocene relict, but it is more likely to have been a more recent (geologically-speaking) establishment from a single seed that has since cloned itself through layering.

Cryptogramma cascadensis (**Cascade parsley fern**): A reliable commentor to the DEIS reported this fern from the Bowl at Mt. Ashland. Its presence has not been verified. Cascade parsley fern is known from high elevations in the Cascades, Sierra Nevada, and Klamath Mountains of California. There is one other unverified report of this fern in the Siskiyou Mountains, at Lake Peak on the Applegate Ranger District. Since it has no status as a TES plant, Forest Service botanists have not looked for this fern in the Siskiyou Mountains, though if present, it would be restricted to relatively small high elevation areas, at best. There is some possibility it occurs in the Siskiyou Mountains only at Mt. Ashland. If present, it would likely be far enough inside the Bowl that it would not be subject to disturbance from any proposed expansion activities.

Eriogonum diclinum (**Jayne's Canyon buckwheat**): Endemic to the Klamath Mountains on high elevation granitic soils. Five populations are known in Oregon. Its range in California is larger. The Mt. Ashland population and Grayback Mountain population are the largest of the Oregon populations. On Mt. Ashland, it is abundant in a core area on the summit and West Ridge area, with the lupine and horkelia, as well as extending with less frequency onto other sides of the mountain. It is also present along the crest between McDonald Peak and Siskiyou Peak.

Saussurea americana (**American sawwort**): A large robust long-lived perennial forb of mountain wetlands. Known from northeastern Oregon, and other parts of western North America. This species is disjunct in the Siskiyou Mountains where there are number of small occurrences between Mt. Ashland and the Oregon Caves National Monument. The largest number of individuals is in the Grouse Creek basin on the southwest side of Mt. Ashland. There is one small population within the Middle Fork area, in a wetland where no disturbance activities are proposed.

Kalmia polifolia **(Kalmia**): This heath-like low shrub of mountain wetlands is rare in the Siskiyou Mountains. It is less rare but uncommon in the Klamath Mountains farther south, and is common in the Sierra Nevada and Cascades and northward. It is present in the Middle Fork area in the same wetland as the sawwort, where no disturbance is proposed.

Poa bolanderi (**Bolander's bluegrass**): This species is a seldom-collected annual native bluegrass that is being reviewed by the Oregon Natural Heritage Program for possible inclusion on their rare plant lists. In addition to Mt. Ashland, known sites in Oregon include Wagner Butte, near Observation Peak, Dutchman Peak, in Kettle Creek vicinity, on McDonald Ridge, and at Crater Lake National Park. There are ten small patches of this grass found scattered within the SUP area. Of those, one is within the proposed Skiway Run, and another is within proposed Run 12. Several are within proposed ski runs in the Knoll vicinity. The small populations of Bolander's bluegrass in the SUP area are found in small openings or under open canopies within dry Shasta fir forest. No surveys have been conducted for this grass in the large areas of suitable habitat outside of the SUP area.

Dicentra uniflora (**one-flowered bleeding-heart**): This locally uncommon forb occupies parts of the natural open rocky areas proposed to become part of the ski runs on both the east and west side of the Knoll. It is known from other locations in the Oregon Siskiyous as well as other parts of Oregon.

Juniperus occidentalis (**western juniper**): One juniper tree stands in a rock island with a couple other scruffy conifers near the Sonnet Chairlift. Western juniper is uncommon west of Interstate 5, in Oregon.

S*wertia radiata* (**monument plant**): Typically a Great Basin species, this tall perennial forb is known locally from the west side of Wagner Butte, and on the Siskiyou Crest area, one to two miles west of the SUP area. It has been reported to be in the Middle Fork area but Forest Service surveys have not been able to validate this.

Mimulus pygmaeus (**pygmy monkeyflower**): A species endemic to the Cascades; sunny sites, clay soils, vernally moist areas 2,500-5,500 feet in elevation. It has been reported within the Middle Fork area but the habitat there is entirely inappropriate for this species. The Forest Service believes this report was a misidentification of small individuals of *Mimulus primuloides*, which are within the Middle Fork area, but are not considered rare plants.

a. Type Localities

Type localities are sites where plants, previously unknown to science, were collected and used to describe new taxa in a scientific publication for the first time. Populations of even common plants at their type localities are important to plant taxonomists as reference populations. Mt. Ashland is the type locality for the Mt. Ashland lupine and Henderson's horkelia discussed above. Mt. Ashland is also the type locality for *Potentilla glandulosa* subspecies *ashlandica* and *globosa* (Ashland sticky cinquefoil and Siskiyou sticky cinquefoil). These subspecies of a perennial forb in the rose family are present in the Middle Fork area. Neither subspecies are rare plants. Subspecies *globosa* is present in many dry open spots around Mt. Ashland, and throughout the Siskiyou Mountains. Subspecies *ashlandica* is present in moist meadows around Mt. Ashland. It is occasionally found elsewhere in the Siskiyou Mountains and is more common in the southern Oregon Cascades.

7. Outstanding or Unusual Plant Communities

Special areas (and/or associated species) discussed under this Section do not have special status under ESA or the NWFP, and Forest Service policy does not require active reconnaissance or special protection for these areas or communities. These areas are discussed as they are determined by the Forest Service to possess special or unusual characteristics and represent locally important elements of biological diversity.

a. Engelmann Spruce Grove

The Engelmann spruce grove and associated wetland in the Middle Fork area is considered by many botanists as unique. Besides the rarity of Engelmann spruce in the Klamath Mountains, this stand is in a stage of late ecological succession and appears to be heading toward spruce climax. Spruce trees are dominant or co-dominant with Shasta red fir and other conifers in all vegetation layers. The shrub layer is dominated by Steve's Peak huckleberry (a Klamath Mountains race of *vaccinium membranaceum*), mountain alder, and swamp currant. Species richness of herbaceous vascular plants, bryophytes and fungi is particularly high. Several of the rare organisms previously discussed, live here and not within the other wetlands or surrounding uplands within the SUP area. Also see discussions in Section D, 1, b, and 7, a, this Chapter.

b. Upper and Lower Wetlands

A portion of the upper half of proposed Run 12 goes through a high open natural wetland meadow dominated by green fescue, a high elevation bunchgrass, not common in this region. This meadow and a few other places around Mt. Ashland are the only places it achieves such a dominant position in a plant community. In many respects, this meadow can serve as a reference area, or “desired condition” for restoration of degraded sites elsewhere on the Siskiyou Crest.

A wetland meadow adjacent to the lower spruce wetland at the bottom of proposed Run 14, has fairly typical mountain meadow plants. However, it is a rare example in the Siskiyous of a meadow whose species composition doesn't reflect a long history of livestock grazing. This observation is based on the infrequency of “increaser” species (species which increase over time under the influence of grazing) that usually dominate these types of meadows on rangelands. This meadow is also an excellent reference area for rangeland restoration of moist mountain meadows.

c. Mt. Ashland Candidate Botanical Area

The 1991 FEIS Chapter III, Botanical Resources section, summarizes the background for this administrative site. Since the 1991 FEIS was completed, the KNF released an LRMP (1995) that established land allocations on the south side of the Siskiyou Crest. Among those allocations in the Mt. Ashland area is the Mt. Ashland/Siskiyou Peak Special Interest Area, emphasizing management of botanical values.

With that allocation process finalized, the RR-SNF may now amend the RRNF LRMP (during Forest Plan Revision) to establish the Mt. Ashland Botanical Area on the RRNF side, aligning the boundaries with those proposed in the 1990 Forest Planning process. The SUP area is not within this candidate Botanical Area within the RRNF. None of the proposed developments associated with ski area expansion are within this candidate Botanical Area.

The "West Ridge" portion of the currently used ski area, and actions proposed under Alternative 2, roughly follow the Forest boundary between the KNF and the RRNF. Current and proposed use may actually be occurring within the Klamath Special Interest Area; this is a compatible use in accordance with KNF LRMP Standards and Guidelines.

8. Invasive Non-native Plant Species

Several non-native plant species have been detected in the SUP area. Some got there opportunistically and a few were deliberately seeded. None of the seeded species have spread beyond their point of introduction, and nowhere in the SUP area are non-native species any more than a minor component of the flora at this time. The non-native species that is most likely to move in or spread with proposed expansion of ski area facilities is colonial bentgrass. This species has been seeded along the entire paved Access Road to the MASA. It has also established itself on Upper Dream ski run.

A known infestation of dalmation toadflax, listed as an Oregon noxious weed, existed on the upper fringe of the Bowl for several years. It has not been seen in recent years. Propagules may still be present and could spread into the proposed new ski runs.

The Forest Service has a policy to use native species from local gene pools when plant materials are desired for erosion control and other revegetation projects. This policy also allows the use of non-native species when native plant materials are unavailable, ineffective, or otherwise unable to meet a resource objective. Native plant materials would specifically be used on any activities associated with proposed ski expansion. It is also possible that non-native plant materials, selected to avoid species that spread, may be used on this project (see Mitigation Measures, Section F, 8, f, Chapter II).

9. Terrestrial Wildlife Habitat

For the purpose of the wildlife habitat and species discussions, "Analysis Area" refers to the upper portions of the sub-watersheds encompassing the SUP area. These include Federally managed lands in the upper elevations of Ashland and Neil Creek watersheds within the Rogue Basin, and Cottonwood and Grouse Creek watersheds within the Klamath Basin. This Analysis Area includes the area in and around Mt. Ashland, and is discussed and referred to in this and the next sections as the Klamath/Siskiyou Mountains, the Siskiyou Crest, or the Mt. Ashland ecosystem, in relation to terrestrial wildlife habitat conditions and species.

a. Overview of Past Activities and Conditions

Historically to the mid 1800s, forested habitat that existed within the Klamath/Siskiyou Mountains was relatively unbroken (meadow areas existed near the summit), and resulted in a functional, structurally diverse habitat due to soil conditions, and natural disturbance factors such as landslides, wildfire, insects, and disease, etc. (Spies et al. 1994). Since that era, habitats along the Siskiyou Crest (see Landscape Ecology, this Chapter), including the SUP area, have changed due to human activity.

Fire has been effectively removed from the Mt. Ashland ecosystem due to suppression activities. Indigenous peoples had previously burned the area within the Ashland Creek Watershed for a variety of purposes (see Williams 2001). Whittaker (1960) described post settlement burning, the absence of which has affected habitat and species composition and function in the Klamath/Siskiyou Mountains. Human activities which have created fragmentation of forested habitats include the grazing of sheep and cattle (both no longer permitted within the SUP area), Forest Service roads, private and Federal timber harvest in the Klamath, Ashland, and Applegate watersheds, and the communication facilities complex at the summit of the Mountain.

The MASA has also contributed to fragmentation of habitat within the SUP area. This area has been affected by creating edge, loss of interior habitat, drying of interior forests, etc., due to human presence, ski runs, and roaded or trailed access. The effects of the interrelated and interdependent terrestrial wildlife activities (nocturnal and diurnal) in this Analysis Area continue to this day, and would continue with the proposed expansion project.

b. Late-Successional Habitat

Late-successional forests contain both mature and old-growth habitats (see vegetative condition definitions presented in Sub-section 3, a, this Section). For purposes of habitat assumptions, late-successional habitat is defined as a forest stand with moderate to high canopy closure, a multi-layered, multi-species canopy dominated by large overstory trees, a high incidence of large trees with broken tops and other indications of dead or dying trees, numerous large snags, and logs and other downed woody material on the forest floor.

Late-succcessional forest types (seral stages) contribute to overall biological diversity within the landscape. Biological diversity is the variety of life forms and processes, including a complexity of species, communities, gene pools, and ecological functions (USDA FS and USDI BLM 1993). With forested stands, biological diversity includes the entire variety of age classes as well as forest types. However, old-growth forests require special consideration, because their integrity as functioning ecosystems and their ability to provide habitat to species associated with the forest interior may be strongly influenced by stand size (Rosenburg and Raphael 1986). Logging and other human activities in the Pacific Northwest have reduced the size of old-growth forests, resulting in region-wide changes in wildlife composition (Rosenberg and Raphael 1986).

Some stands of late-successional forest habitat have become isolated by harvest and other activities that have disrupted connections between large, contiguous blocks. This fragmentation increases the ecological importance of the remaining late-successional forests, including their value as habitat for forest interior plants and animals. The full impact of late-successional forest fragmentation is not completely understood, but the populations and numbers of species associated with mature and old-growth forests can decrease if fragmentation, isolation, and reduction in stand size occurs.

Based on vegetation land cover mapping, approximately 53 **%** of the SUP area is in late-successional forest habitat (see Section D, 3, b, this Chapter), and approximately 21% is in mid-successional forest.

Many Endangered, Threatened, and Sensitive species are affected by fragmentation of habitat. Wilcove (1998), Czech (1997), Czech et al. (2000) and Czech and Krausman (2001) note that fragmentation and exotic species (respectively) are the major cause of species endangerment (see also Doremus and Pagel 2001). Within the SUP area and the Ashland Creek and Klamath River watersheds, fragmentation of habitat has had an as yet un-quantified effect on extant terrestrial species composition.

The Siskiyou Crest in the area of Pilot Rock and Mt. Ashland has been considered an important node for transfer of demographic and subsequent genetic material between populations of owls and other vertebrates (see Section D, 1, this Chapter). The Siskiyou Crest offers a corridor of habitat for species movement from the Cascades through the Siskiyous, to the Coast Range. However, from a landscape perspective, while it may be the most important for the area, it is not the only corridor for movement of gene flow from west to east in southern Oregon and NW California. Corridors exist from the Klamath River in northern CA, north to Roseburg, OR.

For example, the Klamath River riparian corridor, where it crosses I-5 near Hilt, California, offers a viable travel corridor for species genetic transfer over multiple generations. Both elk and spotted owls (documented) have successfully moved between the Coast Range to the Cascades (and the Cascades to the Coast Range) near and south of Roseburg. Possibilities for east-west movement exist from Hilt to Roseburg; however, I-5, along with the communities connected by this freeway, appears to be a major barrier to species movement and long-term genetic exchange for small populations. Wallin et al. (1994) suggest that once landscape patterns, including anthropogenic fragmentation, become established, they are difficult to alter.

The Northwest Forest Plan established a network of mapped Late-Successional Reserves across the Pacific Northwest designed to provide for a distribution of quality old-growth forest habitat for populations of species associated with late-successional forests (see Section D, 1,a, this Chapter). The Late-Successional Reserve (LSR) network associated with the Northwest Forest Plan (including the Mt. Ashland LSR) provides a “coarse filter,” for maintaining species associated with late-successional habitats. Each reserve was designed to absorb landscape scale disturbance processes (“natural” hazards), while maintaining some varying proportion of late successional habitat. The general strategy for obtainings the goal of LSRs was to reduce, but not eliminate, exposure to “natural” and human-caused hazards. The RRNF and KNF LRMPs, and the BLM Medford District Resource plan, including the Cascade Siskiyou National Monument also provide specific designations for the landscape (also see discussion on LSRs in next Section).

The LSR system under the NWFP was designed to provide “clusters and connectivity” of late-successional habitat for the northern spotted owl and other species associated with late-successional forests. These LSRs are located within 8 to 12 miles of each other, to provide for potential dispersal opportunities across the landscape for spotted owls. In addition to this rationale, each LSR was also designed to provide breeding “clusters” of 20 or more pair of owls to act as source populations for the species.

c. Riparian and Special Habitats

Approximately 333 acres of Riparian Reserve occur within the Site Scale Analysis Area. Riparian zones provide a high diversity and abundance of invertebrate species, which is likely to be an important factor influencing the mammal diversity in these areas, as riparian areas provide the major food source for mammalian species, when compared to upland habitats. Bats also occur in higher densities in riparian habitats, likely drawn there by higher species diversity of invertebrate prey in riparian habitat (Cross 1988).

Riparian zones provide habitat for more species of breeding birds (including neotropical species) than any other habitat type in the world. Although at higher elevations (>6,000 feet), riparian bird diversity may decline somewhat and upland habitats may contain more avian diversity (Knopf 1985). Alteration of the function and structure of Riparian Reserves could affect riparian dependent individuals.

10. Terrestrial Wildlife Species

The 1991 FEIS lists and describes some of the wildlife species and habitats that may be affected under this Proposed Action (1991 FEIS page III-9). The FEIS describes in general terms the habitat conditions and wildlife species known or suspected within the SUP area and the larger wildlife Analysis Area. More specific and current information related to terrestrial wildlife species and habitats of interest is presented below.

a. Threatened, Endangered, and Sensitive Species (TES)

In compliance with Section 7 of the Endangered Species Act (ESA)(1973 *et seq*.) and the Forest Service Biological Evaluation process for TES wildlife species, the list of species potentially occurring within the SUP area and larger Analysis Area was reviewed. Lists for the RRNF, Pacific Northwest Region (R6), and the KNF, Pacific Southwest Region (R5) were reviewed in regard to potential effects on any of these species by actions associated with ski area expansion at MASA. Pre-field and reconnaissance results are summarized in Table III-28.

Table III-28. Terrestrial Wildlife TES Species Presence

Wildlife Species (Common name)	Scientific Name	Region of Listing	Pre-field Review: Existing Sighting or Potential Habitat	Field Surveys: Habitat or Species Present
Threatened Species				
Northern Bald Eagle	*Haliaeetus leucocephalus*	NA	No	No
Northern Spotted Owl	*Strix occidentalis caurina*	NA	Yes	Yes
Canada Lynx	*Lynx canadensis*	NA	No	No
Sensitive Species				
Black Salamander	*Aneides flavipunctatus*	R6	Yes	No
Siskiyou Mtn. Salamander	*Plethodon stormi*	R6	No	No
Foothill Yellow-legged Frog	*Rana boylii*	R5 & R6	No	No
Cascades Frog	*Rana cascade*	R5	Yes	No
Oregon Spotted Frog	*Rana pretiosa*	R6	No	No
Northwestern Pond Turtle	*Clemmys marmorata marmorata*	R5 & R6	No	No
Common Kingsnake	*Lampropeltis getula*	R6	No	No
American Peregrine Falcon	*Falco peregrinus anatum*	R5 & R6	No	No
Northern Goshawk	*Accipter gentiles*	R5	Yes	No
Great Gray Owl	*Strix nebulosa*	R5	Yes	No
Willow Flycatcher	*Empidonas trailii*	R5	No	No
Gray Flycatcher	*Empidonax wrightii*	R6	No	No
Upland Sandpiper	*Bartramia longicauda*	R6	No	No
Tri-colored Blackbird	*Agelaius tricolor*	R6	No	No
Pacific Shrew	*Sorex pacificus cascadensis*	R6	Yes	No
Pacific Pallid Bat	*Antrozous pallidus pacificus*	R5 & R6	No	No
Pacific Fringe-tailed Bat	*Myotis thysanodes vespertinus*	R6	No	No
Townsend's Big-eared Bat	*Corynorhinus townsendii*	R5	No	No
California Wolverine	*Gulo gulo*	R5 & R6	Yes	No
Pacific Fisher	*Martes pennanti*	R6	Yes	Yes
American Marten	*Martes americana*	R5	Yes	No
Oregon Shoulderband	*Helminthogltpta hertelini*	R6	No	No
Chace Sideband	*Monadenia chacena*	R6	No	No

Northern Bald Eagle – Federally Threatened

In Oregon, California and Washington, bald eagles typically nest in multi-layered, coniferous stands with old-growth trees, which are located within one mile of lacustrine, large riparian or marine habitat (Frank Issacs, pers. com.). Availability of suitable trees for nesting and perching is necessary to maintain bald eagle site fidelity and populations. Perch trees are also needed by eagles for hunting and resting. These trees typically provide an unobstructed view of the surrounding area. Perches are used for territorial defense, loafing, and for feeding/foraging, because of proximity to feeding areas (Palmer 1988). Oregon, California and Washington area has been key for wintering bald eagles and supports approximately 25 percent of the wintering bald eagles in the United States. Wintering sites are typically near concentrated food sources such as anadromous fish runs, high concentrations of waterfowl, or mammalian carrion. Winter roost sites provide protection from inclement weather conditions, and are characterized by more favorable microclimate conditions.

There is no habitat for nesting or wintering bald eagles within the Analysis Area for MASA. The nearest known occurrence is near Emigrant Lake, approximately 4-5 miles to the northeast of the SUP area. No surveys were conducted.

Northern Spotted Owl – Federally Threatened, RRNF LRMP Management Indicator Species
The northern spotted owl (*Strix occidentalis caurina*) is listed as Threatened under the Endangered Species Act (ESA) (55 FR 26194). No spotted owl pairs are known to nest within the MASA SUP, nor are any spotted owl activity centers located within the SUP area.

Information on the ecology of the northern spotted owl is contained within *A Conservation Strategy for the Northern Spotted Owl* (Thomas et al. 1990), and Federal Register Final Rule (RIN 1018-AB32) Endangered and Threatened Wildlife and Plants: Determination of Critical Habitat for the Northern Spotted Owl (USDI, 1-15-92 Federal). See also the July 18, 2001 *Biological Assessment for the Rogue River/South Coast FY 01/02/03 Timber Sale Projects for Medford District, Bureau of Land Management, Rogue River and Siskiyou National Forests* for a summary of relevant reports on the ecology of the northern spotted owl. There are approximately 5,608 pair of spotted owls and resident singles (activity centers) and approximately 8.1 million acres of suitable habitat across the range of the species (Holzman, U.S. Fish and Wildlife Service, pers. com. 1995).

The Northwest Forest Plan provides for the conservation of the species by allowing non-suitable but capable habitat to regenerate within the LSRs, which should allow the population to eventually stabilize across its range. Reserve design was planned to allow for interaction of metapopulations, as well as utilize habitat throughout the entire range of the subspecies for long-term persistence (Murphy and Noon 1992, Noon and McKelvey 1996). The 1990 Spotted Owl Status Review Committee suggested that population size is primarily a function of the amount and distribution of available suitable habitat (Thomas et al. 1990).

In developing a conservation strategy for late-successional forest-associated species, the Departments of Interior and Agriculture utilized a network of forest "reserves" within the range of the species throughout the Pacific Northwest. This reserve network was designed to protect late-successional forest species where habitat conditions are relatively intact and provide for the regeneration of late-successional forest habitat where habitat is extremely limited. Known spotted owl activity centers (see NWFP ROD C-10) have been designated, mapped, and retained.

Late-Successional Reserves were established with the signing of the Northwest Forest Plan. The intent of LSRs is to protect and enhance conditions of old-growth forest ecosystems, which serve as habitat for old-growth related species, including the northern spotted owl (NWFP 1994). The Late-successional Reserve Network in the Pacific Northwest roughly covers three major mountain ranges: the Cascade, Klamath, and Coast Ranges. Together they roughly form an "H." One side joins the Sierras in California to the Cascades in Oregon. The other side joins the California and Oregon coastal mountains. The Cascade/Sierra Crest, except for the Klamath and Columbia River gorges, forms a continuous north-south "backbone," and the Siskiyous form the "cross-bar". Seventeen LSRs are within or on the edge of the Rogue River and South Coast Basins. See Appendix C of the 18 July 01 Biological Assessment for a descriptive narrative of each LSR.

The Mt. Ashland Ski Area is located within Critical Habitat Unit (CHU) OR-76, designated by the US Fish and Wildlife Service (USFWS). This CHU totals 56,465 acres, of which approximately 22,094 acres are currently in suitable owl habitat. Much of the suitable habitat within the SUP is well above 6,000 feet in elevation.

The USFWS, in cooperation with spotted owl research biologists, have determined that spotted owls have a limited potential to nest at this elevation (Frank Wagner, pers. com.). While the potential habitat in and around Mt. Ashland does have the structural attributes of fully suitable nesting, roosting or foraging (NRF) habitat for spotted owls, based on examination of the habitat and further field analysis and attempts to detect the owls through approved protocol calling methods, the habitat at best likely only provides forage and roost habitat. To date, no spotted owls nests have been detected at comparable elevations in southern Oregon. There are no mapped or unmapped Late-Successional Reserves located within the SUP area.

The SUP area is between the Mt. Ashland Late-Successional Reserve (LSR), and the Soda Mountain LSR (Cascade-Siskiyou National Monument). Both of the LSRs are aligned on an east/west basis and approximately five air miles apart, separated by the Interstate 5 corridor. The Mt. Ashland LSR encompasses 51,512 acres straddling the Siskiyou Crest; 20,829 acres are located to the north on the Ashland Ranger District of the RR-SNF, and 30,683 acres are located to the south on the Scott River Ranger District of the KNF. The SUP area is located on the eastern boundary of the Mt. Ashland LSR, along the Siskiyou Crest.

Fragmentation of the historical habitat has occurred; yet large blocks of contiguous owl habitat and good dispersal capabilities exist throughout the Mt. Ashland LSR; approximately 90% of the LSR is capable of serving as owl habitat and 56% is now fully suitable habitat (Table III-28). Wildfire conflagration in this LSR may alter the habitat to limit or otherwise affect dispersal potential for northern spotted owls (see Carey et al. 1992 for further discussion of effects of habitat fragmentation on spotted owls).

The Soda Mountain LSR (Cascade-Siskiyou National Monument) is managed entirely by the BLM and approximately 55% of this LSR is capable of producing spotted owl habitat. Approximately half of those lands capable of producing suitable habitat within the LSR are now suitable spotted owl habitat. This LSR is situated in a highly fragmented landscape, due to the "checkerboard" pattern of Federally managed public and privately held lands in this area, and there has been a concern for dispersal within the LSR. This LSR serves as a primary link between the South Oregon Cascades and the Oregon/California Klamath Provinces.

Table III-29. Habitat Conditions and Owl Pair Status of LSRs within Dispersal Range of SUP

	MT. ASHLAND LSR	SODA MOUNTAIN LSR
TOTAL FEDERAL ACRES	51,512	34,480
CAPABLE NRF % of total acres	47,041 (90)	19,020 (55)
Existing NRF % of capable NRF	30,069 (64)	10,630 (23)
# PAC's with >40% NRF	22	0
# PAC's with <40% NRF	4	18

NRF = Nesting, Roosting, Foraging habitat
PAC = Pair Activity Centers

The lands between the Soda Mountain and Mt. Ashland LSRs are mostly private, and dispersal capability for owls has been limited by past timber harvest, the interstate freeway and related roads, and other human development. Dispersal is further affected by south facing slopes that do not generally provide habitat for the species. The lands within this area have been subject to harvest, much of it to levels below dispersal habitat. Timber harvest has also occurred on Federal lands, principally on the upper Neil Creek area, and until 1992, in what is now the Cascade-Siskiyou National Monument.

One spotted owl pair activity center (2052) was historically located within 1.3 miles of the Special Use Permit area. This owl pair currently has approximately 2,870 acres of nesting, roosting or foraging (NRF) habitat within 1.3 miles of its nest site within the Ashland Watershed. Studies carried out by Frank Wagner (OSU) and the RRNF in the early 1990s showed that the male of this owl pair utilized open, high elevation (6,100 – 6,500 ft.) Shasta red fir stands for day roosting during winter months when high-pressure systems set up over SW Oregon (Frank Wagner, pers. com. via Fred Way). One primary location used by this spotted owl was the lower portion of the ridge where Run 12 is proposed.

Radio telemetry analysis suggests that the bird used the ridge to take advantage of solar radiation, assisting the bird with internal thermal-regulation. Wagner ascertained this through 19 separate detections on this ridge in the early 1990s. Sam Cuenca (KNF Wildlife Biologist, pers. com.) has observed that spotted owls sometimes forage along these high ridges, but surveys have not identified any nesting owls at these elevations.

Surveys of the SUP area, and habitat adjacent to the SUP area have re-acquired (1999 through 2002) owl locations near historical nests. The closest owl pair on the RRNF is approximately 1/2 air mile from the project boundary, in the Neil Creek Watershed. No owls have been detected in the SUP area near the Bowl. For the Region 5 portion of the SUP, spotted owls have been recently detected closer than in previous years; the closest pair (Upper Cottonwood) is approximately ½ mile from the SUP area. The three other recent pairs found on the KNF side of the ridge are from two to five miles distant.

The KNF and the USFWS have collaborated on an analysis process that examines the effectiveness of LSRs; it asks, is a given LSR sufficiently providing for northern spotted owl? This process is referred to as the California (CA) Northern Spotted Owl (NSO) Baseline Analysis. The result of the process was a recommendation that a 7-mile no-timber-harvest buffer should be established around any LSR deemed "not sufficient."
The CA NSO Baseline Analysis "determinations" for the LSRs that overlap with the KNF, and RR-SNF, are as follows (west to east):

- **LSR 352** (Grider/Thomas – LSR of lower concern, sufficiently providing for NSO
- **LSR 353** (Thompson/Seiad) – LSR of lower concern, sufficiently providing for NSO
- **LSR 354** (known as either Johnny-O'Neil or Applegate-Oak Knoll) – Vegetation data for California and Oregon was not fully analyzed by the Baseline Team. However, preliminary data from California indicates that this LSR is not sufficiently providing for NSO (pers. com. Laura Finley of USFWS and Brian Woodbridge of FS/USFWS - Baseline Team)

- **<u>LSR 248</u>** (Mt. Ashland) – Vegetation data for California and Oregon is not compatible enough for a full analysis to be completed. However, preliminary data from California indicates this LSR is sufficiently providing for NSO (pers. com. Finley and Woodbridge).

The MASA SUP area is well outside of the 7-mile buffer for the Johnny-O'Neil LSR; therefore, the 7-mile buffer recommendation would not apply to the MASA SUP area.

Canadian Lynx – Federally Threatened

The USFWS listed the Canada Lynx as threatened under the Endangered Species Act on March 24, 2000 (Federal Register, Volume 65, No.58: pages 16051-16086). The RRNF reinitiated consultation on the MASA expansion project on August 28, 1998. This 1998 specific Biological Assessment for the Ski Area was prepared in part because a portion of the project was on the KNF, outside of the area covered by the 1997-2005 programmatic consultation effort for non-timber sale projects (August 1, 1996 Biological Assessment, and October 18, 1996 Biological Opinion). The Canada lynx was not addressed in the Forest Service's initial Biological Assessment, but the Forest later requested conferencing on lynx.

Information regarding habitat for lynx was subsequently furnished to USFWS. Among other species, Fish and Wildlife Service's Biological Opinion (BO) of June 3, 1999 (1-7-F-98-414) addressed lynx habitat. At the time the BO was written, based on available information, it was thought that the RRNF contained suitable habitat for lynx. By 2000, new information had become available that signified the RR-SNF is not subject to consultation/conferencing for this species under the Endangered Species Act of 1973. This is because the RR-SNF and Medford District BLM were not included in the January 2000 *Lynx Conservation Assessment and Strategy* (LCAS), Appendix A, Administrative Units involved in conferencing - consultation for lynx. The LCAS was developed by an interagency team of biologists representing the Forest Service, USFWS, BLM, and National Park Service. Vegetation, as defined in the LCAS for the Cascades Geographic Area, is not present in adequate abundance or distribution to support lynx populations on the RRNF.

Historical and current records of lynx occurrence in Oregon, and specifically the RR-SNF, are very limited, with no verified records of occurrence on the Forest or District (Chapter 8, *Ecology and Conservation of Lynx in the United States*, 1999, Ruggiero et al., USDA General Technical Report, RMRS-GTR-30). The evidence, both historical and current, indicates that individual lynx may have been present from time to time in the Cascade crest in southern Oregon, but it is highly unlikely that a resident, reproductive population was ever present.

The RR-SNF has been actively seeking information on carnivores since 1992 and has not documented the presence of lynx or their tracks. Biologists on the Cascade Zone of the RRNF have maintained over 150 baited camera stations during the winter months in seven of the last eight years. During this time, biologists and technicians have continually been on the lookout for carnivore tracks while snowmobiling to and from camera stations.

To date, the only felids or felid tracks documented have been mountain lion (*Felis concolor*), and bobcat (*Lynx rufus*). Additionally, a telemetry study of fishers (*Martes pennanti*) is currently being conducted on the RRNF by Keith Aubry of the Pacific Northwest Research Station. Since 1995, biological technicians have been trapping fisher and collecting telemetry relocations on a regular basis. At no time during the course of this study have these technicians incidentally trapped or seen Canadian lynx, or their tracks.

A three-year national interagency survey for lynx was initiated in 1999. Surveys were conducted in suspected lynx range across the conterminous United States. In the Pacific Northwest, surveys were conducted on four National Forests in Washington and ten in Oregon, including the Rogue River. Canadian lynx were recorded from only one forest (the Okanogan NF in Washington) in the three-year period. Surveys conducted in the Pacific Northwest met Northwest Forest Plan survey requirements.

Two unverified sight records of lynx exist for the RRNF – both in the 1980s. One visual was reported from the Sky Lakes Wilderness (Bobcat Devlin pers. com.), the other from the Applegate Ranger District (Dave Clayton 2000, pers. com.). In addition, a lynx was shot in Modoc County, CA in fall of 1983-84, just south of Klamath Falls near Tionesta, CA, near the intersection of Forest Service Road FS 97 and Highway 139. The shooting occurred at 4,200 feet in elevation (T 44 N, R 06 E, Section 10); this adult male weighed about 35 pounds (Brendan White, Camryn Lee, USFWS 2000 pers. com.). The site was approximately 22 miles south of the California/Oregon border (about halfway between the city of Tule Lake and Canby, CA). This animal was mounted, and verified as a lynx. The person who shot the lynx said he also trapped and released a lynx in the 1960s near the intersection of Lookout Road and Highway 139 (approximately 12 miles south of the 1984 kill). This person may also have seen a lynx in the 1930s just north of Clear Lake. He also mentioned his father trapped an estimated four or five lynx along his three mile route to school in this same area (in the early 1900s).

The RR-SNF will continue to conduct baited camera surveys, dependent on funding, for the next several years. The RRNF also entered into agreement with the Winema National Forest, Umpqua National Forest, USFWS, and Oregon Department of Fish and Wildlife and has conducted helicopter surveys for wolverine (*Gulo gulo*) in the high-elevation habitats of southwest Oregon for the years 2000-2004. Currently, the RR-SNF (including the KNF portion of MASA) is not considered to be within the range for lynx.

Black Salamander – Forest Service Sensitive

The black salamander barely enters the Pacific Northwest in the Siskiyou Mountains of southern Oregon (Nussbaum 1983). It is otherwise restricted to northwestern California. It inhabits open woods, and deciduous and coniferous forests, and is chiefly a ground-dwelling animal. It is often found near forest streams. It resides beneath rocks, within cracks of logs, in talus along road cuts, and under logs and bark (Stebbins 1985). Individuals located on the Applegate Ranger District, to the west of the LSRs, do not seem to be associated with streams or riparian areas. Many sites in the Applegate Valley consist of very dry and open rock outcroppings, particularly at the higher elevations (Clayton 1995). The species has been located in lower Beaver Creek on the KNF in similar dry, as well as riparian associated, habitats. Individuals are most likely to be found in association with rocky (talus) habitat (Corkran and Thoms 1996, Dave Clayton, pers. com. 2003). The species is not likely to occur at the various sites proposed for new ski runs, because of the lack of rocky habitat, and because the species is not expected to be found above approximately 5,000 feet elevation (Dave Clayton, pers. com.). No specific surveys for the black salamander were conducted for the SUP area.

Siskiyou Mountain Salamander – Forest Service Sensitive
The Siskiyou Mountain salamander is a local endemic species with a known range of approximately 250 square miles. This species is a rocky substrates obligate and generally requires cool, moist conditions characteristic of forested stands with a high canopy closure. They are generally restricted to habitats below 6,000 feet in elevation (Dave Clayton unpubl. data). Timber harvest and related activities that alter microhabitat conditions and cause substrate disturbance are principal factors affecting this species and their habitat. The Northwest Forest Plan (USDA/USDI 1994) provides Standards and Guidelines for management of occupied habitat. Surveys associated with the Ashland Watershed Protection Project conducted within the Ashland Watershed have failed to find any suitable habitat in the form of forested talus or rocky substrates. The Ashland Watershed consists largely of highly degraded granitic soils that do not lend themselves to the type of habitat that this species requires. The SUP area is also largely above 6,000 feet in elevation. In addition, there are no known localities for this species east of the lower reaches of the Little Applegate River. No specific surveys for the Siskiyou Mountain salamander were conducted.

Foothill Yellow legged Frog – Forest Service Sensitive
This species is known from several localities in the Rogue and Klamath River Basins. It is generally found in association with stream riffles that have rocky substrates and partially shaded banks (Hayes and Jennings 1988). In the Applegate River drainage, it is generally found in lower elevation, larger stream and riverine habitats (Dave Clayton pers. obs.). There are no reports of this species occurring in the Ashland Watershed, although it may occur in the lower reaches of Cottonwood Creek on the Klamath side of the Siskiyou Crest. No surveys for yellow-legged frogs were conducted. It is unlikely the species occurs within or adjacent to the SUP area, due to its high elevation.

Cascades Frog – Forest Service Sensitive
The Cascades frog is a medium-sized frog, olive to olive-brown with sharply defined dark splotches on the back. It is a montane species found in the Olympic Peninsula, Washington, and in the Cascade Range of Oregon, Washington, and northern California (Blaustein et al. 1995). It appears that populations are declining throughout the range. Reasons for this decline are not well understood, but locally populations have been impacted by predation from introduced trout in mountain lakes.

Habitat for this species includes: montane meadows, marshes, ponds, small bodies of water, ephemeral pools, potholes without vegetation, and along small creeks (Blaustein et al. 1995). They are typically found at elevations above 2,500 feet (Corkran and Thoms 1996) and are closely restricted to water (Stebbins 1985). Suitable habitat can be found along small streams that run through meadows (Csuti et al. 1997) in the SUP area. Surveys for this species were not conducted, because the species uses open sunny habitats (habitats that would not be decreased in the SUP area under expansion activities).

Oregon Spotted Frog – Forest Service Sensitive
The Oregon spotted frog inhabits waters and associated vegetated shorelines of ponds, springs, marshes and slow-flowing streams and appears to prefer waters with a bottom layer of dead and decaying vegetation. It is found in aquatic sites in a variety of vegetation types, from grasslands to forests. Females are reported to lay egg masses in communal clusters at locations that may be used in successive years.

Once thought to be common west of the Cascades, spotted frogs have disappeared from the Willamette Valley and are found only at sites that do not support bullfrogs. They are currently known from less than two-dozen sites in the high Cascades. Spotted frogs occur locally in eastern Oregon, but a recent study (Green et al. 1997) suggests these populations belong to another species. There is no suitable habitat for this species in the SUP area; therefore, surveys were not conducted.

Northwestern Western Pond Turtle – Forest Service Sensitive
Western pond turtles are known to occur within the lower portions of the Ashland watershed, far below the SUP area. Turtles inhabit ponds, lakes, marshes, and the slow-moving portions of creeks and rivers that have rocky or muddy bottoms and abundant aquatic vegetation. Individuals leave the water habitats during the spring-summer months to search for egg laying sites (Nussbaum et al. 1983, Stebbins 1985). Egg laying sites are anywhere from 50-600 feet from the aquatic environment. Nest sites are usually on open sunny ground, on slopes of 4-12%, in heavy clay soil, and a south- to southwest-facing aspect.

Turtles nest under dry conditions; in fact, too much soil moisture will kill the developing embryos (pers. com. via Dave Clayton with M. Hayes). It is believed that predation on turtles by introduced bullfrogs and largemouth bass are important causes for declines in the Pacific Northwest. Forest management practices are likely to have had much less effect on the species. There are no expansion activities proposed within two miles of any known turtle habitat or locality. The elevation (>5,500 feet) of the SUP area is above any known locations in southwestern Oregon for pond turtles. There is no suitable habitat for pond turtles; therefore, surveys were not conducted.

Common Kingsnake – Forest Service Sensitive
Common kingsnakes have been found in low densities in numerous areas in and around the Rogue Valley and east of Ashland. This species inhabits open forest near water (riparian zones) including areas where rocks and logs provide thermal and hiding cover (Nussbaum et al. 1983, Stebbins 1985). Historical records (St. John 1984) indicate that preferred habitat usually contains a mixture of Douglas-fir, ponderosa pine, live oak, manzanita and deciduous oaks. These snakes primarily feed on fence lizards and prefer dry mixed-conifer sites. Timber harvest and related activities that occur in or around riparian habitats, particularly permanent streams, could affect this species or their habitat. The MASA is at high elevation and it is highly unlikely that this species occurs within the SUP area. No surveys specifically for this species were conducted.

American Peregrine Falcon – Forest Service Sensitive
For many years, the American peregrine falcon was listed as Endangered in the United States, until it was de-listed by the USFWS in August 1999. It still remains listed as endangered by the State of Oregon.

Peregrine falcons are crow-sized raptors that inhabit cliffs located within approximately 0.5 mile of riparian habitat. Peregrines nest on ledges clear of rock rubble, located approximately 40 - 80% of total cliff height. Peregrines are aerial predators who feed mostly on birds. Much of the prey consists of species the size of pigeons and doves; however, avian prey ranges in size from hummingbirds to Aleutian Canada geese.

Peregrine falcons can be disturbed by human activity during the nesting season. Disturbance can cause: nest sites and new territories to be abandoned; active nesting attempts to fail due to egg breakage; or divert adult attention from opportunities to forage and feed eyases. See Ferguson-Lees and Christie (2001) for a recent overview of the species.

There are no known nest sites or potential habitat within the SUP area or larger Analysis Area. Within the Southwest Oregon landscape, 13 peregrine falcon nest sites have been active since 1986. Not all sites are active each year.

Northern Goshawk – Forest Service Sensitive

There is suitable habitat for the goshawk within and adjacent to the SUP area. Goshawks use mixed conifer forests, and concentrate their nesting activity in habitat with dense canopy, and open undergrowth. See Ferguson-Lees and Christie (2001) for a recent species overview.

Several goshawk nest locations are known for the Siskiyou Mountains in Oregon, most within the Applegate Valley. There is one suspected nest site on the Ashland Ranger District, below Wagner Gap (Fred Way, pers. com.). Accipiters, including goshawks, are regularly seen near the MASA, especially during fall migration as they gain elevation to travel over the Siskiyou Mountains; however goshawks are rare, even as migrants. Intensive monitoring for spotted owls and great gray owls has not produced any incidental sightings of goshawks in the Analysis Area. Specific inventories for goshawks were conducted in the SUP and surrounding general area in the mid 1990s (Fred Way, pers. com.), with negative results. No goshawk nests have been found by Forest Service personnel working in the SUP area (typically, goshawks aggressively challenge humans who intrude in their nesting areas).

Great Gray Owl – Forest Service Sensitive

Several authors cite foraging habitat throughout the great gray owls' range as relatively open, grassy habitat, including bogs, selective and clear-cut logged areas, and natural meadows (Mikkola 1983, Nero 1980, Winter 1986). Bryan and Forsman (1987) also found great gray owls foraging in open forests.

This owl is suspected to occur along the Siskiyou Crest and may occur within or near the SUP area. Suitable great gray owl habitat is considered to be mature coniferous forest for nesting (21 inches diameter and >60% crown closure) with adjacent large (>10 acres) meadows for foraging. There is potentially suitable great gray owl habitat within the SUP area in two locations. One area is the large meadow immediately adjacent to the proposed parking lot expansion (project P-1), and could be considered suitable forage habitat. Two years of surveys to Regional protocol were conducted for great gray owls in the parking lot expansion area; no great gray owls were detected.

The upper portions of proposed Runs 12 and 13 also bisect a large meadow and adjacent mature forest habitat that could be considered as suitable habitat for the great gray owl. Surveys conducted in 1990 and 1991, along Forest Road 20 on the south side of Mt. Ashland, failed to locate any great gray owls. In 1998 and 1999, surveys were completed in the SUP area on the north side of the Siskiyou Crest using current Regional protocol; no great gray owls were detected in the survey area.

Willow Flycatcher – Forest Service Sensitive
As a neotropical migrant species, the willow flycatcher breeds in riparian and mesic upland thickets in the United States and Canada, wintering from Veracruz and Oaxaca, Mexico south to Panama (AOU 1983). Breeding habitat in California is typically moist meadows with perennial streams, and lowland riparian woodlands dominated by willows, cottonwoods, or in smaller spring fed boggy areas with willow or alders (Serena 1982, Whitfield 1990). The presence of water during the breeding season appears to be an important habitat component (Fowler et al. 1991). Willow flycatchers have also been found in riparian habitats of various types and sizes, ranging from small willow surrounded lakes or ponds with a fringe of meadow, to grasslands, to willow lined streams or boggy areas.

There is one known willow flycatcher breeding territory adjacent to the SUP area in Oregon, in the Grouse Gap area (Fred Way, pers. com.). No suitable breeding habitat for the willow flycatcher exists within the SUP area and no surveys were conducted.

Gray Flycatcher – Forest Service Sensitive
Gray flycatchers breed in large sagebrush and open ponderosa pine habitat, up to 6,000 feet in elevation. Other suitable habitats include ponderosa pine with bitterbrush or rabbitbrush understories, lodgepole pine, juniper forest, and mountain mahogany woodlands. The species prefers dry habitats. Dense westside brush fields may be unsuitable for this species, as the birds like to forage in the openings between brush. During spring migration, gray flycatchers may be found in pine clear cuts and natural meadow areas. They are also frequently seen in the scattered oak/ponderosa pine savannas found at lower elevations in Jackson County. There are no indications of species presence in the SUP area; surveys were not conducted.

Upland Sandpiper – Forest Service Sensitive
This species nests in ungrazed and lightly grazed grasslands, prairies, and hay fields. Dry patches in wet meadows may be used and they even breed at timberline in Alaska (NatureServe 2000). The upland sandpiper is a neotropical migrant that winters on the pampas of Argentina and Uruguay. Birds arrive in the US around early May and depart around late July (Gilligan et al. 1994). The bird often perches on fence posts. Upland Sandpipers build ground nests in tall grass, so that the overhanging grasses make the nest very difficult to locate. Nesting occurs from mid May through July. Young are precocial, so that nest protection is not required once the eggs hatch.

Upland sandpipers occur in most states and Canadian provinces but are considered peripheral in Oregon and Washington (NatureServe 2000). In Oregon, upland sandpipers breed in small numbers in southern Grant County, Lake County (Sycan Marsh), Umatilla County (Ukiah area), and other areas in the northeast part of the state. They formerly bred in Klamath County. Western Oregon records are limited to vagrants (Gilligan et al. 1994). The high mountain wet meadows of the Cascades on the RRNF may provide marginal breeding habitat, but the species is not known from these areas. There is no habitat for this species in the SUP area, and therefore, no surveys for this species were conducted.

Tri-colored Blackbird – Forest Service Sensitive
Tri-colored blackbirds are found from Klamath County, Oregon, south through the central valley of California to Baja (Harrison 1979). The species may be expanding its range as more breeding colonies are being located north of its traditional range. Birds now breed as far north as Washington. Recently discovered Oregon colonies occur in Portland, Lake County, Wasco County, Wheeler County and Umatilla County (Gilligan et al. 1994).

Local breeding colonies are predominantly in the Klamath and Jackson County areas. The species breeds in wetlands on the Jackson County valley floor, including a colony near the J. Herbert Stone Nursery. Because of the potential range expansion to the north, flocks of blackbirds should be observed closely for potential new populations.

There have been no reports of this species at higher elevation, such as the Dead Indian Plateau, although there appears to be some suitable habitat. The birds are known to breed on the valley floors to the east and west on the RRNF. This may indicate an elevational limit for the birds or lack of survey effort. Tri-colored blackbirds are locally migratory, though some birds remain in the Rogue River valley through the winter. During the winter, tri-colored and red-winged blackbirds occasionally occur in mixed flocks.

Tri-colored blackbirds breed in close colonies, in marshes, tules and wetlands dominated by cattails or willows. They will nest with multiple pairs in the same bush. Tri-colored blackbirds return to the same breeding site for many years. They often forage in open fields and farmyards. There is no habitat for this species in the SUP area, and therefore, no surveys for this species were conducted.

Pacific Shrew – Forest Service Sensitive

Bailey (1936) indicated that this species is often found in moist wooded areas with fallen decaying logs and brushy vegetation. Maser et al. (1981) described occupied habitats, as alder-salmonberry, riparian alder and skunk cabbage marsh habitats; the species is less often found in the mature conifer and immature conifer habitats.

Suitable habitat does exist within the SUP area, i.e., forested areas with mature and immature conifer species. No documented sightings have been recorded within the SUP area. Several museum specimens have been collected at lower elevations in the Ashland Watershed (Verts and Carraway 1998). No specific Pacific shrew surveys were conducted.

Pacific Pallid Bat – Forest Service Sensitive

Pallid bats are known to occur throughout SW Oregon and NW California. Suitable roost habitat types include buildings, bridges, rock outcrops, and large decadent snags. Pallid bats have been captured from several sites on the RRNF, including some locations on the Applegate Ranger District. They have also been captured at a site just south of Pilot Rock at 4,500 feet in elevation, approximately 10 miles southwest of the SUP area (Dave Clayton, pers. obs.). The species feeds on large, hard-bodied insects and is one of few local bats that will land and move around on the ground in order to capture its prey. Favorite prey species in SW Oregon include scorpions, Jerusalem crickets, and several types of large beetles.

A pond near the SUP area was trapped using mist nets during the summer of 1998. Three *Myotis spp*. of bats were captured during that night of mist netting (Dave Clayton, pers. com.). No pallid bats were captured and it is very unlikely that pallid bats occur at the high elevation of the SUP (Dave Clayton, pers. com.). No specific surveys for pallid bats were conducted within the SUP and none were recommended.

Pacific Fringe-tailed Bat – Forest Service Sensitive

Miller and Allen (1928) (as reported by Verts and Carraway 1998) considered this species a cave-dwelling bat, even though most of the specimens they examined were from buildings. It appears to be adapted to living in areas with diverse vegetative substrate.

Applicable management direction is found in the ROD and Supplemental EIS for Survey and Manage Species (USDA FS and USDI BLM 2001). Standards and Guidelines provide additional protection for caves, mines, and abandoned wooded bridges and buildings used as roost sites for bats. One documented sighting was recorded on the RR-SNF, Butte Falls Ranger District. Limited survey work and documentation has occurred with regard to the Pacific fringe-tailed bat throughout its range. No habitat for this species is present in the SUP area and specific surveys were not conducted.

Townsend's big-eared Bat – Forest Service Sensitive
Although this bat occurs in a wide variety of habitats, its distribution tends to be geomorphically determined, and is strongly correlated with the availability of caves or cave-like roosting habitat (e.g., limestone, sandstone, gypsum or volcanic), and in old mining tunnels (Dave Clayton, pers. com.).

Townsend's big-eared bats have been found from sea level along the Pacific coast to 7,900 feet in the mountains of New Mexico, and 9,500 feet in Colorado. It appears to be absent only from the most extreme deserts and highest elevations. Based on its habitat requirements for caves, Townsend's big-eared bats do not occur within the SUP area.

California Wolverine – Forest Service Sensitive
In California, and southern Oregon, the wolverine inhabits alpine, boreal forest and mixed vegetation (Grinnell et al. 1937, Schempf and White 1977). California wolverines inhabit dense coniferous forests and uses open sub-alpine forests up to and beyond timberline. They are associated with rocky outcrops, steep mountainous areas and transition zones between primary cover types. Den sites in Idaho were associated with caves, rock outcrops or talus fields, and are typically above the tree line at high elevation (Copeland 1996; see also Ruggerio 1994).

Large, remote areas with little to no human activity appear to be essential to wolverines (Ruggerio 1994). See the Sierra Nevada Forest Plan Amendment (2001) Part 4.4.1.4 for a recent assessment of the species biology and ecology. Forested riparian zones at upper elevations are likely to be important forage habitats for these furbearers. Habitats are typically forested and provide relatively safe travel corridors that allow animals to move within and between watersheds. In populations where there is extreme movement and low density, the ability to freely move between maintained optimal habitats is important for maintaining genetic variability (Wilson et al. 2000). Riparian zones provide a higher density and diversity of small mammals, which attracts predators, such as furbearers.

The present level of human disturbance at the MASA may preclude wolverine use of the area. Except for on-going human disturbance at the MASA, the western portions of the SUP could represent potential dispersal habitat or temporary refugia for wolverine traveling between the Cascades and the Marble Mountains or other locations in the Siskiyou bioregion. The mosaic of extant mature habitats, riparian areas, and high elevation meadows could provide good forage opportunities for this species.

There is a large rock outcrop within the SUP, immediately adjacent to the existing Caliban Run that may be marginally suitable as denning habitat. Due to the high amount of current disturbance from humans associated with recreation in this immediate area (summer, spring and winter), it is highly unlikely wolverines are present in the immediate or adjacent area (resident or dispersers), or that they would use this outcrop as denning sites.

Over the last thirty years, several unverified wolverine sightings have been reported in the Siskiyou Mountains, in the south Cascades, and south of the SUP area in the Marble Mountains, and elsewhere in Siskiyou County. Even in more favorable habitat, this species is naturally present in extremely low numbers (Banci 1994). It is possible that some remain in the Klamath Province, although at very low densities. Marshall (1988), indicated that a wolverine was sighted on Chrome Ridge in Josephine County about 40 miles NW of the Ashland Watershed, and wolverine tracks were identified by a trapper near the Oregon Caves National Monument in the 1980s.

Wolverine have extremely large home ranges (100-600 km^2) and are difficult to detect and inventory. They are known to regularly avoid anthropogenic disturbance, and are sensitive to any disturbance; they will move den-sites if disturbance is in the area of their den. Remote camera sets placed in the Ashland Watershed and on the Dead Indian Plateau in 1994-96 established for fisher and marten failed to document any wolverines; snow track transects in the same area did not find any evidence of the species. An on-going wolverine detection project in the southwest Oregon Cascades has yet to detect any individuals (Jim Goode, pers. com.).

Surveys for several species of furbearers have been conducted in the Ashland Watershed, yet no wolverines were detected. There is no quality denning habitat within or proximal to SUP area; it is likely this area could only be used, if at all, very infrequently as a movement corridor for male wolverines. Surveys in the SUP area are not recommended due to the unlikely potential for wolverines to inhabit the area.

Pacific Fisher – Forest Service Sensitive

Pacific fisher have more habitat-specific requirements than American marten (Buskirk and Powell 1994). By most accounts, fisher use landscapes containing primarily coniferous forests with dense canopies, old-growth (or large trees), and ample downed woody material (Grinnel et al. 1937, Powell and Zelinski 1994), yet ecological relationships between fisher and habitat are largely unknown.

Fisher activity is expected to occur mostly in relatively young (10" DBH+) stands, consisting of more than 50% canopy closure, a multi-layered overstory, and a fairly large deciduous component often associated with wetlands (Novak et al. 1987). In California, fishers have been found throughout the major coniferous timber types with some reports of use in non-timbered habitats (Schempf and White 1977). The fisher, being a larger animal than the marten, will forage on larger animal prey, in addition to the smaller prey items and carrion consumed by each species (Maser et al., 1981 and Novak et al. 1987). Fishers use a variety of resting sites such as hollow logs, rock piles, and snow dens, but the maternal den is usually in a tree (Novak 1987).

Previous iterations of planning documents for Mt. Ashland have suggested analysis of habitat for Pacific fisher was unnecessary due to the probability that the species was not present at the elevation of the SUP area. Native fishers were known to exist within Oregon in a small area near the California border within the interior coast range (Slauson and Zielinski 2002, Aubrey and Lewis in prep), and were not believed to be within the Siskiyous near the SUP area. This assumption has been proven incorrect.

During the winter of 2001/2002, a biologist associated with Southern Oregon University (Eugene Weir) located and photographed an adult Pacific fisher using carnivore bait stations which were placed to protocol in the MASA SUP area. Fisher were repeatedly photographed between February – late April 2002, at a site in proposed Run 12. Mr. Weir's findings are an elevation record for the species in the Siskiyou Mountains. In 2003, Mr. Weir found evidence of fisher in the SUP area during snow track surveys and he also documented fisher in the Neil Creek drainage.

In addition, during the winter of 2001/2002 (late December to late April), a second SOU student (Brian Schroder) also conducted a photo point study of fisher activity, on the western side of the Applegate drainage. He had six fixed camera sets out at one time, and used the cameras at 10 different sites. In December 2001, he recorded one visit by a fisher to a site near the southern tip of Applegate Lake at an elevation of 2,200 feet. At a site near Browntown, he recorded 31 visits by a fisher in January 2002, at an elevation of 3,400 feet. These documented observations suggest Pacific fisher are in the Siskiyou Mountains, and specifically the MASA SUP area. The use of habitat per seasonality and topography is currently unknown in the SUP area. See also Self and Kerns (2001). As of 2004, the Pacific fisher is a candidate for Federal listing under the ESA.

American Marten – Forest Service Sensitive, RRNF LRMP Management Indicator Species
There are no confirmed sightings of marten in the Siskiyous; there is one unconfirmed sighting in the Red Buttes Wilderness from 1990 (Dave Clayton, pers. com.). Both the KNF and RRNF conducted several remote camera surveys efforts in the Siskiyous in the 1990s but no marten were ever detected in the Siskiyou Mountains. Marten have been detected in the Dead Indian Plateau with fixed camera sets, and have been radio collared on the RRNF, Prospect Ranger District.

Suitable habitat for marten exists on the Rogue River portion of the SUP area, in association with late-successional forests. No field reconnaissance or surveys have been conducted within the SUP area specifically for marten, however surveys have been conducted in the Ashland watershed below the SUP area at approximately 4,500 feet in elevation and no marten were detected. Eugene Weir (Southern Oregon University) conducted carnivore surveys (not specifically for marten) to protocol within the western portion of the SUP area during the winter of 2001-2002. Even though potential habitat for the species occurs within the SUP area, no marten were found.

In North America, American martens are closely associated with mature conifer and evergreen stands with complete canopy closure, and small (<100 m), limited, and interspersed openings that are used as forage areas (Hargis et al. 1999). Snags, downfall, and large woody material provide cover, denning sites, and access points to forage areas below the snow (subnivean habitat) (Buskirk 1992). Riparian areas and forested ridges are used as dispersal corridors between areas of suitable habitat (Novak et al. 1987).

Zelinski et al. (1983) suggest that marten consume microtine rodents, squirrels, snowshoe hares and ground squirrels, during winter use of subnivean habitat (Sherburne 1993). The specific diet of marten in the Siskiyous is currently unknown. The marten's primary prey species in the western United States is the red backed vole, which is associated with late-successional forests.

The marten is a Management Indicator Species (MIS) under the RRNF LRMP. The 1990 LRMP set aside 160-acre marten habitat areas within late-successional habitat above 4,000 feet. Before the Northwest Forest Plan modified the RRNF LRMP, a marten management area existed one mile west of the SUP area in the West Fork of Ashland Creek. This site is now within the LSR land allocation (the LSR system replaced the LRMP network of spotted owl, pileated woodpecker, and American marten areas).

There is minimal evidence that the species occurs within the Siskiyou Mountains portion of the RRNF. The population numbers are probably quite low, if the species is present at all. The adjacent LSR portions of the Ashland watershed, and the Ashland/Oak Knoll LSR contain several thousand acres of high quality late-successional habitat.

Oregon Shoulderband and Chace Sideband

These species of terrestrial snails may be found within 30 m. (98 ft.) of rocky areas, talus deposits and in associated riparian areas in the Klamath physiographic province and adjacent portions of the south-western Cascades. Areas of herbaceous vegetation in these rocky landscapes adjacent to forested habitats indicate more moisture retention and areas that contain moist, shaded surfaces are preferred for daily refuges.

In more mesic, forested habitats, especially in Oregon Cascades, the species is associated with large woody material and the typical rocky habitat is not required. Forest habitats without either rock features or large woody material are not currently considered to be suitable habitat for this species. Extensive project surveys were conducted for mollusks in the SUP area, and these species were not found.

Surveys for other previously listed Survey and Manage mollusks were conducted in the spring/summer of 1999, the fall of 2001, and the spring of 2003. In 1999 *Prophysaon dubium* (tail dropper slug) was discovered at three sites within the SUP area; this species was removed from the Survey and Manage species list (USDA FS and USDI BLM 2001). See next section for more discussion on the NWFP Survey and Manage Guidelines.

b. Other Terrestrial Wildlife Species

The Survey and Manage Standards and Guidelines were originally added to agency land and resource management plans as part of the 1994 *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (the Northwest Forest Plan). In January 2001, the Agencies modified the Survey and Manage Standards and Guidelines by identifying needed management, clarifying language, eliminating inconsistent and redundant practices, and establishing an annual species review process.

The Secretaries of Agriculture and the Interior proposed to remove the Survey and Manage Standards and Guidelines by amending 28 land and resource management plans within the range of the northern spotted owl. USDA Forest Service and USDI Bureau of Land Management jointly prepared a Final Supplemental Environmental Impact Statement *To Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines*. This FSEIS was completed in January 2004; a ROD was signed on March 22, 2004.

The ROD for the Survey and Manage Mitigation Measure Standards and Guidelines results in continued species diversity and conservation while at the same time reducing costs and facilitating the agencies' ability to implement the forest management and timber production goals of the Northwest Forest Plan. For the Forest Service, the Under Secretary of Agriculture's March 2004 decision to abolish the Survey and Manage (S&M) Standards and Guidelines results in eligible species being managed under the Forest Service Sensitive species program.

None of the species that were covered by the Survey and Manage Mitigation Measure standards and guidelines are listed as Threatened or Endangered under the Endangered Species Act, nor are any proposed for listing. All of the Survey and Manage species were evaluated for inclusion in the agencies' Special Status Species Programs. For those that qualify, agencies must ensure that actions are consistent with the conservation needs of those species and that the actions do not cause the species to be listed under the Endangered Species Act.

This Section further discusses terrestrial wildlife species that were previously Survey and Manage species that are now not listed as Forest Service Sensitive. Also discussed are other terrestrial wildlife species of interest that may or may not be present in the SUP area.

Bats

The 2001 Survey and Manage ROD directed Forest Service and BLM land managers to *Provide Additional Protection for Caves, Mines, and Abandoned Wooden Bridges and Buildings that are Used as Roost Sites for Bats.* Six species of bats are covered in this provision. Four species are known or suspected to be in the SUP area. The fringed myotis, silver-haired bat, long-eared myotis, and long-legged myotis are proximal to the MASA SUP (Fred Way, pers. com.).

The NWFP protection buffer requirements apply only to caves, mines, bridges, and buildings used as roost habitat; the guidelines provide for a 250-foot buffer on all occupied roosts of these types. Recent telemetry studies in SW Oregon (Steve Cross via pers. com. with Dave Clayton) have confirmed that these bats and others use large snags for roost sites. There is suitable snag habitat for these species within the SUP area. Surveys have not been conducted within the SUP area to determine species presence and habitat use because the "Additional Protection" requirement does not pertain to snag habitat.

Red Tree Vole

In Version 2.1 *Survey Protocol For The Red Tree Vole* (USDA FS/USDI BLM 2002b), suitable habitat for red tree vole is defined as: "The stand, or portion of the stand, where the habitat-disturbing activity will occur has approximately an estimated stand Quadratic Mean diameter $\geq$ 16 inch DBH or Average mean Diameter $\geq$ 14 inch DBH." This stand must meet one of the following criteria: "1) Mature and old-growth conifer forests and those older mixed age conifer forests containing Douglas-fir (*Pseudotsuga menziesii*), grand fir (*Abies grandis*), Sitka spruce (*Picea sitchensis*), western hemlock (*Tsuga heterophylla*) or white fir (*Abies concolor*) with multi-layered canopies and large branches capable of supporting nests and providing travel routes for red tree voles **or** 2) Conifer forest stands with a canopy closure of 60% or greater of the intermediate, co-dominant and dominant trees and with two or more predominant conifer trees per acre."

Version 2.1 also sets the upper elevation limit for red tree vole surveys at 5,500 feet; the entire SUP area is above that evevation. Nevertheless, the Forest Service completed protocol surveys for red tree vole in the summer of 2001, in all potentially suitable habitat within the SUP area. No evidence of red tree voles was observed.

Migratory Birds

Neotropical migratory birds and resident birds occur within and adjacent to the SUP area. No site-specific surveys have been accomplished. Birds within this category use a wide variety of habitats within the SUP area, from the wet and dry meadow habitats to both early and late-successional forested habitat. The current habitat for migratory birds in the area has been modified as a result of fire suppression policies.

In 1918, the Migratory Bird Treaty Act (MBTA) was passed to enforce a treaty between the United States, Mexico, and Canada. This law addressed the issue of poaching migratory birds – under the MBTA, except as permitted by regulation, it is unlawful at anytime, by any means or in any manner, to pursue, export, import, transport, or carry any migratory bird. It is the position of the Federal Government that the prohibitions of the MBTA do not apply to land management activities of Federal agencies, or to employees acting in their official capacities.

Public comment on the 2003 DEIS asked the status of Executive Order 13186 (January 10, 2001). This Executive Order (EO) calls for Memoranda of Understanding (MOUs) for the USDI and USDA. Finalization of these MOUs is in progress at this time, however, the Executive Order does not contain project specific guidelines or requirements. Since these MOUs are national in scope and are not finalized at this time, USFWS recommends (in the interim) consideration of mitigation measures for these birds (pers. com. Dave Clayton USFWS, 2004).

Habitat attributes that appear to be important for landbirds in old-growth forest are large snags, large trees, and production of conifer cones. Structural and compositional habitat attributes that appear to be most important for landbirds in multilayered mature forest are large snags, large trees, closed canopy, deciduous canopy trees, open mid-story, mid-story tree layers, deciduous understory, and forest floor complexity. Structural and compositional attributes that appear to be most important for landbirds in the stand initiation/early-successional stage are residual canopy trees, snags, deciduous vegetation, and nectar-producing plants.

Timber harvest, burning, and related disturbances can affect species richness and composition on a forest stand scale, and can also affect localized breeding success of extant species. Disturbance of any type creates opportunities for some species, and can displace others. Based on local Monitoring Avian Productivity and Survival (MAPS) stations, most egg laying and nestling rearing by neotropical migratory birds in SW Oregon, occurs from 15 May to 15 July. Mitigation measures that limit disturbance activities inside of this critical nesting period can minimize effects to nesting neotropical migrant birds.

Other Aquatic Amphibians

Two additional species of aquatic amphibians of interest occur within the Ashland Watershed. The tailed frog and the Pacific giant salamander are both known from historical sightings within the watershed. Both species inhabit cold, high gradient streams. Both are sensitive to changes in stream temperature and increased amounts of sediments. It is likely that these two species occur within the SUP area, however no specific surveys were conducted.

Butterflies

One rare, possibly endemic, sub-species of butterfly, the Arctic Blue (*Agriades glandon podarce*), has been documented within the SUP area. It is known to have only one host plant, the shooting star of the genus *Dodecatheon*, and was found in association with this plant in a wet meadow near proposed Runs 12 and 13.

This subspecies does not have special status or protection under ESA or the NWFP and occurs commonly throughout the Sierra Nevada of California. However, it was referred to as "one of the scarcest blues" by Dornfield (1980), who listed Mt. Ashland, Crater Lake, and Diamond Lake as the only known Oregon localities (Nice and VanBuskirk 1996).

In 1996, Chris Nice and Rich Vanbuskirk (UC Davis) generated baseline data on sub-alpine butterflies along the Siskiyou Crest area of southwestern Oregon. Five sites along the Crest were surveyed: Grouse Gap; the meadow associated with proposed Upper Run 12 and Run 13; the existing Mt. Ashland Ski Area; an area along Forest Road 20 between Siskiyou Peak and Siskiyou Gap; and along the Mt. Ashland Acess Road.

Of the sites surveyed, Grouse Gap was determined to be the most important area for butterfly diversity. Important factors listed include: large extent of habitat; south facing slopes preferred by heliothermic butterflies; snowmelt occurs earlier on south-facing slopes contributing to longer growing season for butterflies and their host plants; and the associated wet meadows provide some of the most botanically diverse habitats.

The Actic Blue butterfly *(Agridades glandon podarce)* was documented at the Grouse Gap site, about 0.5 miles southwest of the wet meadow in proposed Runs 12 and 13. It was also documented as the most abundant butterfly flying in the wet meadows where it co-occurs with its only known host plant, *Dodecatheon*. Nice and VanBuskirk also reported *podarce* to be widely distributed along the Siskiyou Crest, and the species appears to exist in stable populations at this time.

The Mardon skipper butterfly (*Polites mardon)* is listed by the USFWS as a Candidate species, and occurs in the vicinity of the MASA. Candidate species have no protection under the Endangered Species Act, but these species may be proposed for listing in the future. The Mardon skipper is a small, tawny-orange butterfly dependent upon native, fescue-dominated grasslands in Washington, Oregon, and northwest California. Three Mardon skipper sites are located within a 10-mile radius of each other in the Siskiyou Mountains of southern Oregon (Jackson and Klamath counties). These populations reside within the boundaries of the Cascade-Siskiyou National Monument between Soda Mountain and Fish Lake (US Dept. of Interior 2001), outside the SUP area. The Xerces Society and others (2002) petitioned the USFWS to list the Mardon skipper on December 10, 2002.

Franklin's Bumblebee
Surveys for the species have been conducted by Dr. R. Thorpe (UC Davis) in the large meadow near the intersection of Forest Road 20 and Road 2000300. Franklin's bumblebee has been located in the vicinity of that area, in low numbers. Surveys have not been conducted in meadow areas within the SUP area (Robin Thorpe, pers. com.).

11. Management Indicator Species and Wildlife Assemblages

Five forest wildlife species and one group were selected as Management Indicator Species (MIS), as listed in the 1990 RRNF LRMP. Indicator species were intended to serve as habitat surrogates to qualitatively suggest the condition of the habitat they represent. For the RRNF, MIS species include: blacktail deer, Roosevelt elk, American marten, pileated woodpecker, northern spotted owl, and all other woodpeckers.

A small portion of the SUP area (72 of 960 total acres) is within the KNF. In their 1995 LRMP, the KNF used the term "multi-species assemblages" as MIS. Pertinent assemblages from the KNF LRMP include hardwood species, river/stream species, marsh/lake/pond species, and snag species.

a. Rogue River National Forest

Blacktail deer are residents of the SUP area and rely upon several different successional stages of vegetation to meet their life needs. Does and fawns utilize the ridge tops shortly after fawning, and forage in these areas in the summer and fall. Bucks may use the steeper headwaters of the watershed for summer foraging and join the does in the late summer and fall at the lower elevations. Early successional vegetation in proximity to older-successional vegetation and water functions to meet the needs of this species.

No resident **Roosevelt elk** are found in the SUP area. However, a herd wintering in the Colestine area of California typically enters into the Ashland Watershed in mid-summer, seeking the cooler conifer stands above the 2060 Road, and west of the 2080 Road. Forage for these animals is provided by the meadows and glades above Road 2060.

As a MIS of the 1990 RRNF LRMP, areas within late-successional habitat of up to 160 acres above 4,000 feet were set aside to provide for **American marten** habitat. Current direction under the 1994 NWFP provides for these species through the allocation of Late-Successional Reserves, Riparian Reserves, and Unmapped Late-Successional Reserves. All lands previously allocated under Forest Plans for the protection of marten, pileated woodpecker, and other late-successional species (e.g., northern spotted owl) were returned to Matrix (except those areas located within mapped and unmapped LSRs or Riparian Reserves).

See discussion on the **northern spotted owl** in in the Threatened Species section above (Section 10, a.).

Pileated and other woodpeckers' needs are evaluated through a gross examination of the number of snags across the landscape. Based on recent examination, these needs are being met in the SUP area via natural recruitment of new snags.

b. Klamath National Forest

On the KNF, MIS species are described by assemblages to reflect how changes in those associations may affect species. These assemblages, more commonly called "associations"[14] are described below, with the corresponding species listed. Multi-species associations including hardwood species, river/stream species, marsh/lake/pond species and snag species, are used by the KNF for project analysis (Jan Ford, pers. com. 2002).

The **Hardwood Species Association** includes two categories: (1) The acorn woodpecker represents oak woodlands with associated large conifers; (2) the Western gray squirrel represents mature hardwood and mixed hardwood-conifer. Neither of these habitats are present in the SUP area.

The **River/Stream Species Association** includes seven categories**:** (1) rainbow trout represents rivers/streams (non-migratory); (2) steelhead represents Rivers/streams (migratory); (3) tailed frog represents perennial montane streams with dense vegetation; (4) Cascades frog represents higher elevation streams; (5) American dipper represents cold, swift, perennial streams; (6) northern water shrew represents riparian w/dense grass-forb cover, (7) long-tailed vole represents mesic habitats, dense riparian vegetation. Habitat categories 1 and 2 are not present within the portion of the SUP in the Klamath River drainage. The riparian habitats represented by categories 3 and 4 are present in limited acreage, and the species representing these categories are discussed elsewhere. Habitat category 5 is not present in the SUP area. The non-forested riparian habitats represented by categories 6 and 7 are present in the SUP area.

The **Marsh/Lake/Pond Species Association** includes two categories: (1) northern red-legged frog represents shallow wetlands, ponds and streams with emergent vegetation; (2) western pond turtle represents permanent or nearly permanent water in a variety of habitats. Neither of these habitats is present in the SUP area.

The **Snag Species Association** includes five categories**:** (1) Red-breasted sapsucker represents mid- to late seral mixed conifer and riparian deciduous; (2) hairy woodpecker represents riparian deciduous habitats with large trees for cavities; (3) white-headed woodpecker represents ponderosa pine and high elevation mixed-conifer, (4) Vaux's swift represents late-successional forests with large hollow snags; (5) Downy woodpecker represents riparian deciduous habitats. Snag habitat is present throughout the SUP area; see MIS discussion under pileated woodpecker above.

[14] Not the same as Plant Associations, as described in Section D, 2, this Chapter.

12. Aquatic Habitat

The SUP area encompasses the headwaters of four sub-watersheds: Ashland and Neil Creeks within the Rogue Basin, and Cottonwood and Grouse Creeks within the Klamath Basin. These sub-watersheds are discussed below, in relation to fish habitat condition and species.

Fish habitat condition indicators are based on the Klamath Province/Siskiyou Mountains Matrix of Factors and Indicators developed by the Rogue/South Coast Level One Team. Indicators provide an approach for assessing environmental baseline conditions, e.g., within the natural range of variability by evaluating habitat indicators of a fish-bearing stream system and its tributary watershed. Habitat element indicators for the streams within the SUP area are generally large wood, riparian condition, pool quality/quantity, sediment, streambank condition, water quality (stream temperature in relation to fish), and stream connectivity. These indicators are discussed for each of the four affected watersheds below.

a. Ashland Creek

The majority of this stream is located on the RR-SNNF on the Ashland Ranger District. Most of the East Fork drainage is inaccessible to vehicular traffic – this in turn, contributes to its relatively pristine state. The East and West Forks of Ashland Creek are important analog sites used to compare stream channel conditions in other managed streams in the Siskiyou Mountains of similar geomorphology. The only substantial human impacts, beside the reservoir impoundments at its mouth, are a culvert crossing on Forest Road 2060 and a small portion of riparian timber harvest near Bull Gap (USDA FS 1999b).

Large Wood

Large woody material (LWM) is important for providing cover and habitat complexity in fish-bearing streams. The amount of large wood material expected within the Bear Creek Watershed ranges from 25 to 250 pieces per mile (USDA FS 1995b). LWM is defined as greater than 50 feet long and 24 inches DBH. In 1995, all reaches of East Fork Ashland Creek were lacking in large wood with a maximum value of 5.9 pieces per mile found in Reach 2.

During a 1997 Forest Service stream survey (East Fork), there was an average of 16.9 pieces of large wood per mile in Reach 1 (mouth up to 2.2 miles upstream – 3,800 feet elevation), 28.7 pieces per mile in Reach 2 (2.2 – 3.5 miles upstream – to Bull Gap Creek), 18.9 pieces per mile in Reach 3 (3.5 - 4.3 miles upstream, unnamed tributary, 4,740 feet elevation), and 25.9 pieces per mile in Reach 4 (4.3 - 6.1 miles upstream, springs at 6,600 feet elevation).

The amount of large woody material found during a Forest Service 1990 survey (Reach 1 – 215 pieces of large wood per mile, Reach 2 - 13, and Reach 4 – 33; average 43 pieces of large wood per mile) of East Fork Ashland Creek indicates that there has been a severe reduction in the past seven years. Most of this large wood material was probably flushed out of the stream system during the 1997 New Year's Day flood. There is a good portion of small to medium sized wood above bankfull that will likely be recruited into the stream during above normal winter flows.

The potential for recruitment of large wood into the stream is high since the inner riparian zone is dominated by large trees (DBH 21-31.9 inches) (USDA FS 1999b). Bear Creek is currently not within natural ranges of variability for the large wood indicator, including the tributary East Fork of Ashland Creek.

Reaches 1-3 also contained several debris jams (USDA FS 1999b). Small/medium wood pieces were contained within debris jams, but were not counted as LWM since the wood did not meet protocol specification; wood must engage the bankfull water level. However, these wood pieces are likely to be important to stream dynamics when they move or impede flow during the next flood event.

Riparian Condition

Riparian Reserves within the Ashland Creek watershed contain a high percentage of mature and late-successional conifer forest. This provides an excellent long-term supply of future large wood to stream channels and various benefits to riparian-dependent species, i.e., stream shade, bank stability and habitat complexity.

During the 1997 Forest Service stream survey, the riparian zone was divided into an inner riparian zone from 0-25 feet, and an outer riparian zone 25-100 feet from the stream edge (USDA FS 1999b). The dominant overstory and understory species and size class in both riparian zones were measured. Due to the wide elevation range, three major shifts were seen in the overstory vegetation of both riparian zones. Douglas-fir dominated at the lower elevations, white fir dominated the middle to high elevations, and a variety of conifers (red fir, white fir, Engelmann spruce, and mountain hemlock) were evenly mixed at the highest elevations. Small-sized trees (DBH 9-20.9 inches) dominated Reach 1, approximately the first 2.2 miles. Large trees (DBH 21-31.9 inches) dominated Reaches 2-4. The understory of both riparian zones was generally dominated by Pacific yew with a few areas dominated by bigleaf maple and/or madrone, except at the highest elevations where red fir dominated. Bear Creek, overall, is not within natural ranges of vaiability for riparian condition, although East Fork of Ashland Creek is within natural ranges.

Pool Quantity/Quality

Pools are an important habitat component, providing rearing and holding habitat for fish. Pools are expected to occur at a frequency of 1.5 times bankfull width at a gradient greater than 4 percent for pristine stream systems (Rosgen 1996). In this stream system (Reaches 1-3), this equates to approximately one pool every 29 feet. The actual frequency of pools in this watershed is approximately one every 114 feet or one every 3.8 bankfull widths. This figure is lower then the 1997 Stream Survey Report (USDA FS 1999b) due to incorrect calculations for this measurement on East Fork Ashland Creek. Nevertheless, the pool frequency is still lower than expected.

Low levels of LWM could contribute to lower than expected pool frequency. Also, low pool frequency may be due to the RRNF requirement of defining a pool by utilizing a one-foot residual pool depth. Using pre-1996 Region 6 Stream Survey and Inventory protocol eliminates recording step pools, pools where length must be greater than width, and the requirement that the pool be channel spanning. Inclusion of step pools would probably increase the pool frequency into expected conditions within natural ranges of stream variability.

Coarse granitic sand was found within most pools and riffles in Reach 1. Residual pool depth for all reaches was an average of 1.69 feet, with the deepest pools in Reach 1 (2.1 feet). Ideal pool depth is 3 feet. Overall, good quality pools exist despite the amount of coarse fines in East Fork of Ashland Creek. The steep gradient, low width to depth ratio, large boulders, numerous pocket pools, and cool water temperature results in good quality trout habitat in this stream.

Pool character and quality, relating to depth and microhabitat complexity within each pool, are not within natural ranges of variability for the Bear Creek watershed; however, East Fork of Ashland Creek is within range for this indicator.

Sediment

During the 1997 Forest Service survey, substrate in East Fork Ashland Creek (lower 2.2 miles) was dominated by boulders and sub-dominated by cobble. The next 1.4 miles upstream were dominated by cobble and sub-dominated by boulders. The last reach, Reach 4 (1.8 miles) was dominated/sub-dominated by cobble.

Substrate sampling for streambed composition (Wolman 1954) in Ashland Creek showed 10-19 percent sand. ODFW standards for good habitat conditions are streambed composition with less than 20 percent sand. Stream substrate components (cobble and gravel) in the East and West Forks and their tributaries can accumulate considerable amounts of fines (sediment), due to highly erodable granitic terrain. This may cause spawning gravel embeddedness and low quality pools (pool filling) downstream. Periodic high flow events flush sediment, transporting it downstream to Reeder Reservoir.

Substrate sampling also showed cobble substrate comprising the upper limit (d50) of mobile substrate at bankfull stage in Reaches 1, 2, and the lower portion of Reach 4. Reach 3 and upper Reach 4 contained large gravel as the upper limit (d50) of mobile substrate. The data for all reaches are within the parameters for natural ranges of variability of stream systems.

Streambank Condition

The 1997 New Year's Day Flood may have destabilized streambanks locally as numerous cutbanks were observed during the 1997 survey, having formed after the 1990 survey. Reach 1 had an estimated 332 linear feet of cutbanks located throughout the reach. Reach 2 had 427 linear feet of cutbanks, with several 80 feet linear cut banks. Reach 3 had 161 linear feet and Reach 4 had 31 linear feet located near the beginning of the reach. Bear Creek is not within natural ranges of variability for streambank condition and East Fork Ashland Creek is at risk (moderately stable, some streambank erosion evident).

Stream Connectivity

The fish barriers observed during the 1999 survey were the reservoir impoundments at the mouth of East Fork Ashland Creek, and Forest Road 2060 culvert. The culvert (round pipe) is 6 feet in diameter and 70 feet long. The stream flow drops 3.5 feet from the culvert to a 2 foot deep pool. Using standard fish survey protocol, fish presence has repeatedly been found only up to the culvert. Approximately 600 feet upstream above the culvert is a natural barrier, a 13 foot vertical fall. Approximately ¼ mile upstream of the culvert is another potential fish migration barrier. The stream gradient increases substantially at the end of Reach 3 and becomes a long series of cascading riffles (USDA FS 1999b).

Stream Temperature (Water Quality in Relation to Fish)
Excellent water quality for fish exists, including cold summer stream temperatures. During the summer of 1994 (a record drought), high stream temperatures were at 64.4 degrees Fahrenheit. Maximum seven-day average high stream temperature for 1993-1995, 1997-2000 (no data for 1996) was 60.8, 64.4, 52.3, 60.2, 60.3, 53.6, and 60.7 degrees Fahrenheit, respectively. Most salmonids have an optimum feeding temperature (at which growth and assimilation of food are best) of 55-65F. At temperatures above this, fish can reduce and finally cease feeding as water temperatures rise between 72-77 Fahrenheit (Behnke 1992). Bear Creek watershed is not within natural ranges of variability for the water quality (temperature) indicator, although East Fork of Ashland Creek is within natural ranges of variability.

b. Neil Creek

Anadromous and resident fish have historically flourished in Neil Creek. Miles of salmonid habitat have substantially declined in quality due to simplification of aquatic habitat, fish barriers/obstacles and warm stream temperatures (RVCOG 1997). In the Neil Creek watershed, the following are the most critical limiting factors for anadromous fish production: lack of habitat complexity and refuge habitat; lack of large wood material in stream and on the floodplain; high amounts of fine and coarse sediment; and bank instability. Other limiting factors are a low incidence of side channels, alcoves and beaver dams on private lands, poor winter habitat, high summer water temperatures, low summer flows, high road density, and fish passage (RVCOG 1997). Neil Creek has been identified as a High Value Summer Steelhead stream under the Amendment to the Oregon Salmon Plan (RVCOG.)

Large Wood
Before the 1997 New Year's Day flood, large wood was almost non-existent on the lower, privately owned section of Neil Creek. A strong local concern exists that instream wood promotes erosion and slows floodwater; therefore, instream large wood was deliberately removed after the flood (RVCOG 1997). Large wood counts were higher on the NFSL section (averaged 50-60 pieces/mile) (USDA FS 1990c). High winter flows since the 1997 New Year's Day Flood have flushed out much of the available large wood counted during 1990 and 1994 stream surveys. A lack of future large wood recruitment within the riparian area (on private lands) exists along Neil Creek to provide a future viable large wood source (RVCOG 1997).

No stream surveys have been conducted on private land since the 1997 New Year's Day Flood. Currently, counts of large woody material are low on NFSL within Neil Creek (Mattson 2000). Total large wood counts on NFSL averaged less than 5 pieces per mile in the lower two miles and less than 20 pieces per mile in the next three miles for Reaches 1-4 (Reach 1: Neil Creek river mile 6- 6.52, Reach 2: river mile 6.52-7.21, Reach 3: river mile 7.21-8.73, Reach 4: river mile 8.73-10.06). Only in the upper reach (Reach 5: river mile 10.06-11.79) did instream large wood density approach 50 pieces of wood per mile. The existing large wood material on NFSL appeared to be functioning to trap bedload and create habitat complexity. Counts of woody material in 1990 on NFSL were considerably higher – ranging from 32 pieces per mile in the first mile to a high of 170 pieces per mile in the second mile.

Wood count protocol has changed over time, the earlier protocols included smaller pieces and wood counts would therefore be expected to be somewhat higher. However, such large declines between 1990 and 1999 suggest that the declines are real and likely flood related (Mattson 2000). Bear Creek and Neil creek are not within natural ranges of variability for the large wood indicator since it is below its expected range of greater than 25 large wood pieces per mile.

Riparian Condition

During a modified 1994 ODFW survey on private lands, it was observed that streamside vegetation was mainly a mixture of shrubs and young deciduous trees (ODFW 1994). Inner riparian widths within NFSL were relatively narrow (averaging 22 feet) except in the upper reach, where the mean width was 55 feet on each side of the channel. Sapling pole-sized vine maple was the dominant species in this area, however alder and occasionally conifers, occurred near the stream. Sapling pole-sized trees were the most common size class. The outer riparian zone (15-100 feet, averaging 79 feet) consisted of mainly grand fir and Douglas-fir. Size class was mostly small-sized trees with fewer large trees. There were relatively few timber harvest units observed in the lower reach (Mattson 2000). Management plans, implemented during the past decade on public lands, provide wider buffers and plan for re-growth of riparian vegetation to a more stable and diverse riparian area conditions. Bear Creek and Neil Creek (private lands) are not within natural ranges of variability for riparian condition. Neil Creek (NFSL) is within natural ranges of variability since it has riparian areas providing adequate shade, habitat protection and connectivity for sensitive aquatics species.

Pool Quantity/Quality

Percent of pool habitat on private lands received a “good” rating during a 1994 ODFW stream survey. Pool area exceeded 37 percent in the 1.9-mile segment surveyed (mouth up to 1.9 miles). Pool spacing, which indicates the frequency of pools relative to the width of the stream, received a “marginal” rating. Riffle width to depth ratio was poor in Neil Creek, indicating that riffles tend to be very wide and shallow in most of the surveyed segment (ODFW 1994). No known data exists on private lands after the New Year’s Day 1997 flood. A stream survey was conducted on private lands during summer 2002 and funded and contracted by the UDSA Forest Service RRNF, in conjunction with the Neil Creek Watershed Partnership. This repost was completed March 2003.

Effects of the New Year’s Day 1997 Flood were observed during the 1999 stream survey on NFSL. These effects included cut banks, scoured boulders, high amounts of sand deposits, and some filled pools (Mattson 2000). Fish habitat on NFSL overall, was comprised of 80 to 90 percent riffles, 10-20 percent pools and up to 3 percent side channels habitats. Pool area on NFSL ranged from 19 percent in the lower reaches to just over 10 percent in the upper reaches. Pool area was similar to data gathered during 1990 (Mattson 2000).

Pools are expected to occur at a frequency of 1.5 times bankfull width at a gradient greater than 4 percent for pristine stream systems (Rosgen 1996). In this stream system on NFSL (Reaches 1-4), this equates to approximately one pool very 31 feet. The actual frequency of pools in this watershed on NFSL is approximately one every 197 feet or one every 6.4 bankfull widths. The pool frequency is lower than expected. This may be due to reasons stated under the East Fork of Ashland Creek pool quantity/quality section, and past management activities.

Average depths of pools in Neil Creek were relatively shallow. Average depths ranged from 2 – 2.5 feet in the lower reaches to just under 1.5 feet in the upper reach. Shallow pools (and low pool area) may be a result of recent filling by sand. Although it was noted in the 2000 stream survey report, residual pool depth comparing the 1990 stream survey, suggest that no or little change occurred in pool depths and that the pools have been shallow for some time. Side channel habitat area was unchanged between 1990 and 1999 stream surveys.

Neil Creek, overall, is not within natural ranges of variability for pool character and quality (less than 30 percent pool habitat by area, widespread evidence of pool volume reduction and majority of pools less than 3 feet in depth).

Sediment

Urban and residential development, and agricultural and timber extraction practices, have impacted streambanks in the Neil Creek watershed. This is causing erosion and increasing sedimentation, which has accelerated the loss of riparian habitat (within Neil Creek) (RVCOG 1997).

During a 1994 ODFW survey and 1990 Forest Service survey, sand was frequently observed within the streambed. Observers noted a high bedload of sand-sized particles in the streambed. Sand within the streambed area occupied nearly 30 percent of the habitat throughout Neil Creek. Spawning gravel quantity and quality were fairly good but were consideraby embedded by sand. Decomposed granite dominates the substrate in some areas and limits its value for spawning fish (RVCOG 1997).

During a 1990 Forest Service survey, substrate in Neil Creek on NFSL was comprised of sand, gravel, and cobble with lesser amounts of boulders and bedrock. Sand content, as mentioned above, was over 30 percent in every reach and did not decrease with increased channel gradient. This pattern of high sand content and no observable change with increasing stream gradient suggest high rates of sand input to the channel. The source of sand is likely the decomposed granite geology of the watershed.

During the 1999 Forest Service stream survey, observers found that gravel-sized substrate increased upstream and boulders and cobble decreased. These patterns suggest that the sources of gravel and possibly sand, are in the upper watershed. Sand and gravel may have filled pools during the flood, causing decreased pool depth and decreased pool area (Mattson 2000). Neil Creek, overall, is not within natural ranges of variability for substrate (bedrock, sand, silt or small gravels dominant or embedded cobbles.)

Streambank Condition

Bank instability was noted during a 1999 Forest Service stream survey on NFSL as both older cutbanks and more recent cut banks. These banks were likely one of the sources of the high amounts of sand in the stream. Also, some of the tributaries appeared to be a sediment source (Mattson 2000). A tributary in T40S, R01E, Sec 13, SE of NW, adjacent to NFSL boundary (right bank, facing downstream) was noted to have deep down cutting and evidence of torrents and channel scouring. No signs of mass wasting from upper slopes were observed. No known data exists on private lands. Neil Creek, overall, is at risk (moderately stable, some streambank erosion evident).

Stream Connectivity
Road density in this watershed on NFSL is over 2 miles per square mile, but few roads appear to significantly affect the stream (Mattson 2000). There were 22 falls or chutes on NFSL. Most were determined to be potential, low-flow fish passage barriers, however fish were observed above all but the last falls in Reach 5.

On private land, downstream of NFSL, there were irrigation diversions that impeded fish passage for anadromous fish and prevented fish passage to NFSL. Two irrigation diversion dams were reported in Neil Creek during a 1994 ODFW stream surveys (mouth to 1.9 miles only). The first was a 3-foot high dam with removable dam boards. When the dam boards were removed, this diversion was passable for fish, impassable during other times. During fall 2003, this diversion dam was replaced with a "fish-friendly" diversion dam. Project work was completed by ODFW and RRNF Forest Service. The other diversion dam is 1-foot high and probably not a barrier for anadromous fish, but may be a barrier for resident fish (ODFW 1994). The area above 1.9 river miles to NFSL has not been surveyed.

Stream Temperature (Water Quality in Relation to Fish)
Water temperature, during summer months, has been sampled on private land at two locations. A temperature monitor has been placed above the mouth of Neil Creek and downstream of NFSL near the forest boundary. Maximum seven-day average high stream temperature at the lower location (private lands) for 1995, and 1997-2000 are 69.8, 73, 73, 63, and 76 degrees Fahrenheit, respectively. Maximum seven-day average high stream temperatures at the upper location (NFSL) for 1994-2000 are 72.2, 58.2, 61.4, 59.7, 61.2, 59.1, 75.8 degrees Fahrenheit, respectively. The two outlying temperatures (1994 and 2000) were both drought years.

It is unknown if the higher temperatures are correct stream data or if temperature monitors were not completely submerged therefore, returning bad data. Neil Creek is included on Oregon's 303(d) list as water quality limited for summer temperature and dissolved oxygen levels from its mouth to mile 4.8.

c. Grouse Creek

Large Wood
LWM within the KNF is defined as having a diameter greater than 24" and a length of at least 50 feet that has at least 20 percent of its mass within the bankfull width of the channel. According to a 1989 survey, Beaver Creek from its mouth to Grouse Creek contained an average of 8 LWM pieces per mile. This was well below the 105 pieces per mile criteria referenced in the KNF LRMP. Many debris jams and other accumulations of wood were removed from Beaver Creek after the 1964 flood. More recently, extensive restoration projects have been undertaken in Beaver, Cow, and West Fork Beaver Creeks to increase the amount of large woody material (USDA FS 1996b).

No stream survey data for wood pieces per mile exist on Grouse Creek. Beaver Creek is not within natural ranges of variability for large woody material. Comparing stream survey data on Beaver Creek and its major tributaries and past management activities, it is assumed that Grouse Creek watershed is also not within natural ranges of variability for LWM. No data exists for Grouse Creek drainage for riparian conditions (within 150 feet of streamside).

Pool Quantity/Quality
The criteria for pool quantity referenced in the KNF LRMP is one pool every three to seven bankfull widths. Streams surveyed, including mainstem Beaver Creek, have pool frequencies much greater than the state criteria. Only about 11 percent of the length of mainstem Beaver is made up of pool habitat while approximately 58 percent is riffle habitat. The remaining 31 percent is run habitat (USDA FS 1996b). It is assumed that Beaver Creek and the tributaries surveyed are within natural ranges of variability since they exceed California's State standards.

Grouse Creek has a high sediment input due to active debris torrents (USDA FS 1996b). Upper tributaries to Grouse Creek experienced some debris torrent activity associated with the 1997 flood. This material also moved into mainstem Grouse Creek and in-stream sediment levels (primarily granitic sand) remain high. Due to high levels of granitic sand within the stream, some degree of pool filling has been observed. Based on the preceding observations, Grouse Creek may be at risk or not within natural ranges of variability for this indicator (USDA FS, Kilgore pers. com. 2002).

Sediment
The KNF LRMP criteria for average percentages of substrate composition is less than 15 percent fines as the area weighted average in spawning habitat. A high amount of fines in spawning beds limit egg survival and is a major limiting factor of fish production in this watershed. Percent fines of substrate composition in Beaver Creek were 22 percent. No stream survey data for percent fines exists for Grouse Creek.

As a result of the high amounts of fine sediment in the Beaver Creek System, embeddedness levels are very high. Highly embedded substrate limits food production, spawning gravel, and hiding cover for small fish. The KNF criterion is less than twenty percent embeddedness. All surveyed stream reaches were well in excess of this criterion. Beaver Creek embeddedness was 53 percent (USDA FS 1996b); therefore Beaver Creek is not within natural ranges of variability for substrate (sediment/embeddedness). No stream survey data for embeddedness exists on Grouse Creek. It is assumed that Grouse Creek is not within natural ranges of variability for this indicator due to similar past management activities and past flood effects.

Streambank Condition
Grouse Creek has unstable banks and a high sensitivity to erosion resulting from the 1989 debris torrent. Grouse Creek has mostly granitic soils, which are easily erodible. Localized flooding in 1989 resulted in a debris torrent down Grouse Creek with impacts to Beaver Creek, all the way to the Klamath River. The cause of this debris torrent was a severe summer thunderstorm falling on a recent timber harvest located on granitic soils. High levels of sand currently impacting water quality and fish habitat in Beaver Creek are in part due to this event. Grouse Creek still contains unstable banks, and even with a constructed sediment pond, annually contributes large amounts of sand to Beaver Creek (USDA FS 1996b). A stream survey of Grouse Creek has not been conducted for bank instability but it appears to be not within natural ranges of variability due to excessive sedimentation.

Stream Connectivity
All stream crossings within the mainstem of Beaver Creek are by bridges. No culverts exist within the anadromous reach on Grouse Creek (USDA/Forest Service Kilgore, pers. com. 2002). Therefore, anadromous fish access into Grouse Creek or downstream in Beaver Creek is not impeded by any barriers.

Stream Temperature (Water Quality in Relation to Fish)
Water temperature was continuously recorded near the mouth of streams during 1994. Temperature ranges from lows near 32 degrees Fahrenheit in winter months to highs near 73.4 degrees Fahrenheit in late summer throughout Beaver Creek watershed. Highest stream temperatures (average three day high) were recorded in July. Stream temperature within Grouse Creek (near mouth) in July was 66.2 degrees Fahrenheit (USDA FS 1996b). The KNF LRMP states that maximum summer temperature should be below 70 degree Fahrenheit. Grouse Creek is within the KNF plan parameters for stream temperature and therefore, is within natural ranges of variability.

d. Cottonwood Creek

No known stream survey data exists within Cottonwood Creek watershed. Dennis Maria, CDFG stated that the main stem of Cottonwood Creek does not appear to be a good quality-spawning stream below the East Fork of Cottonwood Creek, 6.5 miles downstream of the SUP area, due to heavy siltation (embeddedness). Above the East Fork, on Cottonwood Creek, there is less embeddedness and conditions for steelhead spawning are favorable, e. g., cool stream temperature, quality rearing and spawning habitat and fair amount of wood per mile compiled from fish surveys conducted by CDFG in 1964 and 1995, and by the Forest Service in 1998).

13. Macroinvertebrates and Fish Populations

The SUP area is located mostly within the Rogue River Basin, with a small portion located within the Klamath River Basin. Both basins are within the same Evolutionary Significant Unit (ESU) for coho salmon (*Oncorhynchus kisutch*) (Southern Oregon/Northern California ESU) and steelhead trout (*O. mykiss*) (Klamath Mountain Province ESU). This implies that these fish species within the two basins are determined by the National Oceanic and Atmospheric Administration (NOAA), formerly National Marine Fisheries Service (NMFS), to be genetically similar and therefore, have the same status under the Endangered Species Act.

a. Ashland Creek

Macroinvertebrates
Forest Service and BLM contracted macroinvertebrate surveys in West and East Forks of Ashland Creek during 1995. Bob Wisseman, contractor, states “The East and West Forks of Ashland Creek above Reeder Reservoir can serve as reference sites for the region, and more specifically, for granitic watersheds in the area. These can also be classified as old-growth control sites, although there has been some logging and road building activity in the watershed in the past.” Mr. Wisseman discusses that the habitat is in excellent condition: “What this site, and a handful of others in SW Oregon demonstrates, is that a granitic watershed, where stream channels are naturally storing and transporting high amounts of coarse, granitic sand, can display and maintain very high biotic integrity” (Wisseman 1997).

A 1999 survey contracted with Bob Wisseman showed similar results at the same site. Mr. Wisseman stated in his 1999 report that the site surveyed on East Fork (T40S, R01E, Sec17 NE1/4 – headwaters of East Fork of Ashland Creek) had very high index scores (>90 percent) for all three aquatic insect habitat types (erosional, margin, and detritus). This is not often encountered. This, combined with the high proportion of rare and small stream associated taxa, identify this stream as a unique resource.

Mr. Wisseman noted that there are many rare taxa present at this site that may eventually become candidates for sensitive taxa. The *Salmoperla* record is only the second known collecting locale for Oregon. This is a rare stonefly that has a good chance of being listed as Sensitive in the future. The caddisflies *Homophylax*, *Eocosmoecus frontalis* and *Palaeagapetus* are rare and may eventually become sensitive taxa (Wisseman 2000).

The aforementioned samples were collected at the larval stage, where it is difficult to differentiate between caddisfly species. Sampling is preferred during the adult stage. Adult samples were collected during early summer 1999, using an ultra violet light trap survey method for sensitive aquatic invertebrate taxa. Two sampling sites were setup, the first 0.5 miles upstream from Forest Road 2060, and the second 500 feet from the mouth of the East Fork of East Fork of Ashland Creek. Only one caddisfly was captured for identification during the survey. This may have been due to poor sampling conditions. The specimen that was identified was a common taxon. Adult sampling on West Fork of Ashland Creek (T40S, R1E, Sec 7, approximately 400 feet upstream from Forest Road 2060) also occurred during the same period. No caddisflies were found

Fish Populations

The MASA SUP area is located within the headwaters of East Fork of Ashland Creek Watershed, 4.5 miles above Hosler Dam and Reeder Reservoir. Healthy resident fish populations reside in East Fork and its tributaries below Forest Road 2060. Resident rainbow (*O. mykiss*) and cutthroat trout (*O. clarki clarki*) and some sculpins (*Cottus perplexus*) have been observed, as well as rainbow/cutthroat trout hybrids. These streams provide excellent habitat for resident rainbow and cutthroat trout. Habitat is protected by the City of Ashland Municipal Watershed designation, and the LSR designation, under the NWFP. A fish distribution map for the Ashland Creek Watershed (and the other analysis area watersheds is portrayed in Map III-10.

Fish surveys within East Fork Ashland Creek were completed during September 1969, July 1997, August and September 1998, and September 2001 by Forest Service personnel and during May 1999 by Oregon Department of Fish and Wildlife. A variety of survey methods were used above and below Road 2060 and throughout the SUP area to ensure a thorough and complete survey. These survey methods consisted of electro-fishing, snorkeling, and creel (fly-fishing). Fish presence was observed below Forest Road 2060 (approximately 2 miles downstream of the SUP area).

No fish were observed above Forest Service Road 2060 crossing on East Fork of Ashland Creek including the SUP area. A probable fish barrier exists due to the design of the culvert at the Forest Road 2060. This level of survey and re-survey has lead to the conclusion that no fish are present in the SUP area or downstream to Forest Service Road 2060.

The1995 Bear Watershed Analysis fish distribution map noted fish presence into the proposed expansion area on the East Fork of Ashland Creek. The map developed for this report was prepared by screen digitizing, and inaccurately depicted fish above Forest Road 2060. The current map (Map III-10), depicting fish presence up to Forest Road 2060 has been recorded in GIS and is accurately displayed.

Reeder Reservoir is rearing habitat for trout. These fish are unable to spawn up the East and West Forks of Ashland Creek, due to small dams at the mouth of each creek which prevent fish passage. Unnamed tributaries, which flow into Reeder Reservoir, may serve as spawning areas for fish that reside in the reservoir. See the discussion on Fish Distribution and Aquatic Habitat in the 1995 *Bear Watershed Analysis* for further information on fish populations and distribution within the Watershed.

Granite Street Reservoir (above Lithia Park), located on Ashland Creek approximately 3 miles upstream from the mouth of Ashland Creek, is a barrier to anadromous and resident fish migration. There are no fish species present that are proposed or listed under the Endangered Species Act (ESA) above the Granite Street Reservoir including East Fork, West Fork, and the mainstem of Ashland Creek. However, this area was deemed as potential and/or historical coho habitat, SONC coho salmon critical habitat and coho essential fish habitat. Due to the municipal water developments, Granite Street Reservoir and Reeder Reservoir and associated impoundments, it is unlikely that coho will re-occupy this habitat. No listed fish populations or coho critical or essential fish habitat exist within SUP area. The nearest chinook (*O. tshawytscha*) essential fish habitat is located within the mainstem of Bear Creek at the confluence with Ashland Creek.

Downstream from the Granite Street Dam, Ashland Creek contains anadromous fish species listed under the Endangered Species Act (ESA). Steelhead frequently spawn and rear in Ashland Creek; coho infrequently spawn and rear there. Ashland Creek also contains resident rainbow and coastal cutthroat trout populations.

Federal Endangered Species Act (ESA) status of these fish species is as follows:

- Southern Oregon Northern California (SONC) coho salmon - listed as T**hreatened** by the National Marine Fisheries Service (NMFS), May 1997. **Critical habitat** designated by NMFS in May 1999.
- Klamath Mountain Province (KMP) steelhead trout – **not warranted** for listing by NMFS, August 2000.
- Southern Oregon Northern California Coastal (SONCC) chinook salmon – **not warranted** for listing by NMFS, September 1999.
- Southern Oregon California Coastal (SOCC) coastal cutthroat trout (anadromous form)– **not warranted** for listing by NMFS, April 1999.
- SOCC coastal cutthroat trout (resident form), rainbow trout or any non-salmonid fish species found in the drainage - no special status exists for these species.

Current Federal Magnuson-Stevens Act (MSA) status of fish habitat is as follows:

- Coho salmon and chinook salmon habitat listed as Essential Fish Habitat by NMFS, January 1998.

Klamath Mountain Province steelhead trout, SONCC chinook salmon, and anadromous and resident SOCC coastal cutthroat trout are Sensitive species included on the Forest Service *Regional Forester's (Region 6) Sensitive Species list* (USDA/Forest Service 1999). No special status exists for any other fish species.

b. Neil Creek

Macroinvertebrates

The Forest Service contracted a macroinvertebrate survey in Neil Creek during 1999. Bob Wisseman, contractor, stated in his report that the site surveyed on Neil Creek (T39S, R02E, Sec 31 SW ¼ - approximately 1/3 mile above Interstate 5) had an erosional habitat total score of 79.8 percent (moderate), margin habitat total score 84.7 percent (high), and detritus habitat total score of 70.8 percent (moderate). Invertebrate densities in the erosional and detritus habitats were very low. This may indicate that there had been a recent storm event just prior to sampling at this site. The very low densities will depress the total bio-assessment score.

The benthic invertebrate community found at this station is a moderately truncated version of a more expanded community typical of mid-order, moderate-high gradient, forested, montane streams in western North America that are minimally impacted and possess maximum habitat complexity for macroinvertebrates. The majority of the fauna found at this site is widespread and common in western North America, and typically associated with mid-order streams. Sensitive or ESA listed taxa are absent at this site. More rare or small stream taxa would be expected to occur at this site (only 2 are present).

A moderate rating of long-lived taxa richness (all three habitat types) indicated that flow is perennial and disturbance to substrates is not high, but that habitat complexity and retention mechanisms are not optimal. The abundance and richness of cold-water invertebrate biota indicates that summer water temperatures can support salmonids (Wisseman 2000).

Similar results were reported during a 1993 macroinvertebrate survey conducted by Bob Wisseman. Physical differences between the two years of data collection included higher summer stream temperatures during 2000. Wisseman, during 2000, stated that water temperatures were on the border of excluding cold-water invertebrate biota. Similar results noted that embedding of armor layer rocks with coarse granitic sand is high, closing much crevice space, filling in pockets, and decreasing entrainment and retention capabilities. Some portion of granitic sand in the channel is derived from natural erosional processes, but a relatively high proportion may come from accelerated erosion cause by human activities. Scour during high water was noted as severe (Wisseman 1997).

Mr. Wisseman stated that Neil Creek is probably in the same general watershed class and stream type as upper Ashland Creek watershed. The Ashland Creek site demonstrates that biotic integrity can be very high in a stream that naturally stores and transports high amounts of granitic sand.

Fish Populations

Neil Creek watershed provides spawning and rearing habitat for summer and winter steelhead, and resident cutthroat and rainbow trout on private lands. It also supports redside shiners and sculpin. Several irrigation diversion dams exist downstream of NFSL within Neil Creek. Human-made and natural barriers off NFSL may limit fish passage upstream; it is unclear if they are partial or complete fish barriers. During a good water year, steelhead could pass most barriers on private land and possibly enter NFSL, (pers. com. Jerry Vogt, ODFW 1995). Habitat is suitable for steelhead on NFSL in Neil Creek. Steelhead spawning surveys were completed during April 2000 on NFSL; no spawning steelhead trout or redds were observed.

During a 2002 winter steelhead survey, adult steelhead were observed above Interstate-5, on private land. No steelhead or redds were found on NFSL during the 2002 survey. An apparent long-standing natural migration barrier (falls) to steelhead trout is present, on private land, about 0.5 miles upstream from Interstate 5 approximately 4.5 miles from the SUP area. A stream survey was taken from the mouth of Neil Creek to NFSL during summer 2002 (NFSL surveyed during 1999). This report documents all obstacles/barriers downstream of NFSL.

During a 1999 fish survey conducted by ODFW on private lands, steelhead/rainbow and cutthroat trout were observed throughout. On NFSL, rainbow trout occurred in the lower two miles of Neil Creek during a 1999 fish survey conducted by the Forest Service. Despite numerous natural migration barriers, cutthroat trout were well distributed throughout NFSL. Cutthroat trout species exist 0.5 miles from the SUP area.

Critical Habitat (CH) and Essential Fish Habitat (EFH) for coho and chinook salmon includes occupied and historical coho and chinook salmon habitat. Coho spawning surveys were completed during December 1995 and 1997 on NFSL; no spawning coho salmon adults or redds were observed. The farthest extent which coho salmon were observed within Bear Creek watershed was during a 1999 ODFW fish survey. Coho salmon were observed to occupy up to 0.4 miles below the confluence of Neil and Emigrant Creeks; located 9.5 miles from the SUP area within Bear Creek.

Historically, coho and chinook salmon probably occupied habitat up to the steelhead natural migration barrier 4.5 miles from the SUP area; habitat determined by channel gradient and valley width. Therefore, CH and EFH for coho and chinook occupies habitat up to the natural barrier. This is a conservative estimate, as no record of coho salmon within Neil Creek exist.

See the East Fork Ashland Creek Fish Population section for status of fish species. All anadromous fish and coastal cutthroat trout are Sensitive on the Forest Service *Regional Forester's (Region 6) Sensitive Species list* (USDA/Forest Service 1999). Map III-10 shows the drainages associated with the SUP area and range of salmonids surveyed as being present in the Neil Creek watershed.

c. Grouse Creek

Macroinvertebrates
No macroinvertebrate surveys have been conducted in Grouse Creek.

Fish Populations
Located in the Klamath basin, Beaver Creek and its tributaries provide 31 miles of anadromous habitat for spring and fall run chinook salmon, winter and summer run steelhead, coho salmon, and Pacific lamprey. Presently, populations of spring chinook and summer steelhead do not exist in Beaver Creek however; there have been sporadic observations of these species over the last ten years. There are 54 miles of habitat provided for other native fish species including rainbow trout, speckled dace, Klamath small-scaled sucker, marbled sculpin, and Pacific brook lamprey. SONC coho salmon and coho critical habitat are listed under ESA and essential fish habitat (EFH) is listed under Magnuson-Stevens Act for coho and chinook salmon (see East Fork Ashland Creek Fish Population section for status of fish species.) Summer and winter steelhead and spring chinook salmon are on the Forest Service *Regional Forester's (Region 5) Sensitive Species list* (USDA/Forest Service 1998). All coho north of San Francisco Bay to the California-Oregon state line are currently listed as threatened the California Endangered Species Act (CESA). Map III-10 shows the range of salmonids surveyed as being present in the Grouse Creek watershed.

The mainstem of Beaver Creek, from the junction of Grouse and Cow Creeks to the mouth of Beaver creek, and Beaver Creek between West Fork Beaver Creek to Jaynes Canyon, are considered very highly significant beneficial use streams (Class 1A). These stream segments are highly productive anadromous streams. Cow Creek up to a point above Long John, and a small portion of Jaynes Canyon are considered highly significant streams (Class 1B) because they are moderately productive anadromous streams. The remaining anadromous streams are considered moderately significant (Class 2) because they are less productive (including Grouse Creek). Beaver Creek watershed rates as a very high beneficial use watershed because a Class 1A stream is entirely within the drainage.

Seventy-seven percent of fall chinook redds observed, occurred in the mainstem of Beaver Creek from the Beaver Creek Campground to the mouth, 22 percent from Soda Creek to Beaver Creek Campground, and 1 percent from Grouse Creek to Soda Creek. Nineteen percent of steelhead redds occurred in the mainstem of Beaver Creek (from mouth to Soda Creek), while 62 percent were found higher up in Beaver Creek (Soda Creek to Grouse Creek). Steelhead trout are found from the mouth of Grouse Creek up to river mile 3.0. From river mile 3.0 to 5.5, resident rainbow trout are present. No fish species occur in the remaining 1.5 miles above resident fish presence. The portion of the SUP area that is located within Grouse Creek sub-watershed is approximately 1.0 mile from the nearest stream, 2.5 miles from resident fish and approximately 4.5 miles from confirmed steelhead presence.

SONC coho and chinook salmon presence in Beaver Creek extends several miles past the confluence with Grouse Creek. The KNF fish distribution map of anadromy records coho salmon presence and their habitat located from the mouth of Grouse Creek, upstream approximately 3.0 miles. No chinook salmon or habitat exists within Grouse Creek. The SUP area within Grouse Creek sub-watershed is approximately 4.5 miles from coho presence and their Critical Habitat and Essential Fish Habitat. Essential Fish Habitat for chinook salmon in Grouse Creek is 7.0 miles from the SUP area.

d. Cottonwood Creek

Macroinvertebrates
No macroinvertebrate surveys have been conducted in Cottonwood Creek.

Fish Populations
Cottonwood Creek and its tributaries support anadromous and resident fish populations; see East Fork Ashland Creek Fish Population section for status of fish species. Summer and winter steelhead and spring chinook salmon are on the Forest Service *Regional Forester's (Region 5) Sensitive Species list* (USDA/Forest Service 1998). All coho north of San Francisco Bay to the California-Oregon state line are currently listed as threatened under the California Endangered Species Act (CESA). Map III-10 shows the range of salmonids surveyed as being present in the Cottonwood Creek watershed.

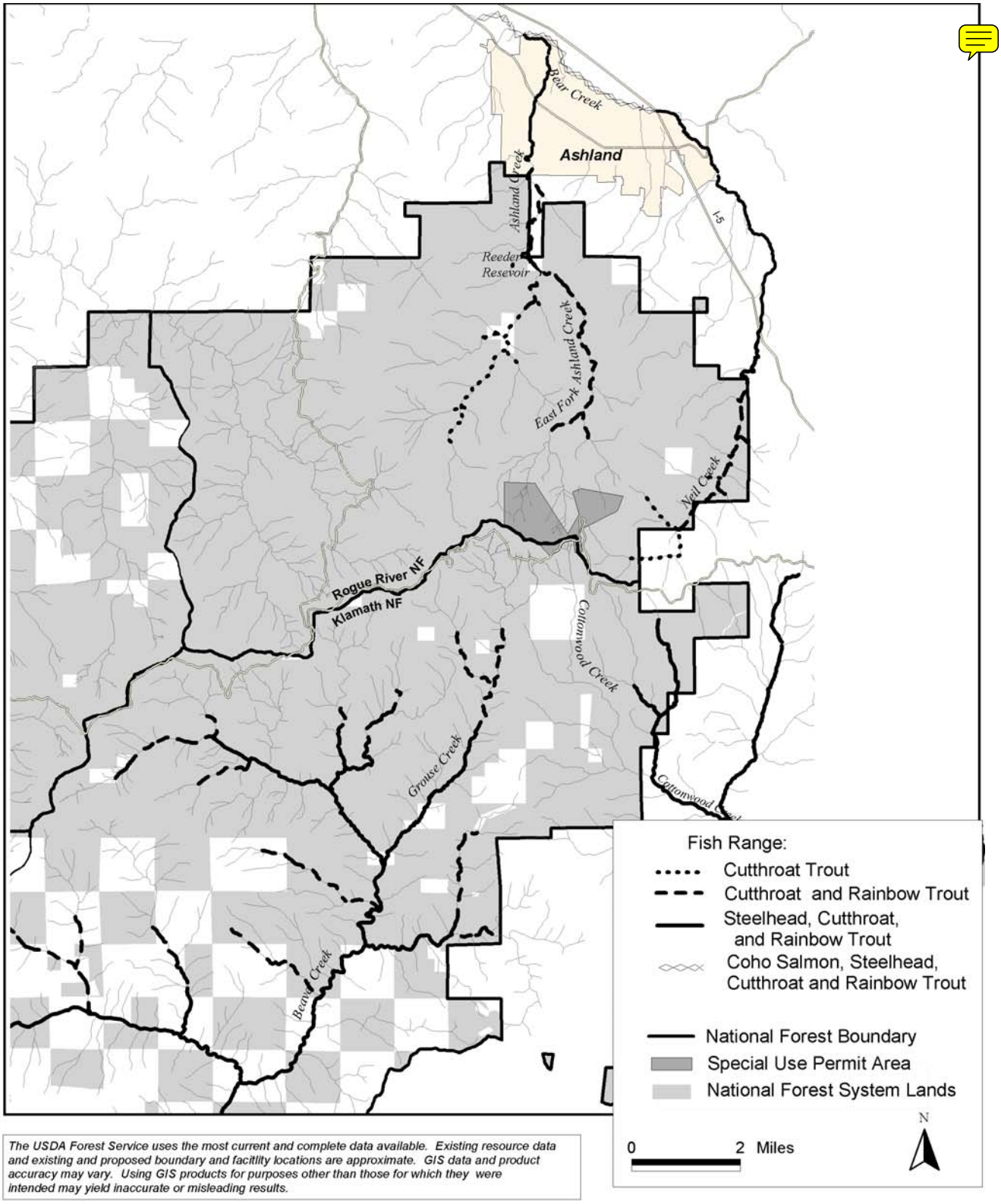
Steelhead trout populations are present throughout Cottonwood Creek and its tributaries. The upper range of fish in the mainstem of Cottonwood Creek was determined during a 1998 Forest Service fish survey. At least 1.5 stream miles were noted as accessible to adult steelhead in the main stem above Mill Creek confluence. The upper range is at the southern end of a canyon (T. 41 S., R. 01 E., Section 3, SW ¼ of NE). A 15-foot falls provides a definite barrier for upstream fish migration at the entrance to the canyon. Fish were observed approximately 300 yards below the falls, near the Medusa Flats area. No fish were observed above the falls and it is the only apparent hindrance to further upstream utilization by spawning fish or juvenile fish for rearing habitat. Juvenile salmonids observed during the fish survey could be resident rainbow trout rather than juvenile steelhead trout since it is difficult to determine at the juvenile age.

The portion of the MASA SUP area located within Cottonwood Creek watershed is approximately 0.3 miles from the nearest stream, and approximately 3.3 miles from steelhead presence. Resident rainbow trout populations were noted in areas where steelhead trout populations exist and are depicted on the fish distribution map (Map III-10).

Chinook and SONC coho salmon habitat exists well downstream in Cottonwood Creek, greater than 10 miles from the SUP area. Dennis Maria, (CDFG), noted in telephone conversations (March 1999 and December 2001) that although recent (less than 15 years) fish presence has not been verified for SONC coho and chinook salmon populations within Cottonwood Creek, these species are suspected in the lower segment of Cottonwood Creek downstream of Hilt, California (coho salmon) and Hutton Creek (chinook salmon). Fish survey data utilized for this Final EIS within Cottonwood Creek were conducted by RRNF (1998), KNF (1993), CDFG (1964 and 1975), and ODFW (1999).

According to KNF standards, Critical Habitat and Essential Fish Habitat for SONC coho salmon habitat are estimated to exist where steelhead trout populations are found. Therefore, CH and EFH currently is estimated up to river mile 14 on Cottonwood Creek – 3.3 miles from the SUP area.

MAP III-10. Fish Distribution



The USDA Forest Service uses the most current and complete data available. Existing resource data and existing and proposed boundary and facitlity locations are approximate. GIS data and product accuracy may vary. Using GIS products for purposes other than those for which they were intended may yield inaccurate or misleading results.

E. HUMAN ENVIRONMENT

1. Scenic Quality

The MASA is located along the crest of the Siskiyou Mountain range. As such, it borders with two National Forests, the Rogue River-Siskiyou NF to the north and the Klamath NF to the south. The proposed expansion involves landscape changes that have the potential to affect the scenic resources on both National Forests. Hence, the scenic quality is described in the context of the management direction, goals and objectives of the respective National Forests.

Since the mid 1970s, the USDA Forest Service has been operating under the guidance of the Visual Resource Management System (FSM 2380) for inventorying, evaluating, and managing the scenic resource. In 1996, the Scenery Management System (SMS) superseded the Visual Resource Management System (VMS). The manual, *Landscape Aesthetics: A Handbook for Scenery Management,* was released to the agency to begin the transition to the new system. National direction has been given to incorporate, as applicable, the methods and philosophy of the SMS with each new planning project (Washington Office (WO) memo #2380 8-22-94; Pacific Northwest Regional (PNW) memo #2380/ 1920 10-17-96; WO memo # 2380 3-10-97), and PNW memo #2380 6-4-98). Complete incorporation of the system will occur with each Forest's Forest Plan Revision.

As part of incorporating the new Scenery Management System into this Final EIS, the scenery analysis uses SMS terminology in describing the existing conditions, management objectives, scenery integrity objectives (SIO) and impacts to the scenic resource. Management objectives reference back to the original visual quality objectives (VQO) allocated in both Forest Plans. Table III-30 below, correlates the VMS terms with those used by the new Scenery Management System. It should be noted that a scenic integrity objective refers to the management goal for an area, while a scenic integrity level, simply refers to the integrity level being met at any one time.

Table III-30. Scenery Management Terminology Cross-reference

VMS Visual Quality Objective (VQO)		SMS Scenic Integrity Objective (SIO)
Preservation	(unaltered)	Very High
Retention	(appears unaltered)	High
Partial Retention	(appears slightly altered)	Moderate
Modification	(moderately altered)	Low
Maximum Modification	(heavily altered)	Very Low

a. Scenic Management Guidelines

Rogue River National Forest

Scenery management guidelines for the visual Analysis Area include those associated with Management Strategy 4 (Developed Recreation) and visual management guidelines for valued viewsheds within the RRNF LRMP.

The LRMP allocates the area within the SUP area as Management Strategy 4: Developed Recreation (MS-4). The goal for MS-4 is to "Provide quality outdoor recreation opportunities within a forest environment that is modified for visitor use, visitor satisfaction and accommodation of large numbers of visitors" (LRMP 4-53). As such, the Forest Plan designates that MS-4 should maintain a minimum visual quality objective (VQO) of Modification (**LOW SIO**) when viewed from any viewpoint inside or outside of the SUP area. Thus, views from along valued viewpoints are required to meet, at a minimum, this same visual quality objective. **Low scenic integrity** is described as:

> ...landscapes where 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. They should not only appear as valued landscape character outside the landscape being viewed but compatible or complimentary to the character within (SMS Handbook 2-4).

The MS-4 boundary overlaps with a management area for County Road 1151 (Mt. Ashland Access Road and Forest Road 20, henceforth referred to as the Crest Road) within the KNF LRMP. In cases of overlapping management areas, the highest visual quality objective applies. For clarity of discussion, **foreground views along the Crest Road** will only be discussed relative to the management direction for the KNF.

Klamath National Forest

The SUP area boundary approved in 1991 extends south of the Siskiyou Crest, just beyond the Crest Road. Several KNF management areas have been allocated along this road, all of which carry the same visual quality objective of Retention.

According to the KNF LRMP, portions of the KNF adjacent to the SUP area are within Management Area-11: Retention Visual Quality Objective. This management area includes views from both the Crest Road as well as views from along the Pacific Crest National Scenic Trail. In addition to these foreground views, background views from Interstate 5 within California are allocated as part of Management Area-11. Management guidelines for this area direct that these views meet Retention VQO (**HIGH SIO**), even when viewed as background, within three years of project completion (KNF LRMP 4-145-8). The Scenery Management System describes **HIGH scenic integrity** as:

> …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 (SMS Handbook 2-4).

The primary goal for this Management Area is to provide a level of attractive, forested scenery by maintaining the area in a natural or natural-appearing condition. Manage human activities so they are subordinate to the characteristic landscape. Also manage human activities so they are not evident to the casual Forest visitor (KNF LRMP 4-145).

An exception to this occurs in cases where facilities must be visible in order to provide the recreation benefit intended. The KNF LRMP accounts for this in its Forest-Wide Standard and Guideline 11-1, which states:

> Facilities and developments, such as roads, trails, campground facilities, structures, signs and interpretive stations, are not required to meet the Management Area VQOs when viewed in immediate foreground (300 feet). These developments will be crafted in materials and appearance to harmonize and compliment the natural character of their immediate settings (KNF LRMP 4-44).

The Scenery Management System provides further explanation in the guidelines for viewer platform design:

> Structures required for serving public use of scenic and recreation resources include viewing platforms, such as roads, parking areas, trails, trailheads, buildings, decks, observation points, ski lifts, an so on. To be functional, these facilities are normally visible in immediate foregrounds and often create more contrast than will be acceptable in areas designated for Retention and Partial Retention scenic condition objectives. They are actually part of the expected image of the public being served. However, allowable limits of contrasts only go to the extent that functions of structures are served. They should also reflect design excellence. Such structures should be a positive element of the built environment that does not detract from scenic experiences. Structures should blend into the landscape while still retaining their function. They should be an indicator of sensitive land stewardship (SMS Handbook D-2).

This exception would apply to views from along the Crest Road only, not from along the Pacific Crest National Scenic Trail (PCNST), as the ski area is not essential to the function of the trail. However, other aspects relative to the trail are important to note.

The guiding congressional acts and management plans for the PCNST acknowledge that the trail will, inherently, cross through a wide range of landscapes, land uses, and degrees of scenic beauty. As the ski area was constructed (including the current parking lot) prior to the designation and construction of the PCNST, it is understood that it is part of the existing landscape character and is an expected part of the PCNST experience. Section 7(a) of the 1968 National Trails System Act alludes to this relationship of the trail and pre-existing land uses:

> Management and development of each segment of the National Trails System shall be designed to harmonize with and complement any established multiple-use plans for that specific area in order to ensure continued benefits from the land.

In addition, the Pacific Crest National Scenic Trail Comprehensive Plan discusses this idea of co-existence with adjacent Management Areas:

> Within Federal lands outside the National Parks and Wilderness (57% of the trail), the trail must co-exist in harmony with all other resource uses and activities of the land as determined through the land management planning process. The trail will cross a mosaic of area differing in primary management emphasis…Viewing and understanding this array of resources and management is one of the primary recreation opportunities to be made available over these portions of trail. (PCNST Comprehensive Plan, USDA FS, 1982, page 22).

At the same time, the PCNST Comprehensive Plan is clear to point out that this co-existence is not intended to negate the desire for achieving aesthetically pleasing experiences:

> Viewing and understanding resource management and other cultural activities are considered to be part of the normal character of the trail. The management of the various resources will give due consideration to the trail and trail users within the multiple-use concept. Prescription for management of the visual resources associated with the trail will be part of agency planning processes (PCNST Comprehensive Plan page 17).

It is also important to note that while the ski area's existence prior to trail development includes it as part of the existing landscape character, it does not suggest that the current visual quality of the area is accepted as part of the **valued landscape character**. The KNF LRMP includes special objectives in situations such as this, where current visual quality does not meet the allocated visual quality objectives. Management Area-11 Standard and Guideline MA 11-7 directs future activities to strive for rehabilitation toward meeting the desired visual quality objective. These may include, but are not limited to, structure removal, terrain modification, and revegetation of cut and fill slopes (KNF LRMP 4-148).

b. Existing Scenic Conditions - Landscape Character

The unique geology of the Siskiyou Mountains forms the basis for describing the landscape character of the scenic Analysis Area. Landscapes develop as a result of geological, biological, and human processes. Developing in layers, these processes illustrate the evolution of the landscape elements comprising the current landscape character. The scenic Analysis Area straddles the ridgeline of the eastern Siskiyou Mountain Range. Flowing east-west, this ridgeline is a transition of landscape patterns. Along the cooler, wetter north-facing slopes, the rocky ridgeline caps off a continuous dense canopy of conifer draping the creek drainages above the City of Ashland. Natural breaks in this canopy occur only at rocky outcrops, along sparsely-spaced meadows, and within avalanche chutes. The existing ski runs interrupt this partially continuous canopy cover with narrow, finger-like swaths. Depending on viewer location, these runs vary from being merely noticeable, to obvious unnatural alterations. During the winter, the runs are more pronounced from the contrast between snow and vegetation.

Along the south-facing slopes of the Analysis Area, the dense conifers along the lower drainages thin in density and extent, with increase in elevation. Irregular patterns of subalpine meadows and clusters of fir dominate the landscape pattern here. At higher elevations, meadows blend into a rocky spine of granite crags near summit peaks. The exposed rocky peak of Mt. Ashland appears overshadowed by the prominence of tele-communication and National Weather Service structures located at the summit. Below these peaks, the Crest Road traverses through the meadows, forming a winding line of bare road cuts and fill slopes, some of which persist as unnatural scars in the landscape. Structures along this line are limited to a group of buildings at the entrance to the MASA. These buildings contrast noticeably, failing to blend with the sense of place of the subalpine setting.

The **valued landscape character** of an area can be described in terms of the positive attributes that contribute to the landscape's aesthetic value. These attributes may vary according to the scale at which the landscape is being viewed. For example, when viewed from the Upper Bear Creek Valley (commonly referred to as part of the Rogue Valley) the Analysis Area is recognizable as a forested backdrop in which color and form dominate. Hence, valued attributes from this distance are patterns of vegetation, rather than textures of individual trees. Evidences of human alterations (roads, ski lifts, structures, recreation sites, etc.) are generally not included when describing the "valued landscape character". Exceptions occur when these deviations become so integrated over time into the sense of place of an area that they become positive attributes themselves. Evidences of lines, vegetative patterns, and structures related to the ski area, therefore, can be considered as part of the valued landscape character at all scales, provided these deviations borrow from natural appearing attributes of the surrounding landscape. This is the case with the majority of the Mt. Ashland landscape.

Given this, the **valued landscape character** of the Mt. Ashland Landscape is described as follows:

> When viewed as middleground and background from sensitive travel routes, the mostly natural appearing landscape dominates. This includes an overall pattern of dense canopy at lower elevations, thinning into a more open, intermittent canopy along the rocky summit ridgeline. Openings resemble meadows, avalanche chutes and other patterns common to subalpine regions in the Siskyou Mountains. Linear openings such as avalanche chutes tend to be located within dissected drainages, while openings from meadows and rock outcrops are usually present along ridgelines and upper portions of concave slopes. Although evident, ski runs are not obvious, and may go unnoticed to the casual visitor, depending upon specific viewpoint and duration of view. Buildings and other facilities structures should not be readily apparent from these views.
>
> Mt Ashland’s existing night lighting is prominent, creating a direct contrast to the natural appearing night sky, as well as indirect glow effects, above and around the mountain. Both lighting and glow are visible for many miles in the Rogue Valley, Hilt/Hornbrook and Shasta Valley communities, and along the Interstate 5 travel corridor. Night lighting impairs night sky clarity and and can obscure star features.
>
> When viewed as foreground along sensitive travel routes, the evidence of ski runs becomes more obvious, but borrows heavily from natural characteristics afore-mentioned. The presence of buildings, facilities, lift towers and lines, and other related structures are prominent at this scale. However, these elements should reflect (in their form, color, textures, and scale) the attributes of the surrounding subalpine landscape. When viewed in immediate foreground from within the SUP area, these elements will dominate the recreation experience, as is inherent in order to provide the recreation function intended, while promoting design excellence.

c. Valued Viewpoints and Viewsheds

In analyzing the potential scenic impacts, it is necessary to discuss the most common travel routes and viewpoints in which the ski area is a component. Changes in landscape character when viewed from these "valued viewsheds" serve as the basis for measuring scenic integrity.

Sensitive views into the scenic Analysis Area have been established as part of the RRNF and KNF LRMPs. These views are part of larger viewsheds along sensitive travel routes. They include:

1) "**Crest Viewshed**": Foreground views along the Crest Road (MA-11 KNF) and the Pacific Crest National Scenic Trail (MA-11 KNF)

2) "**Ski Area Viewshed**": Foreground views from within the SUP area boundary of the MASA (MA-4 RRNF)

3) "**California Viewshed**": Background views from Interstate 5 - California (MA-11 KNF)

4) "**Rogue Valley Viewshed**": Background views along primary travel routes, Upper Bear Creek Valley, referred to as the Rogue Valley (MA-4 RRNF)

Foreground views include seen or potentially seen areas in the immediate foreground up to one mile. **Middleground** views include seen or potentially seen areas between one and five miles from the viewer. **Background** views equate to distances greater than five miles.

During project planning, additional viewpoints were selected for the purpose of simulating the potential effects of ski run expansion (see Map III-11). In addition to representing the most common views from within the Rogue valley, these viewpoints were chosen in order to display the best range of possible viewing angles, and to be consistent with the viewpoints chosen in the 1991 FEIS. Modifications to the exact locations, and choices of these viewpoints have been made with this Final EIS iteration in order to better disclose visible effects to representative views. It is important to note that the views into the scenic Analysis Area change with any minor disposition of viewpoint. Especially when viewed at lower elevations, the visibility of the Analysis Area is directly related to potential screening from foreground ridges. The selected viewpoints are intended to be representative of the majority of those possible.

Three-dimensional renderings of the current condition (Alternative 1, No-Action) and all Action Alternatives (Alternatives 2-6) were produced for the following viewpoints:

1) Background view, **City of Ashland/ Interstate 5 Corridor**: (representative view along this portion of Interstate 5 and vicinity of City of Ashland)

2) Background view, **Dead Indian Memorial Road**: (representative view from the northeast side of the Rogue Valley)

3) Background view, **Highway 66 near** the **Greensprings Summit** (representative view for east side of Rogue Valley)

4) Background view, **City of Medford/ Interstate 5 Corridor** (representative view along this portion of I-5, the City of Medford, and northern Rogue Valley)

Field analysis from these viewpoints serve as the basis for the evaluation of scenic resource impacts relative to the expansion of ski runs. Viewpoints utilized for renderings are portrayed in Map III-11. Collectively, these rendering are used to help illustrate the potential visual impacts associated with views along primary travel routes in the Rogue Valley.

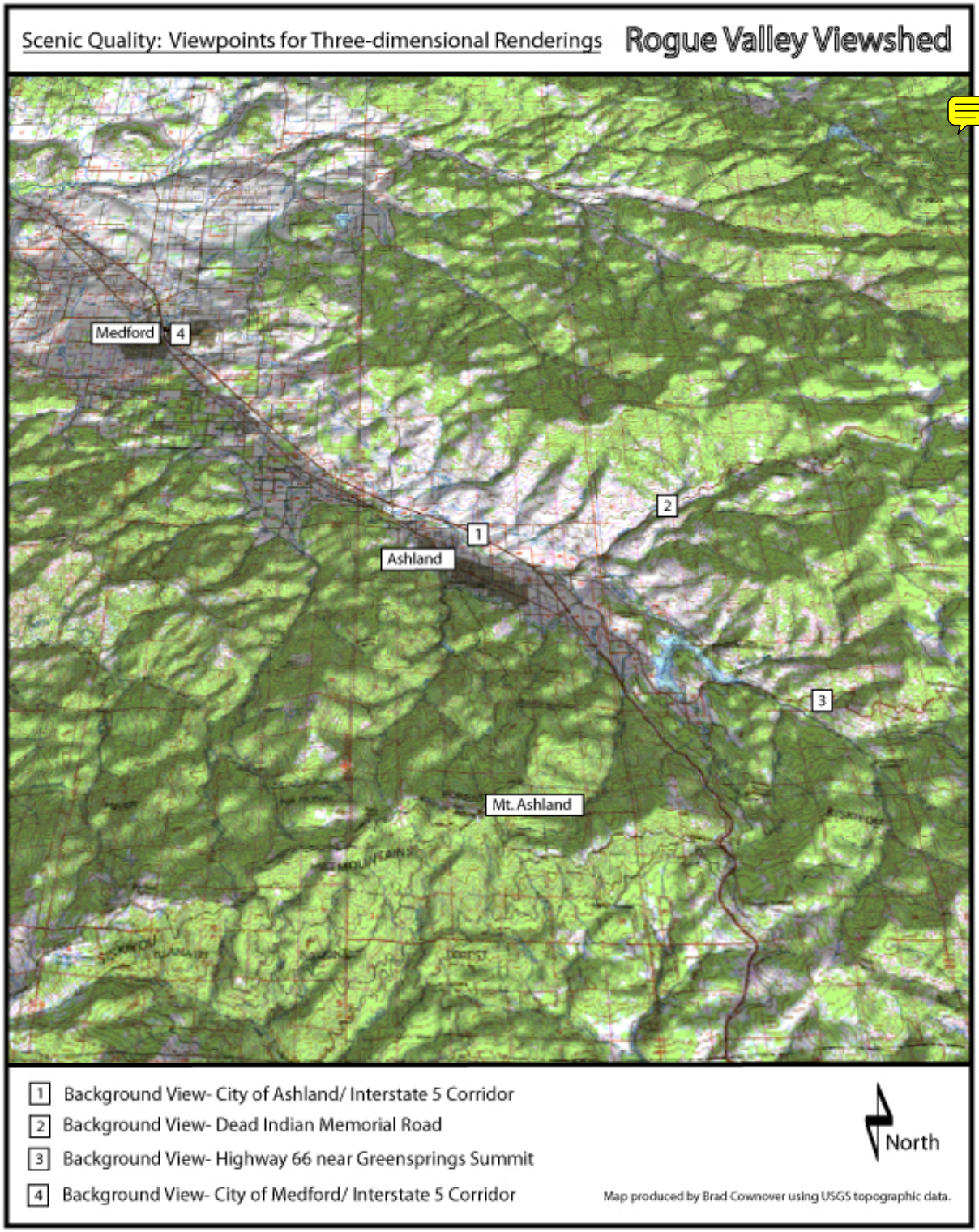
Discrepancies between these points and points used in the 1991 FEIS are a result of refined planning. Medford views were originally excluded from simulations as run visibility would be negligible due to the oblique viewing position. Given the Knoll expansion alternative, more area is potentially visible. Renderings for the alternatives from along the California and Crest Road viewshed were not included as the proposed ski runs are concentrated on the north side of the mountain [15].

d. Scenic Integrity

Scenic integrity refers to the degree of intactness, or wholeness of the landscape character of an area valued for its aesthetic appeal (SMS Handbook 2-2). The baseline for measuring achievement of scenic integrity is the, "valued attributes of the existing landscape character being viewed" (SMS Handbook 2-4). Deviations and alterations that make a landscape less intact are alterations that introduce form, line, color, or texture, that contrast with those of the natural appearing landscape and which do not borrow from the attributes of the valued landscape character. Scenic integrity levels are similar to the visual quality levels (Retention, Partial Retention, etc.) within the Visual Management System (VMS) system. The existing scenic integrity of the scenic Analysis Area is described below, grouped by the four primary viewsheds.

[15] Analysis of effects is based on field study and not simply a graphic comparison between renderings. While these renderings are intended to be representative of the visual changes posed by alternatives, their primary intent is to help communicate the differences in alternatives. Figures contained in Appendix J further display the existing (current) conditions associated with these viewpoints (Alternative 1, No-Action).

MAP III-11. Scenic Quality Viewpoint Map



Crest Viewshed

The Crest Road

The first portion of the Analysis Area encountered when traveling along the Crest Road occurs along a hairpin turn in the area of the Knoll. From along the road, very little of the actual topography of the Knoll is visible, as foreground vegetation obscures the views. Instead, visibility of the Knoll is limited to small openings along a noticeable bench below the road. At the end of the hairpin turn, the road provides an unexpected, dramatic view into the face of the existing Mt. Ashland ski area slopes - very noticeable during both summer and winter. Afterwards, the road makes another curve along a minor saddle where the Snow-play area is proposed. Roadside vegetation inhibits the views into the saddle at this point. The road then leads to the ski area parking lot, which, essentially, is a widened portion of the road itself. During the winter, the Crest Road terminates just beyond the main ski area parking lot near the Nordic parking area - as traffic is limited to those whose destination is either the ski area or Nordic trailhead. Frequent visitors during this time expect to see the landscape visually dominated by the structures and facilities required to provide the recreation experience (roads, parking, vehicles, buildings, snow fences, maintenance equipment, ski runs, lift lines and towers, etc.). During hours of night skiing operation, night lights are highly visible from the hairpin turn and from the parking lot.

During the summer, however, the Crest Road provides one of the more enjoyable scenic drives in the area. At this time of year, the parking lot at the ski area functions as a popular viewing platform, offering vistas of the Bear Creek Valley to the north, and Mt. Shasta to the south. A nearby picnic area and information kiosk provides visitors with a place to rest and take in the view. While this picnic area remains subordinate to the overall setting, the remaining ski area structures (lodge, maintenance buildings, and lift towers) dominate the setting during this time of year, distracting from views of the distant scenery for some visitors. These winter recreation elements are less in keeping with the expectations of visitors during the summer, especially those not aware of the ski area's existence. Remnant trees and rock outcrops adjacent to these structures help to offset this effect.

This same vantage point allows views into the large cut slope behind the maintenance shed. This cut slope is the most dominant feature of the initial view into the area during the westbound summer travel. Although such cut slopes are common along the entire Crest Road, they tend to be more noticeable near the ski area as travel speeds slow. Above this cut slope, ski runs lead the eye toward Mt. Ashland summit, where a profile of lift towers stands visible, yet subordinate to a large white Doppler radar structure. Viewed from this viewpoint, the ski runs blend relatively well with adjacent meadow and tree clump patterns on the south side of the Mountain.

Overall, the landscape at this scale appears moderately altered. While deviations dominate the valued landscape character, small rock outcrops and clumps of trees help to reduce the scale of existing development, thus, meeting a **LOW scenic integrity level**.

Pacific Crest National Scenic Trail
As the Pacific Crest National Scenic Trail (PCNST) follows along the Siskiyou Crest, it traverses a meadow (headwaters of Cottonwood Creek) approximately 400 feet directly below the Crest Road and the existing ski area parking lot. Views into the Analysis Area are limited to that of the Crest Road itself. Ski runs along the north side of the mountain and the Knoll area are not visible. The silhouette of the saddle forming the proposed Snow-play area is obscured by the oblique viewing angle and foreground trees.

During the summer, east and westbound views along the trail offer dramatic vistas of Mt. Shasta to the south. Immediate foreground views include the prominence of lush meadow flowers and grasses, which tend to draw the eye upwards toward the existing road grade of the Crest Road. Here, the flat horizontal line of the road base defines the horizon, broken only by existing clumps of fir below the road. Although grasses are establishing on the slopes below the road, the edge of the asphalt roadbase is visible from certain points, distracting from the natural landscape patterns within the area. Past erosion channels remain visible, yet are not readily apparent to the casual observer. Light and glow associated with night skiing is not visible, as the trail is snow-covered and not used in the winter months.

As the trail circumscribes the meadow, most views upslope are dominated by the meadow vegetation and groupings of large fir trees. Certain portions of the asphalt road base tend to be more revealing, in which case direct views into these spots is dominated by the unnatural lines created. The landscape character appears slightly altered with deviations being evident, but overall subordinate to the meadow and tree clump patterns. Hence, existing views from along the PCNST meet a **MODERATE scenic integrity level**.

Ski Area Viewshed

Views from within the SUP area reveal the common elements expected in a developed winter recreation ski site: lift lines, lift towers, lodge facilities, night lights, etc. As such, these elements are very much expected as part of the experience. This is less true during summer months. Prominent views within this area are from the approach along the Crest Road, the Base Lodge and other facilities, and from within the ski runs. Views from the entry and main buildings are focused toward Mt. Ashland and the eastern-most ski runs. Open meadow patterns along the south side of the mountain help blend the ski runs with surrounding vegetation.

Buildings vary in architectural style, lack any consistent theme, and fail to borrow from the surrounding natural landscape features. All carry a light blue-gray facade and most have shingle roofs. Of the structures, the Rental Shop and maintenance sheds seem to contrast most within the landscape. Vertical lines and voids within the facade of the Base Lodge help it to mimic, to a slight degree, patterns in the nearby rock outcroppings. Trucks, trailers, and other maintenance equipment are in open view. Views from within the ski runs reveal linear openings within a dense canopy, mixed conifer forest. These runs act as viewsheds themselves for skiers, offering scenic vistas over the Rogue Valley. During the summer, visitors frequently traverse across the east-facing slopes below the summit for scenic vistas.

The proposed Tubing Facility and Knoll expansion areas appear continuously forested, with no substantial vegetative removal, as is present with ski runs. Natural openings are present along the saddle portion of the proposed Snow-play area, usually near larger rock boulders. Patches of natural openings define the forested texture of the Knoll. An access road serving the ski area wastewater treatment facility is the most noticeable human-created opening and alteration within the Knoll area. A bench below the hairpin curve in the Crest Road denotes past activities, including the siting of the drainfield within the saddle of the Knoll area.

Alterations to the valued landscape character are mostly subordinate within the SUP area boundary portion of Management Area-4. However, facility structures, road cuts, and parking design do not borrow from the valued attributes of the surrounding landscape character. As a whole, the valued landscape character appears moderately altered when viewed in context of a developed winter recreation site, therefore meeting a **LOW scenic integrity level**.

California Viewshed

The most sustained and direct views in this viewshed are from near the Hornbrook Exit of Interstate 5. The existing ski runs are not visible from this viewshed. Views are limited to the existing parking area, the Crest Road, the south-facing silhouette of the Siskiyou Crest ridgeline, and night glow associated with night skiing. From this distance (approximately 10 miles), views are primarily of a forested ridgeline forming the backdrop to foreground and middleground views within California. Vegetation from this distance appears as patches of color and texture and is more apparent with high contrast lighting and less haze. The south-facing, bowl-shaped meadow (headwaters of Cottonwood Creek) is partially screened by a lower ridgeline. Although two of the three dominant evergreen clumps within this meadow are visible, at travel speed, the Analysis Area is best characterized as an open, flattened gap within the continuous forest canopy along the ridgeline. During hours of night skiing operations, lights cannot be seen directly, but a night glow is visable. Travelers driving north from Hornbrook can see a few lights directly at some locations between the Oegon/California border and Skikiyou Sumit.

Road cuts outside the Analysis Area along the Crest Road dominate as the most noticeable, human-created deviation in the landscape. The existing cut slope above the maintenance sheds is slightly visible, although not discernible at travel speed from the open areas above and below the road. Viewed together, the eye connects the gap between the visible cut slopes along the Crest Road, such that the Analysis Area appears as a node along this line. As such, the overall landscape appearance from this viewshed remains slightly altered, thus meeting a **MODERATE scenic integrity level**.

Rogue Valley Viewshed

This viewshed is a primary focal point along the forested ridgeline defining the Siskiyou Mountains. Along the primary travel routes, Mt. Ashland stands out as the backdrop for the City. Interstate 5 is the most common viewshed, providing sustained views for a few minutes along several stretches. A National Weather Service Doppler radar structure located at the summit of Mt. Ashland is prevalent most of the year, but especially during the summer.

Except for this radar structure, the ski runs themselves are the only visible evidence of human alteration within the Analysis Area during the day. Structures, lifts, and lift towers are not discernable from at this distance. However, at night, during hours of night skiing operation, the lights along lift lines are very prominent and dominate the night sky as far away as Shady Cove, approximately 30 miles to the north. During cloud cover, the effect persists as these lights refract off the cloud layers, creating a noticeable glow in the clouds immediately above and around the ski area.

This viewshed appears densely forested with breaks in vegetation occurring near the ridgeline. Existing ski runs are visible, but not easily recognizable as such, to the average viewer during the summer. Straight edges along the Caliban ski run tends to be the most unnatural line, otherwise, the majority of runs are oblique in orientation, helping to blend well with natural openings and vegetation patterns. During the summer, the runs appear bare and contrast against the adjacent colors of rock outcrops. During winter, run openings blend in places with natural openings, as the snow conceals the color contrast of the material it covers. However, overall contrast is greatest in winter, given the color difference between the snow within ski runs, and the deep green of the conifer canopy. This contrast is lessened at times when heavy snowfall accumulation persists on branches of trees, blurring the hard edges between ski runs and canopy.

Overall, the landscape character is slightly altered, as the ski runs, though visible, remain subordinate to the valued landscape character, and therefore meet a **MODERATE scenic integrity level.**

City of Ashland/ Interstate 5 Viewpoint

Views into the ski area from here are partially obscured by foreground ridges above the city. The current ski runs only comprise approximately 1/4 of the visible portions of the Analysis Area from this view. The silhouette of the Knoll and the saddle between it and the main ski slopes are visible, but partially obscured in places by a foreground ridge. This ridge completely obscures views of the Knoll as the viewer elevation lowers into the City of Ashland. Evidence of runs remains subordinate to the dominant natural appearing landscape, meeting a **MODERATE scenic integrity level**.

Dead Indian Memorial Road Viewpoint

Although foreground ridges block views into the Knoll, this viewpoint offers the most direct and extensive view into the existing ski runs. These runs occupy approximately 1/2 of the visible portions of the Analysis Area. Ski runs are less oblique from this viewing angle, appearing as unnatural lines descending from beneath Mt. Ashland summit. As the runs are limited to the upper portion of the mountain, they blend relatively well with surrounding openings above and adjacent to the runs, such as the Bowl. Existing diagonal run and lift lines are somewhat softened by the angle. Although the ski runs dominate the view, they borrow from the valued attributes of the surrounding landscape, meeting the low end of a **MODERATE scenic integrity level.**

Highway 66-near Greensprings Summit Viewpoint
From this viewpoint, the existing ski runs are direct in sight and almost entirely visible. The exceptions are the lower portions of the runs obscured by the silhouette of the Knoll (which is most visible from this vantage point) and the remaining portion of the SUP area (which is oblique in view). Hence, the existing ski runs seem to visually occupy approximately 3/4 of the visible portions of the viewshed. As the views are nearly perpendicular to the ski runs from this angle, the runs appear as linear lines descending from the summit, occasionally interrupted by unnatural diagonal lines. While borrowing from the valued attributes of the surrounding landscape, the overall landscape appears moderately altered, meeting the high end of a **LOW scenic integrity level**.

City of Medford/ Interstate 5 Viewpoint
From this viewpoint, the existing ski runs appear the most oblique. The upper portions of the Knoll and the saddle separating it from the main ski slopes are visible from different vantage points, obscured by foreground ridges as one travels along I-5. The evidence of the ski runs are less visible from this vantage point, yet the views into Mt. Ashland remain prominent, as the snow-capped peak draws the viewer directly into the Analysis Area. The existing runs occupy less than 1/4 of the visible portion of the Analysis Area. Portions that are visible appear similar to adjacent natural texture changes. The area appears mostly unaltered. Deviations to this include the visibility of the Doppler radar structure during the summer, and the dominance of the lights at night, during night skiing. Thus, the overall valued landscape character appears essentially intact, with slight deviations that do not persist continuously, meeting the low end of a **HIGH scenic integrity level.**

2. Heritage Resources

In consultation with the Oregon State Historic Preservation Office (SHPO), the 1991 FEIS concluded that ski area expansion "was determined to be a 'no effect' undertaking relative to significant cultural (Heritage) resources." This was based on a 1984 archaeological reconnaissance survey conducted in and adjacent to the Middle Fork area down to an elevation of 5,300 feet. That 1984 survey did include most of the currently proposed Knoll development area but it did not include the far western portion of the LC-6 proposed development, nor the proposed Snowplay/tubing facility area.

a. Past Uses

The prehistory and history of the eastern Siskiyou Mountains is addressed in Chapter II of the Rogue River National Forest's Cultural Resource Overview (LaLande 1980). That document is of sufficient detail to serve as the basic reference of ethnographic, prehistoric, and historic background for this Final EIS.

Native Peoples
Several previous studies establish prehistoric use of the Siskiyous in the vicinity of Mt. Ashland (Winthrop and Winthrop 1984). At the time of Euro-American settlement, the Mt. Ashland area probably fell within the territory used by the northernmost band of Shasta Indians. The Takelma, another Native American group, may have shared this portion of the eastern Siskiyous with the Shasta. Both groups followed a hunter/gatherer/fisher way of life. Areas within and adjacent to the expansion area were probably used episodically for subsistence activities in the summer and fall months.

Intensive archaeological surveys in the Upper Ashland, Cottonwood, and Grouse Creek watersheds have revealed a few isolated artifacts and several very small, sparse lithic scatters at high elevations. Test excavations suggest light, seasonal use of the area for hunting and edible plant processing activities by small task groups of native people. One study suggests that Grouse Gap may have been a stopping place on a travel route linking the Rogue River and Klamath River basins. This route was probably minor in comparison to the major travel route across the eastern edge of the Siskiyous at what is now called Siskiyou Pass. Based on the cumulative results of twenty years of ongoing archaeological and historical research in the eastern-most Siskiyou Mountains, the high country that includes Mt. Ashland---although this area was certainly visited and used seasonally by native people---appears to contain relatively few, small archaeological sites that resulted from those centuries of use. The sparseness of the archaeological record in this area contrasts to the far more plentiful cultural evidence found at lower-elevation, foothill and valley locations. This situation in large measure reflects the high-elevation area's often severe weather conditions, its long-term annual snowpack, and the brief seasonality of most game and edible plant species--all factors that probably served to confine most native use to the late summer and early fall months.

No ethnohistorical, oral tradition, or other documentation currently available to the Forest Service indicate that specific high points in the eastern-most Siskiyou Mountains, including Mt. Ashland, held particular spiritual or religious significance to native peoples. Although such places may well have once been so regarded, the forced removal of most local native people to distant reservations in the 1850s caused a severe rupture in traditional native relationships with the landscape of much of the Rogue River Basin.

In order to seek current tribal views on the question of traditional uses and beliefs, early in the scoping process for the MASA expansion proposal, the Forest Service contacted by formal, government-to-government letters, six Federally recognized tribes relevant to MASA. Three of these are tribes whose members include descendants of the Shastan and Takelman groups that formerly resided in the vicinity (i.e., ancestors who thus would have utilized the eastern Siskiyous' high country before Euro-American settlement caused dispersal or removal of most native people from the Rogue River valley/middle Klamath River area). The three other tribes are located along the lower Klamath River drainage, between 50 and 100+ miles southwest of the SUP area, and have reserved the opportunity to comment or consult on projects that might affect water issues within the Klamath River watershed.

The Forest Service received no replies, either written or verbal, from any of the tribal governments regarding possible interest in or concern about the proposed expansion project. In order to ensure that tribal concerns were not being overlooked, Forest Service tribal relations specialists from both the RR-SNF and the KNF subsequently made follow-up personal contacts with the six tribes' appropriate cultural resource staff members. Although the tribal staff did not express concerns (or the desire to consult) about the project, this FEIS has been sent to those six tribes for their review and comment. They can still indicate their desire to begin government-to-government consultation on this project.

Euro-American Settlement
The first Euro-American to arrive in the area was Peter Skene Ogden, of the Hudson's Bay Company. Ogden led his "Snake Country Brigade," made up of nearly forty French-Canadian and Indian trappers, north over Siskiyou Pass in February of 1827 (LaLande 1987). Ogden was followed by other trappers through the 1830s-1840s. In the 1850s, gold was discovered in southern Oregon and northern California, which helped bring in the first major influx of permanent settlers to low elevation valleys in the Rogue and Klamath basins. Before the end of the century, a few hardy tourists and locals were beginning to use Mt. Ashland (called Ashland Butte until about 1910) for recreation and hunting purposes. Also, sheep and cattle grazed extensively in the meadows surrounding Mt. Ashland. The first skiers on the peak also arrived at this time. Forest Service trails were constructed in the area and a lookout was established on Mt. Ashland's summit in the 1920s (accessed via a trail up the West Fork of Ashland Creek from the City of Ashland).

The first substantial development in the vicinity was construction of the Ashland Loop Road in 1937 by the Civilian Conservation Corps (CCC). This road led from Ashland and passed through the future site of the ski area near the Base Lodge (i.e., present Forest Road 2060 and 2060200 from Ashland to Bull Gap). From there, it followed the Siskiyou Crest to the Applegate River (now Forest Road 20). Trail Camp Ski Shelter, located at 5,500 feet on the eastern edge of the Ashland Creek Watershed, was also constructed by the CCC at this time and was used by local ski enthusiasts until construction of the present ski area in 1963.

Concurrent with MASA development in the early 1960s was the construction of the nine-mile Mt. Ashland Access Road from Interstate 5 at Siskiyou Summit, and two facilities at Mt. Ashland's summit; a television broadcasting facility and a National Weather Service radar station. Although over 150,000 people visit the ski area and immediate Mt. Ashland vicinity every year, probably fewer than 200 currently enter the proposed Middle Fork area or other proposed new development areas located some distance away from existing roads. This number has been exceeded in the recent years due to on-the-ground planning efforts and related field trips (some organized by the Forest Service and others by private individuals and groups).

b. Heritage Resource Protection

Protection and management of heritage resources is mandated by a variety of Federal regulations, most notably the National Environmental Policy Act of 1969; Antiquities Act of 1906; National Historic Preservation Act of 1966, as amended (1992); Archaeological and Historic Preservation Act of 1974; Archaeological Resources Protection Act of 1979; American Indian Religious Freedom Act of 1978; the regulations for the Advisory Council on Historic Preservation (36 CFR Part 800); Uniform Regulations for the Protection of Archaeological Resources (36 CFR Part 296); and Executive Order 13007 (1996), which provides that Federal lands be managed to accommodate access to and ceremonial use of traditional Indian sacred sites.

The Forest's Cultural Resource Inventory Strategy Plan (a SHPO-approved document) provides direction for cultural resource inventory on the RRNF. The plan gives a brief overview of the environment and cultural background of the Forest, and it describes the kinds (and predominant land-type locations) of prehistoric and historic cultural resources found on the Forest.

The Plan's inventory strategy utilizes a classification scheme that divides the Forest into "high," "medium," and "low" potential land-types, based on their demonstrated/expected probability for containing significant cultural resources. Survey intensity, "second entry" coverage, and other technical aspects of on-the-ground search efforts are defined, and specific direction is provided for survey coverage and post-survey documentation.

Resource Surveys

Since about 1990, a number of Forest Service surveys have been conducted in both the Ashland Creek Watershed, on the RRNF, and the Grouse Creek/Cottonwood Creek drainage, on the KNF. Most of these surveys found prehistoric and/or historic evidence, a few of the sites were found eligible for the National Register. Five surveys have been conducted within or very close to those areas encompassed by the proposed Middle Fork area, the Knoll area, and other proposed new MASA developments. These include the previously mentioned 1984 survey performed by Winthrop and Winthrop, a 1994 survey of two areas that were proposed for location of a new ski-area sewage treatment facility (one within the current "Knoll" proposal area and the other within the proposed Snowplay/tubing facility area), a 1997 re-survey of portions of the 1984 survey (associated with MASA's wastewater treatment facility, outside of the proposed Middle Fork area but within the proposed Knoll area), a 1997 project-specific survey of the proposed Middle Fork expansion area, the 2000-2001 survey of the Knoll area, the proposed snowplay/tubing facility area, and all other new MASA developments proposed under this Final EIS. The following discussion is based on the results of the 1997 and 2000-2001 surveys.

Over 90 percent of the acreage of the SUP area is classified as "low-potential" ground for containing heritage resources. Nevertheless, the 1997 and 2000-2001 surveys gave 100% coverage to the various expansion areas' "area of potential effect" (all proposed new and/or widened ski runs, lift lines, tubing area, and infrastructure locations), regardless of site-potential level. Some areas were searched two or more times. In addition, all high-potential areas within or close to the proposed expansion areas were intensively searched. The total area searched by the 1997 and 2000-2001 surveys was approximately 450 acres, purposely extending beyond the proposed projects' "area of potential effect."

Two heritage resource sites were found within the proposed LC-6 area surveyed in 1997. One, a small prehistoric lithic scatter, is located outside of the LC-6 expansion's "area of potential effect." The other, composed of two associated and very recent hunting blinds, is located in an area that may be affected by development of proposed ski Runs 12 and 12A.

Site RR-1666 is a small, sparse lithic scatter primarily composed of obsidian debitage (probable evidence of the making and maintenance of hunting projectile points and other obsidian tools). The site appears to represent a lightly and intermittently used hunting bivouac, rather than a regularly used seasonal camp. Although the archaeological information contained in the site is comparatively limited, the site has suffered very little human disturbance. Site RR-1666 is one of the few known "undisturbed" lithic scatters in the Ashland Creek Watershed and, because of its modest archaeological research potential, has been evaluated by the Forest Service as eligible to the National Register of Historic Places, with SHPO concurrence.

Site RR-1667 consists of two recent (ca. 1980s) hunting blinds; these features were hastily built of plywood and lumber, using trees for support. Construction effort was minimal. They are open to the weather and simply provide visual concealment to persons lying or crouching within them. This site has been documented with a brief written description and photographs. Site RR-1667 has been evaluated as not eligible to the National Register, with SHPO concurrence. The site is within the expansion's area of potential effect.

The only pre-1960s historical artifact found during the 1997 survey within the Middle Fork area was an amber-glass bottle. Despite an intensive search of this vicinity, no other historical items were found. The bottle possibly dates to before the 1920s and most likely held whiskey or other spirits. It may represent a brief visit to the area by deer hunters sometime prior to World War II.

Within the proposed Knoll area, the proposed snowplay/tubing facility area, and other areas surveyed in 2000-2001, no prehistoric or historic sites were found within the "area of potential effect." Two ca. 1930s Forest Service trail signs were found nailed to a tree close to but outside of the proposed snowplay/tubing facility area. These signs marked the junction of two trails; several blazed trees that apparently marked one of these long-abandoned trails are situated within the proposed snowplay/tubing facility area, but no discernable trace of trail grade was found.

The scarcity of prehistoric or historic evidence within or near the proposed MASA expansion areas indicates that, overall, this high-elevation, steeply sloping, forested, and regularly snow-covered area has been relatively lightly used by both Native Americans and Euro-Americans.

3. Land Uses and Regulations

a. Land Management Direction - Developed Recreation

Pursuant to CEQ 1502.20, this Final EIS is tiered to the FEIS and ROD for the RRNF LRMP (USDA Forest Service 1990) as amended by the Northwest Forest Plan (NWFP) (USDA Forest Service and USDI Bureau of Land Management 1994). The Proposed Action and alternatives are located on lands allocated to Administratively Withdrawn under the Northwest Forest Plan. This Final EIS is also tiered to the FEIS and ROD for the Land and Resource Management Plan for the Klamath National Forest (KNF LRMP 1995). See Section H, 3 of Chapter I for more detail on applicable management direction from the Northwest Forest Plan.

The entire expanded SUP area resulting from the 1991 ROD/FEIS for MASA is currently being managed as Administratively Withdrawn under the Northwest Forest Plan. This allocation includes areas associated with the RRNF and KNF LRMPs that, in this case, emphasize developed recreation, and does not include regulated or programmed timber harvest.

The primary goal of Developed Recreation is to provide quality outdoor recreation opportunities within a forest environment that is modified for visitor use, visitor satisfaction and accommodation of large numbers of visitors. For additional information, see Chapter I, Section H, and the RRNF LRMP.

b. Other Facilities and Permits

Several facilities located within or adjacent to the SUP area, are unrelated to the MASA. These facilities include the National Weather Service Doppler radar station near Mt. Ashland's summit, the KTVL-TV transmitter facility 800 feet west of the summit, and a radio facility building 900 feet northeast of the Base Lodge (see Map II-2). All of these facilities operate under separate Special Use Permits issued by the RRNF and all are served with electrical power from underground cables (also under permit to Pacific Power).

The Weather Service facility was constructed in 1967 and was enlarged in 1994, as part of a national modernization effort. The "Mt. Ashland Doppler Weather Radar" facility is one in a national network of 162 advanced weather radar sites in the United States. The Federal Aviation Administration (FAA) and the Forest Service also have electronic communication facilities within the building.

The KTVL site is under permit to Sierra Freedom Communications, the owner of KTVL-TV, which is based in Medford, Oregon. This site, developed in 1965, is reserved for commercial broadcast stations that are compatible with the existing use. KTVL's building also houses four local FM radio stations, and cellular communication facilities.

The radio facility building is under permit to Clackamas Communications, Inc., a Milwaukie, Oregon-based company. This site was developed in 1963, concurrent with the ski area. The building currently houses a variety of radio transmission systems serving numerous organizations. The site is reserved for electronic facilities such as 2-way radio, public safety, microwave, and cellular.

4. MASA and the McDonald Peak Inventoried Roadless Area

Controversy over roadless areas has been in public debate for decades. This Section briefly outlines the history behind roadless areas, and specifically for the McDonald Peak Inventoried Roadless Area (IRA), an area without roads and inventoried for its roadless characteristics and once considered for potential Wilderness designation.

The (expanded) SUP area boundary associated with the programmatic decision made for MASA with the 1991 ROD/FEIS, includes lands within a portion of this IRA. The current ski area facilities and use overlap into this area by less than one acre, in the vicinity of the Upper West Ridge Run (see Map III-12 and Chapter II, Section C, 3). Note: the 1990 RRNF LRMP utilized the term "unroaded", which is synonymous with the term "roadless".

- 1972: In response to the Wilderness Act of 1964, the Forest Service initiated a planning process called *R*oadless *A*rea *R*eview and *E*valuation (RARE). The purpose was to inventory all the areas of unroaded public lands to consider them for proposal to Congress for formal designation and protection as Wilderness lands. This inventory was a description of an area of land based on its unroaded (roadless) status, not an allocation for use of that land.

- 1979: The Forest Service began a second study known as RARE II. This process was designed to recommend which roadless areas should be allocated for wilderness, which for multiple use, and which for further study. The RRNF inventoried 13 roadless areas at that time, including the McDonald Peak area.

- 1980: Portions of three of the identified roadless areas within the RRNF (not including McDonald Peak) were added to Crater Lake National Park. This left the remaining portions of these three areas unsuitable for inventory as roadless, based on agency direction and criteria (e.g., size).

- 1984: A re-inventory was conducted to delete areas with non-conforming uses (areas with existing roads or intensive vegetation management). Most areas were refined with acreage slightly decreasing in size, including McDonald Peak.

  Specifically, an area identified as 9,446 acres located on the divide between Ashland Creek, Little Applegate River, and Wagner Creek known as McDonald Peak, was studied for its unroaded (roadless) condition (see Map III-12). During this process, the Forest Service determined this area was not comprised of qualities and characteristics worthy to recommend to Congress for Wilderness proclamation. This determination removed these acres from abeyance and freed them for other uses.

- In June and August 1984, Congress passed the Oregon Wilderness Act and the California Wilderness Act, which established three Wilderness areas on the RRNF. These actions directed consideration under the Forest Plan (planning) Process, for all or portions of nine remaining roadless areas (81,228 acres total), including McDonald Peak IRA.

- 1990: Through the development of the Forest Plan process, the RRNF allocated portions of these nine areas, including the McDonald Peak IRA to multiple uses. The McDonald Peak area was assigned six uses (allocations): Restricted Watershed (for municipal water needs of Ashland), Developed Recreation (Mt. Ashland Ski Area), Special Interest Area, Restricted Riparian, Botanical Area, and timber harvest (under a Managed Watershed strategy associate with the Talent Watershed). This allocation decision was made in July of 1990, as part of the ROD for the RRNF LRMP (see 1990 FEIS Appendix C). Appendix H of the Draft EIS included excerpts describing this area and a map showing the 1990 LRMP land allocations associated with the McDonald Peak IRA. It also contained a map showing the current (NWFP/RRNF-LRMP) land allocations in relation to the McDonald Peak area. These documents are now available upon request and are not included in the Appendices to the FEIS.

- 1985-1991: Overlapping the completion of the Forest Plan, a concurrent Environmental Impact Statement (EIS) analysis process was conducted to create a Mt. Ashland Ski Area Master Plan. This programmatic decision (July 1991) resulted in a changed (expanded) the SUP boundary and authorized, conceptually, expansion of skiing terrain. This expanded area encompassed for future development, approximately 298 acres of the McDonald Peak roadless area, inventoried and once held in abeyance.

- 1992: National Environmental Policy Act (NEPA) Forest Service implementation regulations changed and directed the Forest Service to clearly and deliberately make known, through an Environmental Impact Statement analysis process, any significant character changes to those lands described and inventoried as roadless. This regulation did not exist prior to 1992.

- 1999: A process was undertaken to clarify the boundary lines associated with IRAs from the 1990 RRNF LRMP. The intent of this process was to transfer the lines into ARC-INFO, a more current computer mapping program used by the Forest Service. The purpose of this process was to more accurately map all existing IRAs on the RRNF. The intent was not to change or re-inventory these areas. This process was undertaken to allow mapping of greater detail and accuracy to be produced at any scale in Geographic Information Systems (GIS), and to identify coordinates that may be located on the ground utilizing satellite Global Positioning System (GPS) equipment. The need for this process was to establish the boundaries of IRAs on a map base that would allow project planning and implementation teams to clearly identify whether activities are within or outside of these roadless areas.

  The task of trying to reproduce the lines exactly as originally intended was complex. Forest Plan White Paper #37 (USDA FS RRNF 1999e) documents the process used to clarify IRA boundary lines. The overall results of this process amounted to some (minor) change in acreages in all RRNF IRAs. The overall difference totaled 0.23%, an increase of 189 acres for all RRNF IRAs. For the McDonald Peak IRA, this process resulted in a modified area that included a total of 9,425 acres (a reduction of 21 acres, or -0.23%). The resultant acreage of this process for the McDonald Peak IRA (9,425 acres), instead of 9,446 acres, is utilized herein for mapping and analysis purposes.

- 2000-2002: In accordance with Executive Office direction, the Forest Service began an EIS process for the Conservation of Roadless Areas on the National Forests. This process was ongoing with Draft EISs having been released, interim Forest Service direction, and sustantial public comment. Specifically pertinent to the MASA Final EIS process, FSM Interim Directive No. 1920-2001-1, revised decision authority for certain projects in IRAs. In a March 20, 2002 letter to the Regional Forester from the Acting Forest Supervisor for the Rogue River National Forest, the situation was outlined in regard to the MASA Expansion proposal (see Chapter I, Section H, 10). The Regional Forester concurred with the Forest Supervisor recommendation and determination in a May 8, 2002 letter that the authority and responsibility to approve process steps and sign decision documents related to the MASA Expansion would remain with the Forest Supervisor of the Rogue River-Siskiyou National Forest.

- On July 14, 2003, the U.S. District Court in Wyoming enjoined from implementation this Rule that provided direction to the National Forests for management of Inventory Roadless Areas.

- Effective July 16, 2004, Federal Register (69 FR 42648), this Interim Directive (ID) was reinstated, with two changes, the direction previously issued in ID No. 1920-2001-1 to implement the Chief's 1230/1920 letter of June 7, 2001, regarding Delegation of Authority/Interim Protection of Roadless Areas. This roadless area direction has been reinstated because of the continued legal uncertainty of implementing the Roadless Area Conservation Rule at 36 CFR part 294 (66 FR 3244).

Because the timber harvest resulting from ski expansion activities is incidental to the construction of new ski runs or ski lifts, and ski area development is not prohibited in this area under the RRNF LRMP, MASA Expansion meets the exemption criteria in FSM 1925 .04a, 2, (2), b *(cutting, sale, or removal of timber incidental to the implementation of a management activity not otherwise prohibited under the LRMP).* Therefore, delegation of authority to approve or disapprove timber harvest associated with this proposed expansion project (within a roadless area) remained unchanged by the most recent roadless interim directive.

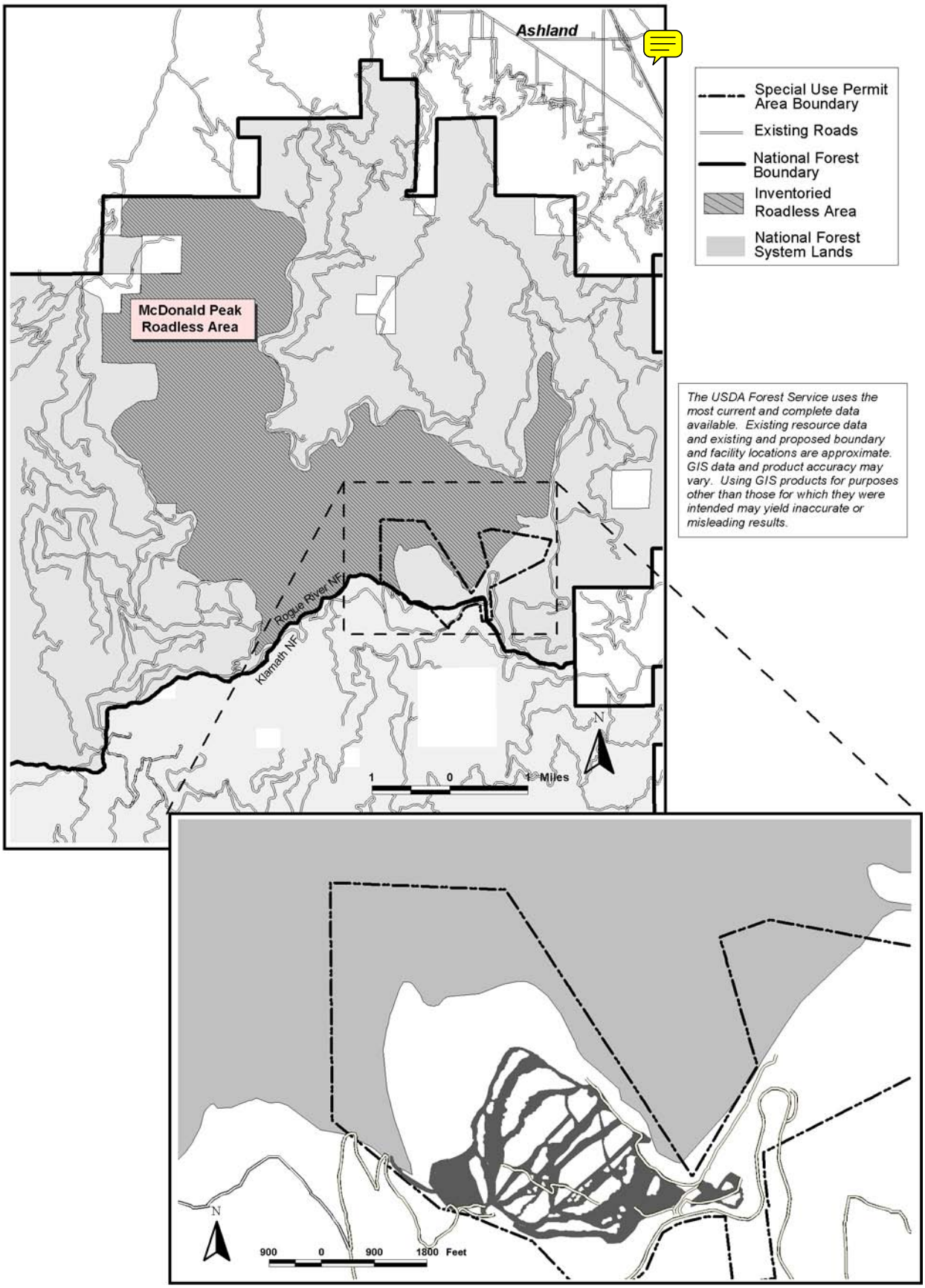
- 2004 (now): This Final EIS discloses the anticipated character changes for areas included in the expansion proposals (and the current uses and conditions) in context of the **9,425 acre McDonald Peak IRA**, inventoried for its roadless characteristics, as well as in the context of other areas without roads within Southwest Oregon, Northern California, and the Siskiyou Crest bioregion. The McDonald Peak IRAis located entirely on lands administered by the RRNF (see Map III-12).

The McDonald Peak IRA is not adjacent to, contiguous to or near any designated Wilderness area. It is not adjacent to, contiguous to or near any other area previously or currently inventoried as roadless. The area, as described in Appendix C of the 1990 RRNF LRMP, has not experienced any management activities in the form of timber harvest and/or road building. It has not experienced any major fires. It has experienced some natural landslide activity, on the western slopes of Wagner Peak, in the Little Applegate drainage. The current character of this area remains essentially as described in 1990 (see Appendix H).

Scoping has also identified that there is a desire by some people for the land allocation decisions for this area to be revisited and once again be considered for formal Wilderness designation. The analysis for wilderness designation of the McDonald Peak was conducted between 1971 and 1990, culminating with the Forest Plan ROD in July 1990. This Final EIS will not revisit these decisions.

What is analyzed in this Final EIS is the change in character and impacts resulting from implementation of ski area expansion alternatives. Future designation of lands without roads as Wilderness can only be proclaimed by Congress. The avenue for the USDA Forest Service to make such a recommendation to Congress, must be based on a higher order of planning and analysis, namely, Forest Plan Revision; it cannot be accomplished through project level work and is not being proposed via this Final EIS.

MAP III-12. McDonald Peak Inventoried Roadless Area



5. Transportation

The MASA is accessed via the Mt. Ashland County Road 1151 (Mt. Ashland Access Road). This road is a two-lane paved road connecting the ski area to Interstate 5, near the Siskiyou Summit. During the winter, the Mt. Ashland Access Road is plowed by the Oregon Department of Transportation (ODOT), with funding provided by the statewide Sno-Park permit program. The balance of the year the road is maintained by the Jackson County Department of Public Works.

In consultation with traffic and highway engineers, it was determined that 25 miles per hour with a 300 foot separation between vehicles in packed snow conditions would be a reasonable safe maximum speed. Conservatively, this would allow approximately 400 vehicles per hour to arrive at the ski area. Jackson County has provided the Forest Service with data on Mt. Ashland Access Road vehicle accidents from December 1999 to April 2003. During this four-year period, there were 29 accidents, 11 of which resulted in an injury with the remainder resulting in vehicle damage only. Approximately one half of the total accidents took place on snow or ice-covered roads. Some accidents occur between travelers and snow removal equipment. Most of these accidents can be attributed to people driving too fast for winter road conditions.

Winter traffic primarily accesses the ski area. Some traffic is for the express purpose of snow play, Nordic skiing, or scenic driving. Current average car occupancy is estimated at 2.3 persons per car. On the average, 23% of the traffic for Thursdays, Fridays and Saturdays is directly related to night skiing. Occasionally, night traffic volume exceeds daytime traffic volume.

Beyond the MASA parking lot, the road changes to a non-surfaced Forest Service classified road, identified as Forest Route 20. During the summer, this section of road is popular for recreational use and serves as an access point to the eastern Siskiyou Mountains for hikers, campers, hunters, botanists, and others; it remains closed during the snow season

Total summer visits are also not precisely known, but have substantially increased since 1991. A vehicle counter, located slightly west of the Mt. Ashland Campground on Forest Road 20, recorded an average of 81 vehicles per day in 1994 compared to 45 vehicles in 1990. At 2.3 persons per vehicle over a 150 day summer season (June through October), total visitor use beyond the ski area is estimated at around 28,000 persons.

a. Parking at MASA

The current parking lot has a capacity for approximately 550-600 vehicles when parking control personnel are used and the lot is fully plowed. This capacity typically meets the needs of weekday skiers. However, on busy weekends and holidays from Thanksgiving through the President's Day weekend, the parking lot fills up and guests are forced to park on the County Road, which is a safety concern for MAA management and law enforcement personnel. Data from the last two operating seasons ('02-'03 and '03-'04) indicates that the parking lot capacity is exceeded approximately 25 times per season. That is approximately 21% of the operating days, and 54% of weekend and holiday days (MAA Parking Counts, 2004).

Shortly after major storm events, capacity is typically less than 600, due to incomplete plowing of the lot. In order to fit 600 vehicles in the lot, a very tight arrangement must be used whereby distances between cars, and rows of cars are very tight. Car doors can barely be opened and drivers often need to maneuver back and forth in order to vacate their parking space.

A 1/3-mile walk or shuttle is required in order to reach the Base Lodge from the back (west) lot. Conversely, when both lots fill, Nordic skiers sometimes need to walk a similar distance from the Access Road in order to reach the Nordic trailhead at the back lot.

b. Bus Transportation at MASA

In recent years, MAA has attempted to provide affordable bus transportation for the public to MASA. A bus service has been provided on weekends and holidays throughout the ski season. Buses run from Medford and Ashland, typically consisting of one run to MASA in the morning, with one run returning in the afternoon. On average business days, two buses are used. During low business periods one bus is used, while three buses are used on peak days. Buses are also utilized for school groups who visit the mountain for ski outings during the week. Service provided is very basic, utilizing regular school buses.

Use of this service has been almost exclusively by youths who have no other means of transport to the mountain. Adult usage is almost non-existent due to several factors. Skiers typically pack large amounts of clothing and ski gear to be prepared for the varied and changing weather conditions. Packing gear on a bus can be very difficult. Patrons also utilize their vehicles for breaks and lunches on busy weekends and holidays to avoid large crowds in the lodge. Close and easy access is an important element in skiing and skiers consider this when they decide where to ski.

Bus service is currently provided by Laidlaw Transit (local provider of school buses for several school districts), on a per trip basis. The MAA has been committed to providing this service at an affordable price, especially considering patrons of the bus are almost exclusively youths of the valley. This essentially has been a MAA subsidized operation. Following are statistics from this program:

2001/2002 Season: Service provided by Laidlaw Transit at $300 per round trip.
Expense-$35,056
Income-$20,621
Loss-$14,435
Break even cost would have been $16.44 per round trip.
MAA charged $8.00 per round trip.

2000/2001 Season: Service provided by Laidlaw Transit at $300 per round trip.
Expense-$18,871
Income-$12,916
Loss-$5,955
Break even cost would have been $10.23 per round trip.
MAA charged $7.00 per round trip.

1999/2000 Season: Service provided by Laidlaw Transit at $280 per round trip.

Expense-$22,829
Income-$13,580
Loss-$9,249

Break even cost would have been $11.11 per round trip.
MAA charged $7.00 per round trip.

For the three seasons from 1999 to 2001, approximately 2.4 percent of skier visits were by bus transportation. School groups visiting during the week accounted for about 70 percent of this figure while the remaining 30 percent visited on weekends and holidays. Previous year's figures indicate similar subsidies and skier visits attributed to bus transportation.

Rogue Valley Transit District (RVTD) was also approached about the possibility of providing this service. For RVTD to be involved they would need a fleet (3 buses), adequate usage to make a profit, and political support for adding this run to their routes. RVTD found these elements lacking during the 1997/98 ski season, and do not currently provide this service.

c. Roads Analysis

Responsible Officials are directed to use a Roads Analysis process to ensure that road management decisions are based on identification and consideration of social and ecological effects. *Roads Analysis: Informing Decisions About Managing the National Forest Transportation System* (FS-643) has been provided as guidance for conducting a science-based roads analysis (USDA FS 1999f).

Current policy requires the Forest Service to undertake a scientifically-based road analysis procedure, at appropriate scales and coordinated with other ecosystem analysis, in order to make better decisions regarding road management. Roads analysis at the Forest-scale generally provides a broad context for informing road management decisions. Site-specific projects may be informed by a project scale roads analysis.

At the Forest scale and in conformance of the Roads Management Policy, a general assessment of roads in the southern portion of the Rogue River National Forest was conducted in 2002 (*Rogue River National Forest Roads Analysis,* USDA FS 2003b); this document became available to the public in March 2003. The KNF Forestwide Roads Analysis was completed in June 2002 and is available on the KNF Internet webpage. These documents were utilized for analysis under this Final EIS and are incorporated by reference.

Many existing roads within the MASA SUP area are managed by the Special Use Permittee (MAA) but are technically roads by definition, and remain under the jurisdiction of the Forest Service. Because road management activities are part of the Proposed Action and alternatives, this Final EIS has conducted a project-level Roads Analysis process, in conformance with the Road Management Policy. This Roads Analysis was conducted at a logical scale associated with the MASA SUP, in conjunction with this NEPA process. Documentation of the project-specific Roads Analysis conducted in conjunction with Mt. Ashland Ski Area expansion is contained in Appendix G. The 2003 Upper Bear Assessment (USDA FS 2003d) also includes a site-specific Roads Analysis for the larger and adjacent Upper Bear Analysis Area.

6. Range Conditions

Grazing along the Siskiyou Crest and in the vicinity of Mt. Ashland began with the first settlers in the 1850s. Intensive grazing in the late 1800s and early 1900s took place, involving thousands of sheep and cattle, along with smaller numbers of hogs and horses. The high elevation meadows were often the primary areas grazed. Even though prohibited by establishment of the Ashland Forest Reserve in 1893, some grazing probably took place in the Ashland Watershed, especially in the West Fork, with its extensive meadow system.

Currently, there is no authorized use of the MASA SUP, the Federally-managed lands within the Ashland Watershed, or the immediately surrounding adjacent areas for livestock grazing. There is authorized grazing to the south of Mt. Ashland on the KNF, and to the west on the RRRNF in the Little Applegate drainage. Historically and recently, some unauthorized cattle use has occurred in the Mt. Ashland vicinity and within the Ashland Watershed. This has been the result of livestock drift and inadequate management/administration of the authorized range allotments. This unauthorized use has been very minor in the last few years (only a few cows have been seen in the MASA SUP area) and is being monitored and administered by both National Forests. This unauthorized use is being addressed through ongoing Federal allotment administration and permittee stock management.

7. Social Conditions

This Section presents social conditions in and around the MASA, with a focus on the City of Ashland and Jackson County.

a. Population

Over last two decades, overall growth in Jackson County averaged approximately 1.6% per year, with the growth rate in the 1990s more than double that in the 1980s. The City of Ashland is the second largest commercial and population center in Jackson County. Ashland's population rose by an average of 1.3% annually over the past two decades, increasing from 14,943 in 1980 to 19,522 in 2000. The city grew more than twice as fast during the 1990s as in the 1980s.

Table III-31 illustrates the components of population change in Jackson County between 1970 and 2000. Net migration accounted for over 80% of the change in the 1970s and 1990s, but less than 50% in the 1980s. The recession in the 1980s in Oregon, resulting in significant losses of timber related jobs, resulted in substantial migration out of the region. Consequently, overall migration accounted for a lower share of population growth. Net migration in the 1990s included a substantial number of older residents.

Table III-31. Components of Population Change, Jackson County, 1970 - 1997

Year	Population	Population Change	Natural increase		Net Migration	
			Number	Percent	Number	Percent
1970	94,533					
		37,923	5,867	15.5%	32,056	84.5%
1980	132,456					
		13,933	7,325	52.6%	6,608	47.4%
1990	146,389					
		34,880	4,410	12.6%	30,470	87.4%
2000	181,269					

Source: US Bureau of Census, Portland State University, Center for Population Research

Table III-32 describes the racial mix of the population in Jackson County and the City of Ashland. Most of Jackson County's residents are white (91.6% in 2000). This represented a decrease from 1990, when 95.8% of the respondents were white. Part of this decrease may be attributed to a change in Census methodology that included a new category in the 2000 Census for persons of two or more races. Hispanics represent the largest and fastest growing minority group in Jackson County. They accounted for 4.1% of the population in 1990 and 6.7% of the population in 2000 according to U.S. Census data. This trend is expected to continue. In 2000, the City of Ashland had a similar ethnic distribution, though it has a higher percentage of Asian and Pacific Islanders (2.0%, compared to 1.1% in the County) and a lower percentage of Hispanics (3.6%, compared to 6.7% in the County).

Table III-32. Population by Ethnic Group, Jackson County & City of Ashland, 1990 & 2000

Ethnic Group	Jackson County				City of Ashland			
	1990		2000		1990		2000	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
White	140,188	95.8%	166,125	91.6%	15,582	96.0%	17,873	91.6%
Black	340	0.2%	724	0.4%	81	0.5%	118	0.6%
Asian/ Pacific Islander	1429	1.0%	1,953	1.1%	339	2.1%	391	2.0%
Native American	1863	1.3%	1,980	1.1%	152	0.9%	199	1.0%
Other[1]	2,569	1.8%	10,487	5.8%	80	0.5%	941	4.8%
Total	146,389		181,269		16,234		19,522	
Hispanic[2]	5,949	4.1%	12,126	6.7%	382	2.4%	695	3.6%

[1] The "Other " category on this table includes respondents who chose "Two or more races" on the 2000 Census

[2] The US Census Bureau treats Hispanic origin as a separate question from Race, and "Hispanic" is not included as an option on Census questions dealing with race

Source: US Bureau of Census, Portland State University, Center for Population Research

Table III-33 shows the official population projections for Jackson County over the next 20 years. These projections are based on current population figures from the 2000 US Census and future projected growth rates prepared by the Oregon Office of Economic Analysis in 1997. Between 2000 and 2020, the population of Jackson County is expected to increase by 45,453 people. Average annual growth rates are projected to be between 1.5% and 1.1% during this period, much lower than during the last decade but higher than during the 1980s.

Table III-33. Population Projections for Jackson County, 2000 – 2020

Year	Projected Population	Average Annual Change
2000	181,269	1.2%
2005	192,409	1.2%
2010	203,227	1.1%
2015	214,653	1.1%
2020	226,722	1.1%

Source: Oregon Office of Economic Analysis

b. Housing

As with many areas in Oregon, housing costs in Jackson County have increased substantially during the last decade. During this period, housing prices in Ashland have remained higher than in the County as a whole. In 2000, the median home value for the City of Ashland was approximately 35% higher than for the County ($188,400, compared to $140,000 in the County). The median gross rent for renter-occupied units in Jackson County was $597 in 2002. In the City of Ashland, the median rental price in February 2002 was $500 - $599 for a two-bedroom unit, and $600 - $699 for a three-bedroom unit.

The average sales price for owner-occupied homes in Ashland was reported at $112,328 in 1989. This figure rose to $197,528 in 1999, an increase of 76% over the course of a decade. By 2001 the average sales price had reached $277,742. This represents an increase of 147% from 1989, and a 41% increase from 1999 (EcoNorthwest 2001). One reason reported in other parts of Southern Oregon for increasing housing prices is the increase in housing demand due to in-migration of new residents from regions where housing is more expensive (United Way of Klamath Basin 1996).

In 2000, owner-occupied housing units accounted for nearly 67% of the total number of units in Jackson County. In the City of Ashland, they accounted for only 52% of the total. According to the US Census Bureau, the 1990 vacancy rates were 5.2% and 4.9% in the County and the City, respectively. The vacancy rates in 2000 were 5.6% for Jackson County and 5.7% for the City of Ashland.

Table III-34 indicates building activity in Jackson County from 1991 to 1998. Since 1990, residential building activity has been relatively constant in the unincorporated portion of Jackson County. A total of 11,176 housing units were permitted, between 1991 and 2001. From 1991 to 1998, approximately 60% of these units were single-family detached homes, while the remainder were manufactured homes. In 2000 and 2001, the percentage of new housing units made up by manufactured homes dropped to below 30%.

In the City of Ashland, 1,809 units were permitted between 1991 and 2001, including 256 units of senior housing and 120 housing units in mixed-use zones.

Table III-34. Number of Building Permits Issued by Jackson County & Ashland, 1991 - 1998

Year	Total Dwelling Units Jackson County	Total Dwelling Units Ashland
1991	1,002	160
1992	1,133	87
1993	1,172	97
1994	1,218	114
1995	1,071	229
1996	926	180
1997	875	226
1998	954	115
1999	1,117	253
2000	906	183
2001	882	165
Total	11,176	1,809

Source: Jackson County and City of Ashland

c. Community Facilities and Services

Fire Protection

Jackson County has eight rural fire districts. Although each fire district has no legal responsibilities outside of its jurisdiction, most participate in automatic or mutual aid agreements to assist other fire departments in case of emergency. The Oregon State Forestry Department provides fire protection to over one million acres of public and private timber and wildlands in the County. Fire protection in cities within the County is provided primarily by municipal fire departments. The City of Ashland's Fire Department has 25 paid and volunteer firefighters.

Within the SUP area, the Forest Service provides fire protection only to wildlands. There is no agreement in place with the Forest Service or any rural fire protection district to protect structures within the MASA. The Oregon State Fire Marshall's Office periodically inspects structures within the ski area.

Law Enforcement

The City of Ashland Police Department and the Jackson County Sheriff's Office provide most of the law enforcement services for the MASA. The City of Ashland has 35 paid and reserve officers. Law enforcement services for MASA are provided by the Forest Service and County Sheriff's Department, under a cooperative agreement. The Oregon State Police enforces the state's Sno-Ppark permit system at the MASA.

Medical Services

Major medical facilities in Jackson County include the Rogue Valley Medical Center and Providence Medford Medical Center in Medford and the Ashland Community Hospital in Ashland. The Rogue Valley Medical Center is the largest medical facility between Eugene, Oregon, and San Francisco, California. It is a 305-bed, non-profit medical center with a full range of services including family birth, cancer and heart centers. Ambulance service to the MASA is provided by the City of Ashland. Jackson County provides some medical services to residents, contracting with a physician to serve as Health Officer. County health services include maternal and child-health for low-income families, immunizations, communicable disease clinics, HIV/AIDS testing and counseling and a family planning clinic with prenatal care and pregnancy testing. The County also provides a variety of mental health services.

Schools
The Jackson County Educational School District (ESD) provides support services to 13 school districts in Jackson, Josephine and Klamath counties. During the 2003-2004 season, over 1,700 students from 41 schools participated in MASA's After School Ski Program (MAA, 2004b). The Ashland School District 5 has one high school, one middle school and four elementary schools, with a total enrollment of 3,003 in 2003 students and a student-to-teacher ratio of approximately 22-to-1. There also are two private schools in Ashland. Enrollment at Ashland schools are projected to decrease by approximately 18 percent over the next five years according to a study done by a consultantant for the Ashland School District (Barnack 2004).

Institutions of higher education include Southern Oregon University in Jackson County, and Rogue Community College in Josephine and Jackson County. Southern Oregon University, located in Ashland, has an enrollment of approximately 4,890 undergraduate students and 575 graduate students. The University is designated as a Center of Excellence in the Performing Arts. The existence of MASA is considered to be an influencing factor for some students in their decision-making process to enroll at SOU (pers. com. Hisatomi 2003).

Social and Community Services
Public and private agencies provide a variety of social and community services to county residents. As mentioned previously, the Jackson County Health Department of Health and Human Services offers public and mental health services. The Department also operates facilities for drug and alcohol treatment, assists in providing veteran services to military veterans and their spouses and dependents, and administers grants from the County, State and Federal government that provide a variety of human services such as programs for the homeless and young children having difficulty in school.

The City of Ashland's Senior Program provides a variety of services including shuttle bus transportation to weekly noon meals, preventative health care clinics, discounts on City utilities and garbage services, help preparing tax returns, insurance counseling, and a new senior center offering a variety of recreational and social activities. There are six privately operated senior living facilities in Jackson County.

d. Quality-of-Life

Southern Oregon boasts a high quality-of-life for its residents, particularly for residents and visitors to the City of Ashland. Key lifestyle factors include a small town ambiance, a high level of cultural and recreational amenities, a sophisticated and well-educated population, and an abundance of outdoor recreation opportunities. Residents are a mix of lifelong residents accustomed to small town living, and metropolitan area "transplants" looking for a more relaxed pace and better quality of life (Ashland Chamber of Commerce 1999). The area has a relatively mild climate, with average summer highs in the upper 80s/low 90s and lows in the 50s; the winter highs in the mid-40s and lows in the 30s. The RR-SNF and KNF offer a variety of hiking, backpacking, rafting, fishing and other recreational opportunities.

The annual nine-month long Shakespearean Festival in Ashland attracts over 100,000 visitors annually. Other cultural amenities in Ashland include the Oregon Cabaret Theater, Schneider Museum of Art and nearly two-dozen art galleries. Ashland also boasts a wide array of restaurants serving residents and visitors. Other attractors include biking, hiking, skiing (both alpine and Nordic) in the mountains on two sides of the city; a diversity of music, theater and art; local wineries; and a 100-acre city park.

Time magazine (March 8, 1999) once identified Ashland as one of the best communities in the country in which to retire, noting: "For a town of little more than 18,500, Ashland has a dazzling combination of physical and cultural activities." In 2001, *Outside* magazine featured it in it's *Live Here Now* list of "perfect places to live big, play hard, and work (if you must)," and it has been featured in two popular guidebooks, *100 Best Small Art Towns in America* and *Great Towns of America – Guide to the 100 Best Getaways for a Vacation or a Lifetime* (*Preservation* magazine, May/June 2002).

To some degree, these amenities for residents are offset by relatively high housing prices for a community of its size, and a tight housing market in recent years. Because of these effects and growth throughout the Bear Creek Valley area, "urban" problems are perceived to be increasing: traffic congestion, longer commute times, finding affordable housing, and working longer hours (or more jobs) just to keep pace with the cost of living. These issues are seen as contributing to a deterioration in the quality-of-life. A feature article in *Preservation* magazine cites increasing housing prices and a loss of connection to the community among some new residents as reducing the quality of life in Ashland (May/June 2002).

The MASA directly contributes to the area's quality-of-life by providing readily accessible winter and summer recreation opportunities, year-round employment, and programs in conjunction with local schools. Approximately 2,500 students annually participate in school programs at the MASA (including 1,700 from the After School Program).

Historically, convenient access to skiing has been a factor in attracting students to Southern Oregon University. *Outside* magazine (September, 2003), in an article on the top 40 schools in the country for outdoor activities, rated SOU at number 20. Perhaps the ski area's greatest contribution to the local economy and quality-of-life is to attract visitors to the area in winter when much of the local tourism industry experiences a downturn in visitation. Local restaurants and lodging establishments, in particular, benefit from wintertime ski area visitation.

8. Skiing Demand

This section focuses on the market area and demand for an increase in skiing capacity at the MASA. Assessment of the demand for and impacts of other existing and proposed recreation uses is provided in Section E, 9, Recreation, this Chapter. This analysis incorporates by reference the November 1995 *Development Phasing Analysis of Alternative 7* (Barnhart Malcolm, Inc.), the 1991 FEIS, and the 1999 Pelican Butte Ski Area Draft EIS (Winema National Forest).

a. Existing Market Conditions

The market appeal of the MASA is a function of the physical attributes of the mountain, the quality of the facilities provided, and the size and nature of the available skier market. Mt. Ashland competes for skier visits in both local and regional markets, drawing its skiers principally from Jackson, Josephine, Curry, Douglas and Klamath counties in Oregon and Del Norte, Shasta, Siskiyou, Trinity and Humboldt counties in California. The majority (about 75%) of the skiers are from Jackson and Josephine counties. Approximately 3 percent of skiers are from Klamath County; 10 to 12 percent are from California (NSAA and RCC Associates 2002). The characteristics of these markets are discussed below. A brief overview of the national and Oregon markets precedes the discussion of Mt. Ashland's specific market.

National Skier Demand

While lift-served skiing originated over fifty years ago in North America, the sport grew slowly until the 1960s when its popularity exploded. This growth coincided with a period of economic prosperity and a strong desire for family-oriented recreation and leisure. As a result, participation in skiing grew at an annual rate of approximately 16 percent during the 1960s. As the ski industry matured during the 1970s, overall growth tapered off to about ten percent. The pace of growth slowed considerably during the 1980s, with skier visits vacillating due to adverse weather conditions, and changes in attitudes toward recreation and leisure. During the 1990s, skier visits have averaged 52.3 million visits annually, with the 1992/93, 1993/94 and 1997/98 seasons witnessing record visitation years with over 54 million skier visits nationwide. National skier visits in 2000/01 and 2001/02 were 57.7 million and 54.4 million, respectively.

Table III-35 presents total skier visits in the United States for the period 1985/86-1997/98. These statistics suggest that participation in skiing has stabilized on a national average. Essentially, the life cycle of the industry has reached maturity and without some major "kink" in the life cycle, skier visits are expected to remain between 50-60 million for the foreseeable future (SE GROUP 1996). However, ski areas in Oregon and Washington reached an all-time high of 3.79 million skier visits in 2001/2002. Both states had record-setting skier visitation last year, with 2.14 million visitors to Washington ski areas and 1.65 million visitors in Oregon (Pacific Northwest Ski Area Association 2002).

Based upon analysis by the National Ski Area Association (NASA), U.S. skier visits have been projected to remain flat or even decline over the next 10 years. Total U.S. skier visits would be projected to remain between 50 and 60 million skier visits during the next decade. Growth in skier visits in Oregon and Washington during this period has been moderate and has exceeded national averages during this period. More recently, ski areas in Oregon and the nation have had record-setting visitation. In July 2003, the National Ski Areas Association announced all-time single season record of 57.6 million visits for the 2002-2003 winter. This represented the second, record-setting season in the span of three winters. In 2001-2002, Oregon ski area operators realized an all-time, single season attendance record of 1.66 million skier visits. In addition, the dramatic growth in the snowboard age market may stimulate increased demand in the nation and Pacific Northwest, as this "Echo Boom" materializes. The Northwest leads the U.S. in the growth of snowboarding, with close to 40% of its skier visits attributable to that segment of the market.

Table III-35. U.S. Skier Visits, 1985-2002

Year	U.S. Skier Visits (millions)	Index (1985/86 = 100)	OR and WA Skier Visits (millions)	Index (1985/86 = 100)
1985/86	51.9	100	2,685	100
1986/87	53.7	104	3,152	117
1987/88	53.9	104	3,378	126
1988/89	53.3	103	3,569	133
1989/90	50.0	96	2,656	99
1990/91	46.7	90	2,809	105
1991/92	50.8	98	2,811	105
1992/93	54.0	104	3,237	121
1993/94	54.6	105	3,199	119
1994/95	52.7	101	3,321	124
1995/96	53.1	103	2,727	102
1996/97	52.5	101	3,155	118
1997/98	54.1	104	3,070	114
1998/99	52.0	100	3,395	126
1999/00	52.2	101	3,485	130
2000/01	57.4	111	3,115	116
2001/02	54.4	105	3,808	142

Source: Kottke National End of Season Survey, 2001/2002; Goeldne, 1999

Based upon analysis by the National Ski Area Association (NSAA), U.S. skier visits have been projected to remain flat or even decline over the next 10 years. Total U.S. skier visits would be projected to remain between 50 and 60 million skier visits during the next decade. Although skier visits, both nationally and in the Northwest, have been relatively flat in recent years and national visits are expected to remain flat, the dramatic growth in the snowboard age market may stimulate increased demand in the Pacific Northwest, as this "Echo Boom" materializes. The Northwest leads the U.S. in the growth of snowboarding, with close to 40% of its skier visits attributable to that segment of the market.

Regional Skier Market

Regional (Oregon and Washington) skier growth has exceeded national averages in most ski seasons over the past 10 years. The total number of skier visits in Forest Service Region 6 increased by about 394,913 (an increase of about 15 percent) between 1987/88 and 1997/98, an annual average rate of 1.2 percent. Much of this increase was due to population growth in the region. Between 1990/91 and 1997/98, skier visits increased at 1.5 percent annually.

Oregon skier visits increased from about 860,000 during the 1974/75 season, to 1,624,889 in the 1998/99 season, an average annual growth rate of about 2.4 percent (USDA Forest Service, Region 6 skier counts). Skier visits in Oregon then dropped in each of the following two seasons, to a low of 1,404,330 in 2000/01, before reaching an all-time high of 1,656,358 in 2001/02 (Pacific Northwest Ski Area Association 2002). Growth between 1987/88 and 2001/02 averaged approximately 1.1% per year.

Research conducted jointly by the Forest Service and the Pacific Northwest Ski Areas Association in 1993 showed that both Washington and Oregon are net exporters of skier visits to destinations outside the two states. Roughly 46% of Washington and Oregon skiers leave the region to ski and enjoy a resort experience elsewhere.

Regional ski areas and resorts typically draw skiers from within a 5-hour driving radius or approximately 250 miles. Market research indicates that most people are willing to drive long distances if the amount of time spent getting to their destination is small in relationship to the length of their stay. For this reason, skiers within the regional market typically travel to regional ski areas for long weekends, or a three or four-day visit. In order to attract these visitors, regional areas must be located near existing overnight accommodations. Because fewer mid-week visitors stay overnight, it is most cost effective to utilize an accommodation base in a nearby metropolitan area or community.

In general, occupancy rates at regional resorts are not high enough to ensure economic viability unless the ski area is located in the vicinity of summer recreation areas and supporting tourist services (facilities that attract summer visitors that help to balance the lower occupancy rates experienced during winter months). This phenomenon is exemplified by both Mt. Ashland and Mt. Bachelor, located near Bend, Oregon. The combination of excellent winter and summer recreational amenities offered in proximity has contributed greatly to the overall success of these ski areas as regional destinations.

Mt. Ashland's regional market extends north almost to Salem (Interstate 5), and stretches along the Pacific coast from Waldport, Oregon to Eureka, California (Highway 101). It also extends south to Red Bluff, California (Interstate 5), southeast to Susanville, California (Highway 395), east to Denio, Nevada (Highway 140), and northeast to Bend, Oregon (Highway 97). In addition to those in the local market area, important cities in the regional market area are Eugene, Klamath Falls, Grants Pass and Roseburg, Oregon. In Northern California, Eureka and Redding are prominent urban areas.

The 2000 population within the 250-mile travel zone is estimated to be approximately 1,940,150, including the local market area population (*Pelican Butte Ski Area DEIS*, 1998c). For the years 2000 to 2010, average annual growth rates of 1.3 percent and 2.1 percent are projected for Oregon and California counties, respectively. For the years 2010 to 2020, growth is projected to increase by 1.0 and 1.5 percent annually for Oregon and California counties, respectively, in the regional market area (PSU Center for Population Research and Census, California Demographic Research Unit). This represents regional population growth from 1,940,150 in 2000 to 2,319,100 in 2010, for a total population increase of 19 percent. By year 2020, regional population growth would be projected to increase to 2,638,800, a 36 percent increase over the 2000 population.

The communities within MASA's regional market area are presently served by a number of local and regional ski facilities, including Mt. Bachelor, Mt. Shasta Ski Park, Willamette Pass, Hoodoo Ski Bowl, and Warner Canyon. In addition, the outer boundary of the regional market includes communities that are currently served by numerous local and regional resorts located in the central and northern Sierras, and in the Lake Tahoe Basin.

Destination skiers currently comprise 15% of MASA'skier visits (NSAA and RCC Associates 2002). These include skiers seeking a new destination experience, as well as skiers who are visiting other ski areas in the region and are able to add another day or two to their visit to Southern Oregon.

The population concentrated around the San Francisco Bay area represents the bulk of the regional market for most Northern California ski resorts. The majority of the Lake Tahoe ski areas benefit from the Northern California commuter market, and the availability of a large and proximate bed base in the greater Tahoe area. However, increasing visitor pressure on the Tahoe ski areas and congestion on the highways that serve them, coupled with the Tahoe Regional Planning Agency's growth and development restrictions, makes Mt. Ashland an attractive alternative for the Northern California skier (similar to existing trends at Mt. Shasta Ski Park).

Although Mt. Ashland lies outside the regional market driving radius for the large population centers of the Sacramento/San Joaquin Valley and the San Francisco Bay area, changing travel patterns after the terrorist attacks of September 11, 2001, increase the chances that skiers may drive to destinations on the fringe of their regional market area, rather than fly to skiing areas in other regions (Beeler 2002).

Local Market

Typically, a local market is defined as a day-use ski area (lacking extensive overnight accommodations), attracting skiers within a two-hour drive or approximately a 100-mile radius. These areas are usually in proximity to a large population base and are served by a direct transportation route.

Two existing ski areas serve the bulk of the population base defined by Mt. Ashland's local market area -- Mt. Ashland Ski Area and the Mt. Shasta Board and Ski Park. Mt. Ashland's local market generally includes all of Jackson and Klamath and a portion of Josephine counties in Oregon, as well as Siskiyou County and a portion of Shasta County in California, representing a total population base of roughly 395,228 people in 2000 (see Table III-36). The key cities within the local market are Ashland, Medford, Klamath Falls and Grants Pass, Oregon. Largely due to exceptionally good snow and an extended season, Mt. Ashland achieved record use of 104,744 skier visits in 1994/95. Mt. Ashland recorded 95,170 skier visits in 2001/02, followed by 102, 479 visits in 2002/03 and 102,329 in 2003/2004.

Mt. Shasta Ski Park also serves the majority of Jackson and Klamath counties in Oregon and Siskiyou County, California. Mt. Shasta Ski Park reports that approximately eight to ten percent of its skier visits are generated from Southern Oregon (Thompson, pers. com. 2002). Mt. Shasta Ski Park's local market area also includes Shasta, Modoc, Trinity, Tehama, and Lassen counties, representing an additional population of approximately 300,000. Mt. Shasta Ski Park recorded a record 172,000 skier visits in 2001/02.

Recently, the population of Southern Oregon and Northern California has experienced modest growth. For the period from 2000-2010, the population of Siskiyou County is projected to increase at average annual rates of 1.1 percent. For the same period, Jackson, Josephine and Klamath counties are projected to grow at average annual rates of 1.5, 1.5 and 1.0 percent, respectively. As shown in Table III-36, with a 2000 population of 395,220, the local market area population is projected to grow to 456,078 by the year 2010 and to 505,411 by the year 2020.

Table III-36. Population, Mt. Ashland Local Market Counties, 1990-2020

Population By County	1990	1997	2000(2)	2010	2020	AAGR (3) 2000-2010 (%)	AAGR (3) 2000-2020 (%)
Jackson, OR	147,444	169,300	181,269	210,370	233,764	1.5	1.06
Josephine, OR (1)	41,868	48,667	50,484	57,728	63,390	1.5	0.94
Klamath, OR	57,950	61,600	63,775	70,447	77,357	1.0	0.94
Siskiyou, CA	46,500	44,900	44,700	49,700	53,900	1.1	0.9
Shasta, CA (4)	49,012	53,733	55,000	67,833	77,000	2.1	1.7
TOTAL	342,774	378,200	395,228	456,078	505,411	1.3	1.2

(1) Represents approximately 2/3 of Josephine County population. (2) From 2000 US Census
(3) Average Annual Growth Rate (4) Represents one-third of Shasta County's total population.

Source: 2000 populations: Portland State University Center for Population Research and the Census; 2010 and 2020 projections: Oregon State Economist; California populations and estimates: California Demographic Research Unit

b. Market Competition

Improvements at MASA would provide additional skiing opportunities that would compete with the existing ski areas in Southern Oregon and Northern California for a share of the skier market. The planned Dyer Mountain ski area in Westwood, California (Lassen County) would also compete for skiers within Mt. Ashland's regional market[16]. Outside the local market, but within the regional market area, Hoodoo Ski Bowl, Willamette Pass, Cedar Pass, and Warner Canyon currently supply day-use skiing. Mt. Bachelor, located outside the local market but within the regional market, supplies day-use and destination skiing. The characteristics of these ski areas are summarized in Table III-37 below. Not included is Mt. Bailey, which provides some snow-cat skiing. The planning permit to develop Mt. Bailey into a downhill ski area was revoked by the Umpqua National Forest in 1998.

Table III-37. Characteristics of Ski Areas Within Local and Regional Market Areas

Characteristics	SKI AREA					
	Mt. Ashland	Mt. Shasta Ski Park	Mt. Bachelor	Hoodoo Ski Bowl	Willamette Pass	Warner Canyon (1)
Market Orientation	Local	Local	Local/Regional	Local	Local	Local
Skiable Area (acres) (2)	238	425	3,686	N/A	220	77
Top Elevation (ft.)	7,475	6,900	9,065	5,703	6,683	6,489
Base Elevation (ft.)	6,330	5,800	6,700	4,668	5,120	5,700
Vertical Drop (ft.)	1,145	1,400	3,365	1,035	1,563	700
# of Runs/ Longest Run (miles)	23/1.0	25/1.4	71/1.5	29/1.0	29/2.0	12/1.0
Snowmaking (acres)	None	275	None	None	130	None
Lift Inventory	5	4	12	6	6	1-T-Bar
Tows	1	1	2	1	1	
Fixed Chairlifts	4	3	3	5	5	
Detachable Lifts	0	0	7	0	0	
Lift Capacity (people/hour)	4,730	4,200	21,000	5,280	8,400	700
Estimated SAOT	N/A	2,250	10,000+	N/A	2,700	600
Estimated PAOT	1,650	N/A	12,500+	3,500	6,000	350
Ski Season	mid-November to mid-April	mid-November to mid-April	mid-November to early-June	late November to early-April	mid-November to mid-April	mid-December to mid-March
Average Snow (inches)	265	150-200	350	160-200	300	90-120

(1) Operates only on weekends and holidays (2) Skiable Area is defined as all terrain accessed by lifts and includes both designated and non-designated runs. The term is snnonymous with "ski area boundary"

Source: *White Book of Ski Areas 2002*, PNW Inventory and Analysis, 1991; Mt. Shasta Ski Area, 1997b

16 The Dyer Mountain Project is a 50 million dollar proposed development that is currently undergoing environmental analysis under the California Environmental Quality Act (CEQA). It is anticipated that implementation will begin during the winter of 2004/05 (Lassen County News, April 28, 2004).

Skier days recorded at competing ski areas within the local and regional market areas are tabulated in Table III-38. Mt. Bachelor's 508,869 annual ski days (2001/02) represent 55.5% percent of all ski days occurring in the region. Mt. Ashland, Mt. Shasta, and Willamette Pass represents 10.4%, 18.8%, and 8.6% percent of average annual visitation, respectively.

Table III-38. Skier Days Generated at Market Area Ski Areas

Year	Mt. Ashland	Mt. Shasta Ski Park	Mt. Bachelor	Hoodoo Ski Bowl	Willamette Pass	Warner Canyon	Total
1984/85	78,463	Closed	522,000	47,000	68,700	6,760	722,923
1985/86	45,691	39,000	485,000	46,452	48,000	4,800	668,943
1986/87	41,184	68,000	624,000	53,839	75,000	4,850	866,873
1987/88	67,136	77,000	600,126	58,223	51,100	2,860	856,445
1988/89	79,836	92,990	606,415	52,621	78,864	2,170	912,896
1989/90	39,713	63,600	486,726	28,422	35,414	Closed	653,875
1990/91	49,225	4,596	575,158	35,054	48,750	1,382	714,165
1991/92	30,173	88,073	578,000	30,358	48,672	Closed	775,276
1992/93	87,512	94,864	593,000	48,000	88,000	2,681	914,057
1993/94	82,594	101,051	553,000	48,850	76,047	2,041	863,583
1994/95	104,744	116,000	563,178	45,199	86,793	3,050	869,971
1995/96	75,107	92,777	550,000	23,105	45,886	4,030	790,905
1996/97	80,584	90,000	552,000	40,544	68,906	4,920	836,954
1997/98	84,816	*150,000	535,000	36,197	66,349	5,000	877,362
1998/99	98,863	*142,000	564,000	41,096	92,501	5,100	943,560
1999/00	86,569	*158,000	475,303	51,285	79,232	5,300	855,689
2000/01	71,228	*160,000	470,032	39,688	62,261	4,150	807,359
2001/02	95,170	*172,000	508,869	57,112	78,681	5,500	917,332
5-Year Average	87,329	156,400	510,641	45,076	75,805	5,010	880,260

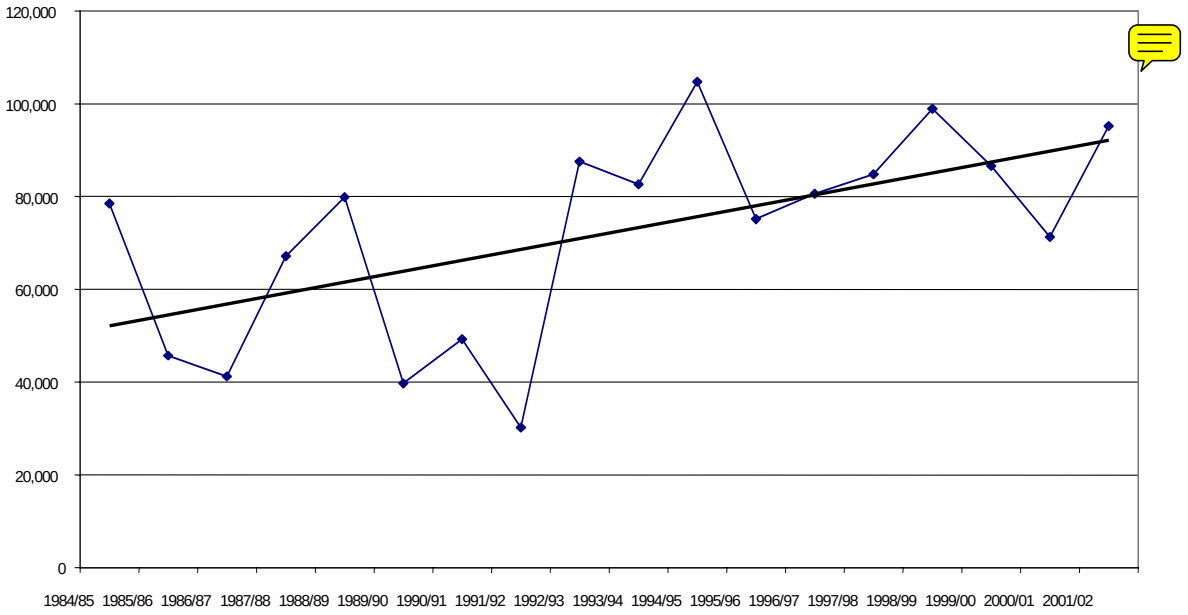
* Estimates provided by Mt. Shasta Ski Park

Source: US Forest Service Region 6; Pacific Northwest Ski Area Association

As Table III-38 and Figure III-11 indicate, skier visitation at the MASA has fluctuated over the past 15 years. These fluctuations are due in large measure to varying snow conditions and closures due to high wind or other conditions. While visitation has fluctuated during the period, overall it has increased by between three and four percent per year. Using a regression analysis to indicate overall trends in visitation, between 1990/91 and 2001/02 and between 1984/85 and 2001/02, average annual increases were 3.9% and 3.3% for these two periods, respectively. This analysis takes into account both good and bad (drought) years.

Mt. Hood ski areas, including Timberline, Multipor/Ski Bowl, and Mt. Hood Meadows, lie outside the regional market area. However, Mt. Hood ski areas do serve as day-use facilities for communities that lie within the northern limit of MASA's regional market. Overall, ski areas on Mt. Hood would not be key competitors of MASA from a regional destination perspective.

Figure III-11. Skier Visits and Trend, MASA: 1984/85 through 2001/02



Other than Mt. Shasta Ski Park, the geographic area north of the Lake Tahoe Basin essentially has no substantial skiing facilities. Lassen Park Ski Area ended their operations in 1993, in response to management decisions of the National Park Service, stewards of Lassen National Park. Coppervale (west of Susanville, CA) and Plumas-Eureka Ski Bowl (near Qunicy, CA) are extremely small ski areas that operate surface tows only, on a "weather permitting" basis. Their skier visits are nominal. The Forest Service recently terminated action on the proposed Mt. Shasta Ski Area, which had been authorized for development in 1988, but was determined to be located within an area eligible for the National Register of Historic Places.

While existing Lake Tahoe Ski areas are pursuing upgrading and expansion plans, proposed projects represent only an incremental increase in the existing supply. Most upgrading and expansion projects are targeted primarily to attract visitation from regional and destination markets. As existing and proposed ski areas in the Tahoe region reach prescribed build-out, and utilization approaches and exceeds comfortable capacity, the resultant "spill-over" effect would increase skier visitations to Mt. Ashland. As conditions become more congested in the Lake Tahoe region, skiers from the Sacramento and greater San Francisco Bay areas would find Mt. Ashland an attractive alternative, especially on long weekends and extended holidays.

In addition to the existing resorts serving the marketplace, at the present time, there are plans or proposals for two new ski facilities within Mt. Ashland's local and/or regional market: Dyer Mountain and Alder Creek Divide. Plans are under way to develop the Dyer Mountain Ski Area, near the town of Westwood in Lassen County, California, within the regional market area for the Mt. Ashland Ski Area. Proponents of the Dyer Mountain Ski Area hope to offer skiing by the 2004-05 season, on a resort that will eventually include more than 600 acres of groomed skiing area, a gondola, and six to eight high-speed detachable chair lift lines. The proposal to develop a ski area within Mt. Ashland's local market area at Alder Creek Divide, near Macdoel, California, is inactive at this time.

9. Recreation at MASA

Introduction
Of approximately 632,000 acres on the RRNF, the LRMP provides about 121,000 acres (19 percent) of Primitive and Semi-primitive dispersed recreation opportunities, of which approximately 92,000 acres are designated as Wilderness. Approximately 5,350 acres (0.08 percent) of the RRNF are allocated to Developed Recreation, of which 960 acres (0.002 percent) lie within the MASA SUP area (USDA 1990). The Analysis Area for recreation primarily focuses on the area within and adjacent to the SUP area.

The Mt. Ashland area provides diverse recreation opportunities, including developed alpine, backcountry, and Nordic skiing, climbing, snowshoeing, driving for pleasure, developed camping and picnicking, primitive experiences, hunting, hiking, horseback riding, mountain and road biking, scenery and nature observation and photography, and other activities in both developed and dispersed recreation settings.

For the sake of brevity, the term “skier” is also meant to include “snowboarder” throughout this discussion unless clarification is needed to distinguish between these different ways of sliding down a snow-covered slope. “Skier” also refers to people using other types of sliding devices such as skiboards, skate skis, and devices used by persons with disabilities (outriggers, sitzskis, etc.). The term “rider” is synonymous with snowboarder. The terms ski “run” is synonymous with ski “trail”

a. Ski Area Improvements

This Section identifies activities that have taken place within the MASA SUP area over the past few years and since the 1991 ROD was signed. These activities are noted because they may contribute to the understanding of the current condition, and the Proposed Action and alternatives being analyzed.

In addition to normal site maintenance activities, the following types of actions have been authorized since 1991. All of the projects listed below are consistent with the 1991 ROD/FEIS, were done with a goal to improve the recreational experience at Mt. Ashland, and were processed and authorized under appropriate NEPA analysis.

"**Run Widening Project**" (1993)--Removed approximately 150 commercial sized trees (by helicopter) from about nine different locations over a 1.5 acre area. Fifteen thousand board feet (MBF) was sold to MAA. Most trees were less than 18 inches DBH were left on site for erosion control and woody material needs.

"**Run Re-Contouring Project**" (1995)--Excavation, blasting, and placement of rock to side of existing ski run. Use of excavator to place rock and to smooth out run surface. Entire project area encompassed approximately 4 acres.

"**Slope Grooming Project**" (1996)--Additional re-contouring, building on the 1995 project which had proved successful for skiers; a 2.5 acre project area.

"**Run Re-contouring and Run Widening**" (1997)--Slope grooming portion of this project included rock blasting and excavator work at two ski run sites (each approximately 30 feetx 15 feet). Run widening included tree removal at two locations: Romeo (6 trees, 14" - 36" DBH) and Upper Caliban (12 trees all less than 12" DBH). Although approved, the run widening portion of this project was not completed.

"**Wastewater Treatment Facility**" (1999) involved the following components: the construction of a Sequential Batch Reactor (SBR) treatment plant located in the Knoll area, an influent line (untreated sewage) from the Base Lodge area and Rental Shop to the treatment plant (approximately 3,680 feet), a power line from the access road to the treatment plant (680 feet), an effluent (treated wastewater) line from the SBR treatment plant to the drainfield (located approximately 150 to 200 feet upslope), a pipeline (approximately 630 feet of which 375 feet are in common location to the influent pipeline) to carry treated sludge from the SBR site to a tank located near the access road, and a drainfield (approximately 1.25 acres of active drainfield within an area of 4 acres).

The Sequential Batch Reactor system is an activated sludge process (a wastewater treatment method) that concentrates naturally occurring microorganisms in the treatment system to speed up the natural removal of organic compounds found in wastewater (the essence of wastewater treatment) and gives a higher level of treatment than traditional systems. Construction of this facility was completed in the fall of 1999. This action also included the removal of approximately 400 to 500 trees (estimated at 30,000 board feet of commercial product). The trees were sold by the Forest Service to MAA through a Timber Settlement Agreement, at a predicted bid (appraised) value.

Additional minor improvements to the ski area have been made since 1991. These changes include the following items:

- The parking lot was re-paved.
- Other runs, primarily middle Dream and Avon, have received extensive summer maintenance work such as rock blasting, in order to eliminate obstacles during low snowpack periods.
- Infrastructure upgrades such as a redesigned food service area, remodeled bar and toilets, and placement of a trailer near the Rental Shop Infrastructure upgrades such as a redesigned food service area, remodeled bar and toilets, placement of a trailer near the Rental Shop and a "sea container" near the Base Lodge.
- Addition of a short portable rope tow at the base of Sonnet to aid in teaching first-time skiers and boarders.

b. Lift-Served Skiing at MASA

The 1991 FEIS considered seven action alternatives that included various combinations of expanded ski terrain. The 1991 ROD eliminated two geographic areas from future consideration, Mt. Ashland's South Side in the vicinity of the Mt. Ashland Campground, and an area on the mountain's north side where lifts had been proposed down to the 5,300-foot elevation. Both areas included novice and intermediate skiing terrain. This decision left two areas for future ski run expansion, the Knoll and Middle Fork areas, with their associated runs and ancillary facilities such as parking and guest service structures. This combination of ski runs and facilities provides the "recreation experience." MAA's current site-specific proposal includes development witin the Middle Fork and Current Facility areas.

Corrected Information: In the first sentence on page III-31 of the 1991 FEIS, reference is made to Table III-9. The reference should have been to Table III-14, Skier Ability Level by Percent. Furthermore, that table's "ideal design" percentages differ from that found on page II-52 of the 1991 FEIS. According to SE GROUP, current ideal design percentage (as expressed in acres) for the skier/snowboarder market is for beginner (2%), novice (8%), low intermediate (18%), intermediate (35%), advanced intermediate (21%), and expert (17%) respectively (see Tabel I-1). These design percentages tend to reflect broad averages exhibited by a day use area and reflect the increase in snowboard use at ski areas. Each ski area, state, or region will have different design goals and capabilities based on size and market.

The existing terrain distribution percentages in 1991 FEIS Table III-14 were inaccurate and do not reflect actual conditions, either in 1991 or 2004. Current terrain distribution by ability level is 3/9/0/11/41/37 (rounded to nearest percent). One reason for the discrepancy is that the 1991 analysis probably did not consider **access** to terrain while formulating skier ability levels. See the "Ski Runs" discussion on the following pages.

Winter sports recreation has evolved a great deal since the 1991 ROD was signed. Two of those changes include the advent of snowboarding and the development of "shaped" skis. Snowboarding was in its infancy in 1991 and now makes up close to 40 percent of the market at MASA (28 percent nation-wide). Shaped skis have a narrow waist and wide tips and tails, relative to most skis constructed prior to the 1991 ROD. This shape has dramatically shortened the learning curve for lower ability level skiers and allows people to enjoy more difficult terrain.

Since 1963, lift-served skiers have used the southeast-facing slopes of Mt. Ashland, primarily between the summit and Mt. Ashland Campground, within section 21. This use is highly variable from day to day and year to year, depending on weather and snowpack conditions. No recreation use surveys have been conducted that would provide actual use by number of visits to the southeast side by lift-served skiers. However, overall use appears to have increased since 1991 due to four factors. First, and most important, is the dramatic increase in the snowboarder population. Snowboarders tend to "ride" off of designated runs more than skiers; riders can board off track easier than skiers. Second, a succession of normal and above normal snow depths (except for the 2000-2001 season) created good ski conditions throughout most of each operating season, thereby making the southeast side more attractive for many skiers. Third, MAA began a shuttle service from the back parking lot on busy days for guests who have to park in the back parking lot. Many southeast side skiers and boarders have begun to use this service so they do not have to walk back to the Base Lodge area. The shuttle service began in the 1996-97 season (see Section D, 5 this Chapter). Finally, population growth has likely contributed to increased use.

This increased use has led to a concern for the safety of Nordic skiers and others who use the Grouse Gap Nordic Trail, and by those who park in the west parking lot. Some lift-assisted skiers enter the trail at high rate of speed while others jump the cutbank above the parking lot. In both cases, the concern is that an out-of-control lift-assisted skier might collide with other users of the trail and parking lot.

While the improvements described in Section a, above, have contributed to a more user-friendly experience, the ski area as a whole remains substantially unchanged since the ROD was signed in July 1991. The ski area is still known for its steep and short ski runs. On many weekends, the area has long food and rental shop lines, a crowded lodge, long waiting lines for the bathroom facilities (especially for women), a tightly packed and overflowing parking lot, overcrowding on some slopes, and lack of guest services in the western portion of the ski area. On peak days, visitation in the 1,000-1,500 PAOT range regularly results in overcrowding in some, if not all, areas of the facility. All of these factors detract from a quality recreation experience for most users.

In addition, the Ski Patrol base station, located under the Rental Shop, cannot adequately provide for the necessary functions of injured guests, patrollers, emergency personnel, witnesses, and family members. Potential biohazard contamination is a risk, patient privacy is minimal, and trauma management is sometimes difficult. The 600 square foot space contains two first aid beds, first aid equipment and supplies, search and rescue cache, reference material, risk management documentation files, a restroom, and personal items for up to 45 patrol members (paid and volunteer). The base station is substantially the same as it was in the early 1980s.

Ski Runs

Four chairlifts serve approximately 125 acres of designated ski runs, which is a 34-acre difference from the 88-90 acres stated in the 1991 FEIS. This discrepancy is explained by the following factors. The primary factor is the use of Geographic Information Systems (GIS) that allow for more precise mapping. Another factor is the run widening project mentioned above (approximately 1.5 acres) and the inclusion of Rodger's Way, Dan's, and Upper West Ridge trails (approximately 7 acres) in run calculations (which were not included in the 1991 figures). Chapter II of this Final EIS contains a listing of existing named runs used for this analysis.

As stated in the 1991 FEIS, the current ski area "is known by skiers for its advanced skiing terrain." Over 75 percent of the existing ski runs are rated as either Advanced Intermediate or Expert. This is an extremely high percentage and is due in part to easier terrain being inaccessible. For example, to reach the Intermediate terrain on Lower Dream and Low Intermediate/Novice terrain on Lower Caliban, a skier must first negotiate the upper Intermediate terrain of Upper Dream; this is why the Caliban Run is rated as Intermediate on the MAA "Trail Map." Conversely, relatively easy terrain may be accessible, but there is no easy way out. The upper part of Circe is on five to 25 percent slopes, but the only way out has a 45 percent slope. Defining **ability levels** on ski runs incorporates a number of factors:

> **Steepness of slope**--Steeper slopes are generally more difficult than more gentle slopes. Steepness of slopes is commonly expressed in percent. Vertical drop or rise is divided by horizontal distance to determine slope percent. For example, a 20 foot drop over 80 horizontal feet would equal a 25% slope. Short pitches can sometimes exceed maximum percentages within a run classification, if those pitches are not excessive or numerous on a particular run or route. Ski industry standards for this factor are shown in Table III-39. Slope angles for all existing and proposed runs were measured by Forest Service personnel using a clinometer (a slope measuring device).

Table III-39. Standards for Ski Run Classification

Ability Level	Slope Gradient (percent)
Beginner	8 to 12
Novice	to 25 (short pitches of 30)
Low Intermediate	to 30 (short pitches of 35)
Intermediate	to 40 (short pitches of 45)
Advanced Intermediate	to 50 (short pitches of 55)
Expert	over 50 (maximum of 80)

Source: SE GROUP

Ability level ratings for existing and proposed ski trails are listed in Chapter II, Table II-16 of this Final EIS.

Access--A lower level ability skier cannot safely access easy terrain if the route to that terrain includes upper level terrain. For instance, an intermediate skier who wanted to ski Lower Tempest from the top of Ariel Chairlift, would have to ski Upper Tempest's expert terrain.

Width of slope--A wide slope is easier to ski than a narrow slope. The essence of skiing is the ability to turn the skis. A weaker skier will have a more difficult time turning than does the more advanced skier. If the amount of turning is lessened through wider terrain, then the less accomplished skier will have an easier time on a wide slope as opposed to a narrow slope.

Snow grooming--Modern grooming techniques smooth, manipulate and compact the snow surface and make terrain easier to ski. Non-groomed slopes may have moguls (bumps in the terrain), ice or very hard packed snow, and fresh unpacked snow, all of which are more difficult for the less accomplished skier.

Fall line--Fall line skiing refers to down slope direction, the way a marble would roll down a table if one end is uplifted, as opposed to cross slope skiing. It is easier to ski the fall line than it is to ski the cross slope. Good ski run layout takes advantage of natural fall line slopes to the extent possible or creates fall lines through snow and/or ground manipulation.

Psychology--This refers to how safe or secure a skier feels while on the slopes. Exposure to drop-offs, such as the steep glacial cirque adjacent to Upper Dream, is very disconcerting to some skiers. An anxious skier learns slowly and sometimes gives up the sport. A skier with a high comfort level learns more quickly.

Trail Density--Crowded slopes are generally more difficult than less crowded slopes. Some feel intimidated by faster skiers and by their inability to confidently avoid others (or be avoided by others). Lower skier densities provide "elbow room" within the comfort zone of each skier ability level. Comfort zones for skiers will vary from person to person based on their ability, the terrain, and their speed (Cahill and Larson, 2002).

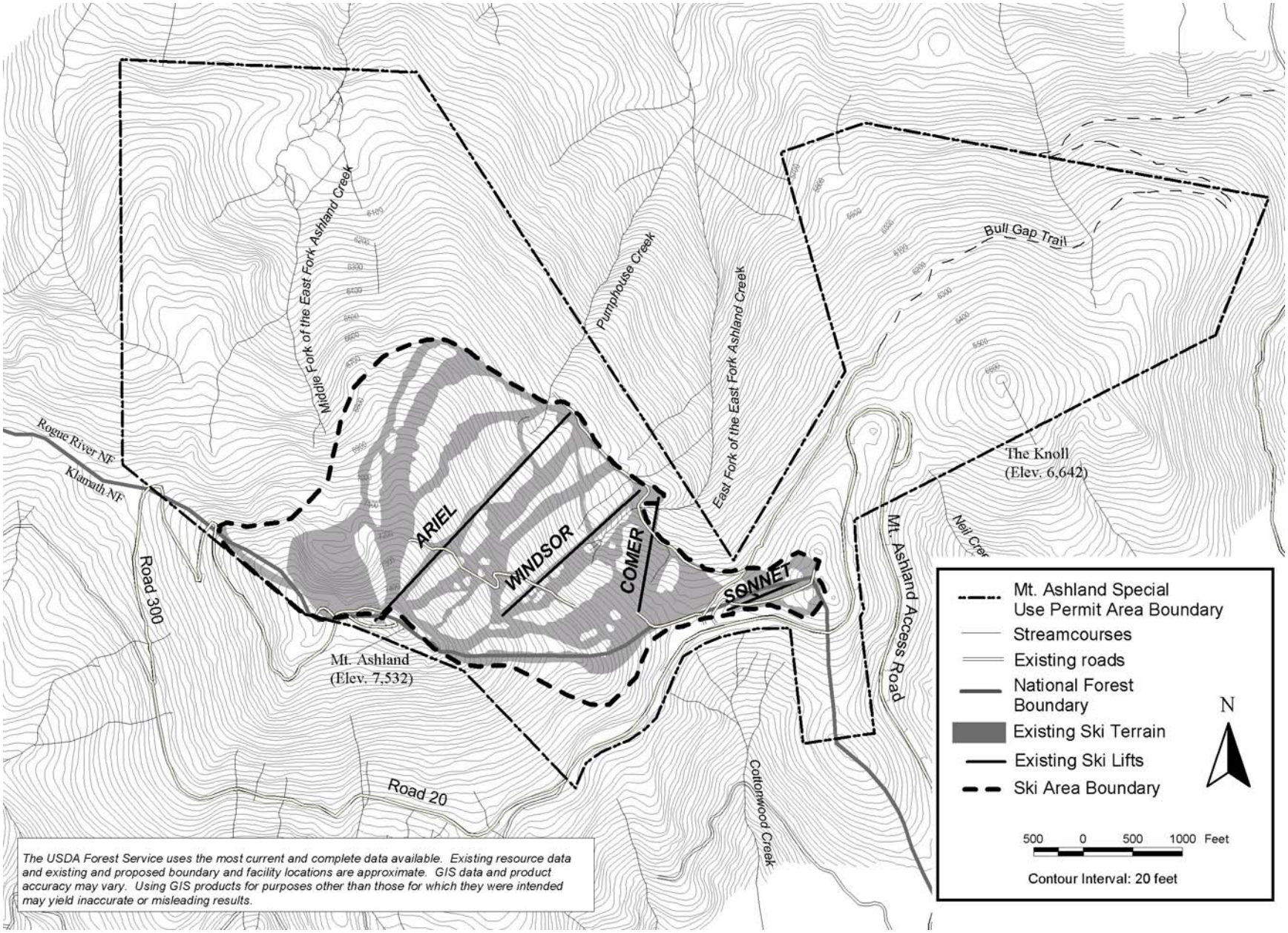
Relationship to other trails within the Ski Area--At each ski area, trail ratings are relative to other trails within the same ski area. An "advanced" trail in the Midwest may be an intermediate trail at a Rocky Mountain area. At Mt. Ashland, the Sonnet Run is rated beginner primarily because it is the easiest trail on the mountain. Sonnet's 19-20% slope exceeds what is commonly described as Beginner terrain.

Ski Area Boundary

The ski area boundary at MASA includes all terrain that can be accessed from a ski lift where the skier can return to a lift via gravity (without hiking). It does not include most of Mt. Ashland's south side or areas that are permanently closed by the Ski Patrol. It does include all designated runs, the 2nd Bowl, and forested areas between runs. Tree skiing is most popular at Mt. Ashland on "powder days" after fresh snow has fallen. Some of the more popular areas for tree skiing include the west side of Caliban and the areas between Ariel and Pistol and between Windsor and Winter. Dense tree stands in some areas prevent skiers and riders from taking full advantage of the tree skiing areas at MASA. The current ski area boundary is approximately 238 acres and is portrayed on Map III-13.

Ski area boundaries are open or closed. An open boundary allows access to backcountry terrain. The user may or may not return to the ski area. A closed boundary prohibits lift-assisted skiers from leaving the ski area due to safety concerns such as avalanche hazard or where topography makes it difficult for the skier to return to the developed ski area. MASA has an open boundary policy for the south side of Mt. Ashland except for occasional closures from the top of Ariel during "whiteout" conditions. Access to the south side via Windsor is always open (except for night skiing). The remainder of the area has a closed boundary policy except where the Bull Gap Nordic Trail leaves the ski area below the Poma Run (pers. com. MAA 2000). Despite that policy, some skiers and boarders ignore the signing and boundary rope. Some are able to climb out while others continue downslope and become lost. On average, approximately two to three formalized search and rescue efforts take place in the East Fork area each ski season. Fortunately, no one has perished as a result of violating the policy, although a number of victims were found to be suffering from mild to severe cases of hypothermia.

MAP III-13. Current Ski Area Boundary at MASA



10. Recreation, Excluding Lift-Served Skiing

Other recreational activities take place within the ski area prior to opening in late fall, and after closing in the spring. These pursuits include snowmobiling, sledding, snowplaying, Nordic skiing, snowboarding, hiking, picnicking, sightseeing, mountain biking, and participating in special events. Until 2003, snowmobiles were allowed on Rodger's Way, Dream, Caliban, Bowl, and Circe ski runs after the area closes in the spring (Snowmobiling is now prohibited on a permanent basis at MASA, except for that associated with ski area operations or authorized by permit, e.g., NWS and KTVL TV). Sledding and snowplay take place near the main parking lot prior to opening and after closing. Nordic skiers and snowboarders use the entire ski area and are often found in the Bowl until the snow melts in mid summer.

When the snow is gone, hikers are seen on the ski slopes throughout most of the summer months. Picnickers and sightseers are often out-of-town visitors, taking a drive before attending a Shakespeare Festival play in Ashland. Mountain bikers are prohibited on the ski slopes, but are seen on a near daily basis on the Bull Gap Mountain Bike trail, which passes below the Base Lodge. This is the first leg of a quick descent to the City of Ashland. Special events that originate or pass through the ski area include mountain bike and foot races, weddings, and family reunions.

a. Snow Tubing Facilities

Snow tubing facilities do not currently exist at MASA. There are no other lift-served tubing facilities in Jackson County. The closest lift-served facility is at Diamond Lake in Douglas County. The closest developed tubing facility is located at Diamond lake Resort on the Umpqua National Forest, approximately 80 miles northeast of Medford. Most snow tubing facilities are associated with developed ski areas although a few, including Diamond Lake, are independent of any ski area development. New facilities have been constructed at Willamette Pass southeast of Eugene, Mt. Bachelor, and Hoodoo Ski Area within the last five years. At Willamette Pass and the Summit at Snoqualmie east of Seattle, Washington, new lanes are being added because demand has exceeded capacity (pers. com. Granger 2002).

A number of new facilities have also been constructed in California (the latest in Yosemite National Park at the Badger Pass Ski Area). Nation-wide, snow tubing is one of the fastest growing winter activities (Gatlin 1993, Heck 1997, Schultz 1997, and Kreitman 2001). Eighty nine percent of all snow tubing facilities associated with ski areas have been developed since the 1996/97 season (NSAA 2002).

Eight ski areas in the Pacific Northwest have constructed new tubing facilities in recent years: Willamette Pass, Mount Bachelor, Cooper Spur, Hoodoo, Mt Hood Skibowl and Summit in Oregon, and Summit at Snoqualmie and Stevens Pass in Washington. Table III-40 displays tubing visits at three of these resorts.

Table III-40. Pacific Northwest Tubing Facility Visits

Year	Summit at Snoqualmie	Mt. Bachelor	Willamette Pass
2002/03	35,019	20,092	5,045
2003/04	56,286	17,546	5,000

Willamette Pass opened in 2000, Mt. Bachelor in 2001, and Summit at Snoqualmie in 2002.
Source: SE Group and Deschutes National Forest

Snow tubing is generally considered a family activity that requires no special equipment other than warm winter clothing. Typical tubing slopes consist of groomed "lanes" with sidewalls that prevent the tube from entering other lanes or from going entirely off the slope. Generally, the lanes are constructed in a straight line down the slope although some facilities include jumps, moguls, and turns. A critical design factor for all tubing facilities is that the runout zone needs to be flat or with a slight uphill gradient at the end, so that tubers can safely stop.

b. Recreation in the Mt. Ashland Vicinity

A number of winter and summer recreation activities take place within two to three miles of Mt. Ashland, the highest point in Oregon west of the Cascade Mountains. One of the main attractions on a year-round basis is the near 360-degree view. On a clear day, 13 Wilderness areas, ten National Forests, nine counties, twon National Monuments, and one National Park are visible from Mt. Ashland's summit. The views include three distinct geographic provinces: the young volcanic peaks of the Cascades, the ancient and rugged Klamath Mountains, and the mostly arid Great Basin (USDA FS 1994b). These views are a highly valued aspect of most recreation activities in the area.

Winter Use

In winter, the prime attraction is Nordic skiing in all its forms including the traditional "kick and glide," telemark, and skating[17]. Most skiers begin at Mt. Ashland's west parking lot and follow snow-covered Forest Road 20. The first mile of Forest Road 20 is regularly groomed by MAA and serves as a "catch line" for downhill skiers (first one third mile), the initial section of the Grouse Gap Nordic Ski Trail, and as a snowcat route to Mt. Ashland's summit for other permitees, primarily the National Weather Service and KTVL-TV. A far lower number of skiers use the Bull Gap Nordic Trail. This trail has two trailheads, one located at MASA's main parking lot, and the other located on the Mt. Ashland Access Road, approximately 1-1/2 mile east of the ski area.

[17] Nordic skiing is generally defined as traditional cross-country skiing and skate skiing over flat to moderate terrain and trails, and includes developed groomed trail networks, as well as backcountry touring (i. e., off groomed trails). Nordic skiing differs from the definition of *backcountry skiing*, which is defined here generally as ski mountaineering, wherein the focus is climbing steeper slopes and mountains (typically with skis and skins) with the intent of skiing or snowboarding down challenging ungroomed and undeveloped slopes. In contrast to hike-to backcountry skiing, *lift-served backcountry skiing* utilizes lifts to attain much or all or the necessary elevation gain to access challenging ungroomed and undeveloped slopes

In 1991, on Mt. Ashland's south side in the Road 20 area, the predominant use was by "kick and glide" skiers. That is still true today, but their numbers appear to have not increased since 1991. Conversely, backcountry telemark skiing has increased rather substantially. The entire Siskiyou Crest area from Mt. Ashland west to McDonald and Siskiyou Peaks is skied most every weekend, and on an irregular basis on weekdays.

"Skating" is a somewhat specialized form of Nordic skiing and almost always requires a groomed track (generally only found at Nordic resorts or groomed snowmobile trails). Skating use is low compared to other forms of Nordic skiing.

The south side also receives use by sledders (although the terrain is not conducive due to unsafe runout zones), snowshoers, and hikers (when the snow is firm). In addition, snowboarders are increasingly seen in the area performing inverted aerial maneuvers that are not allowed within the current ski area. These snowboarders have generally not bought a lift ticket. This conglomeration of uses generally takes place within one half mile of the west parking lot and is disconcerting to some Nordic skiers who are looking for a more "pristine" experience. As mentioned in the "Lift-Served Skiing" section above, all of these uses are mixed in with skiers accessing the area from Windsor and Ariel Chairlifts. Areas further to the west toward Grouse Gap Shelter and McDonald Peak are used almost exclusively by Nordic skiers.

Snowmobiling is prohibited on the entire south slope of the Crest from Mt. Ashland to Siskiyou Peak and on the north side of the Crest from Mt. Ashland to the Willamette Meridian. Private landowners on the south side are allowed snowmobile access to their property via the Grouse Creek Nordic Trail (KNF Road 40S15).

Total winter visits to the Mt. Ashland vicinity, excluding downhill skiers, are not precisely known. Based on vehicle counts taken at the west parking lot from 1988-1990, it was estimated that up to 7,400 visits were made to the area over a long (abundant snowfall) winter season and as few as 2,500 in a short (drought) winter season. Since the community purchase of MASA, snowpacks have been near or above average except for the 2000-2001 drought year. Based on personal observations by Forest Service employees, the general public, and MAA vehicle counts, it is estimated that 6,500 to 7,000 visits occur annually during the winter season in the Mt. Ashland vicinity.

Summer Use

In summer, primary recreation activities include sightseeing, hiking/backpacking, mountain biking, and viewing wildflowers and other plants. As previously mentioned, the area provides outstanding vistas from many locations. Many visitors drive only as far as the ski area parking lot, get out of their car for a "stretch," take a few photos, and then return to Ashland or other Rogue Valley locations. Others spend part of a day hiking and viewing wildflowers along the Pacific Crest National Scenic Trail (PCNST) between Grouse Gap and the Mt. Ashland Access Road. The moist and dry meadows along the trail (and Forest Road 20) provide a changing wildflower display throughout the summer. Mountain bike use (prohibited on the PCNST) in the area has increased substantially since 1991. Popular routes include the aforementioned Bull Gap Mountain Bike Trail and Forest Road 20, and many of its side routes. Illegal mountain bike and four-wheel-drive use in the area is increasing along with concurrent damage to botanical resources.

As mentioned in 1991, other attractions in the area include the Mt. Ashland Campground (camping and picnicking), Grouse Gap Shelter (picnicking and weddings), and as a starting or ending point for the drive along the Siskiyou Crest between Dutchman Peak and Mt. Ashland (described in the Forest Service pamphlet, "Siskiyou Loop Auto Tour"). Long distance backpackers also make use of the area, especially those who are hiking the PCNST in its entirety from Mexico to Canada, or those choosing shorter segments of the trail.

Total summer visits are also not precisely known, but have substantially increased since 1991. A vehicle counter, located slightly west of the Mt. Ashland Campground on Forest Road 20, recorded an average of 81 vehicles per day in 1994, compared to 45 vehicles in 1990. At 2.3 persons per vehicle over a 150 day summer season (June through October), total visitor use beyond the ski area is estimated at around 28,000 persons. This figure does not include summer use that terminates at the ski area or other locations east of the campground.

11. Noise

Noise sources at MASA include construction and maintenance activities, equipment operation, vehicular traffic, explosives used for avalanche control, and human users of facilities. Noise from these sources is generally not heard outside the ski area except for the explosive use. Noise measurements have not been taken within the SUP area. Noise sources that originate outside of the SUP area include aircraft, trains, and Interstate 5 vehicular traffic; the latter two on rare occasions can be heard from within the ski area when atmospheric conditions are favorable.

During the winter operating season, noise level remains near background except in the Base Lodge, Rental Shop, and parking lot. Ski lifts at MASA are powered by electric motors and produce low noise levels, as does the movement of the cables on the lifts. Occasionally, the background noise is interrupted by the passing of snow groomers and/or snowmobiles used for administration and maintenance activities or by State-operated snow plows in the parking lot.

During the summer months, noise levels are also near background except for certain types of maintenance and construction activities, which require heavy equipment use. This noise is specific to a particular project location and equipment type. For example, backhoe work by the Rental Shop cannot be heard in most other parts of the ski area.

Power outages occur a few times a year at Mt. Ashland, usually during thunderstorms or a major winter storm. In this case, the National Weather Service, KTVL-TV, and MAA use generators to temporarily power their facilities. Generator use, although infrequent, is the largest single source of noise at the ski area (other than explosive use). The SUP area is generally very quiet except for aircraft noise, an occasional rifle shot during the fall deer-hunting season, the infrequent sounds of hikers in summer, backcountry Nordic skiers in winter, and the sounds of alpine skiers talking on the Rodger's Way, Caliban, Circe, and West Ridge ski runs.

12. Economic Conditions

Jackson County is the focus of this socioeconomic assessment as it would experience the majority of the economic and social impacts associated with developing or not developing the proposed ski area improvements. However, given the regional economic forces and recreation trends in this area, some socioeconomic effects would extend beyond this Analysis Area. Jackson County is linked to several larger functional economic units by a variety of economic activities, relationships between industries, and commuting patterns.

a. Economic Structure

Historically, Jackson County's primary industries have been the trade (wholesale and retail), government and manufacturing sectors. Traditionally, the wood products sector accounted for a large percentage of the manufacturing sector, in 1979, contributing about 12% of all non-farm employment, 65% of all manufacturing employment, and 80% of durable goods manufacturing. However, since 1980, the importance of the wood products sector in Jackson County has decreased substantially to only 44% of all manufacturing employment in 2000, and 51% of durable goods manufacturing in 2001. Employment in this sector of the economy is expected to continue to decline during the next decade.

Manufacturing also has declined in overall importance from 17.4% of total employment in 1979 to 12.5% in 2000, although the percentage of non-wood products manufacturing jobs has remained relatively constant with new jobs created in printing and publishing, electronic and other high tech equipment and fabricated metals and machinery. While the wood products and manufacturing sectors have declined, other sectors of the economy have increased in importance, particularly the services and trade sectors. Employment in the service sector grew from 20% of total employment in 1979, to 31% in 2001. This includes a substantial number of new jobs that have been created in the health care industry. The construction industry also grew during the 1990s.

Construction jobs increased absolutely and as a percentage of total non-farm employment. Although the total number of government jobs increased during the last two decades, the relative percentage of jobs in the government sector decreased from 17% in 1979, to 11% in 2000. The agricultural sector has played a relatively stable, though decreasing role in the County's economy. In 1979, it accounted for 7.4% of total employment. In 2000, it represented approximately 4% of total county jobs.

Recreation and tourism are also important contributors to Jackson County's economy, particularly in the Ashland area, where the annual Shakespearean Festival brings over 100,000 visitors to the area every year. These visitors support a strong hospitality industry in and around the City of Ashland. Southern Oregon University also is an important component of Ashland's economy, with approximately 5,465 undergraduate and graduate students, 310 faculty, 295 administrative and classified staff, 15 to 30 temporary employees, and 113 student employees. These employment figures are expressed in terms of FTEs, or full-time equivalencies.

In addition to the Oregon Shakespeare Festival, natural amenities within and adjacent to the County draw other visitors to Jackson County. They include the Rogue River-Siskiyou, the Winema, and Klamath National Forests, Mt. Ashland Ski Area, Valley of the Rogue and other State Parks, and Crater Lake National Park in adjacent Klamath County.

The Mt. Ashland Ski Area is an important contributor to the County's recreational tourist economy. The ski area (MAA) currently employs 199 full and part time employees (the equivalent of 51 full-time employees in 2001/02). Employment at Mt. Ashland results in direct income to County residents of approximately $1 million and an additional approximately $500,000 - 700,000 in indirect income. In addition, through payments to the Forest Service, the MASA contributes approximately $6,500 - $7,000 per year to Jackson County (25% of payments to the Forest Service are distributed to Jackson County).

Although most skiers at Mt. Ashland are day visitors from Jackson or adjacent counties, approximately 15% are destination visitors (NSAA and RCC Associates 2002). These and other winter visitors play an important role in stabilizing hotel occupancy rates and other tourist-related businesses that plan for peak visitation during the summer months when attendance at the Shakespearean Festival is at its height. They also help contribute to the County and City transient lodging tax receipts.

b. Employment

As noted above, Jackson County has gone through a significant economic restructuring during the last two decades. The relative importance of manufacturing, particularly in the wood products industry, has declined while construction and services have increased in significance. During this same period, total employment in Jackson County has increased in nearly all sectors. Between 1979 and 2000, there was an average annual increase of 69 manufacturing jobs and 2,057 non-manufacturing jobs. This represents an average annual percentage increases of 1% and 3% respectively. In comparison, over the same time period, an average of 991 jobs were added in the service sector each year, for a 5% average annual increase.

Employment for Jackson County by sector is summarized in Table III-41. This table illustrates the shifts in economic structure and overall increase in employment.

Table III-41. Wage and Salary Employment in Jackson County, Oregon, 1979, 1990, 2000

Employment Sector	1979		1990		2000		Percent Change
	Jobs	Percent	Jobs	Percent	Jobs	Percent	1979-2000
Total Employment	59,089	100%	76,513	100%	103,734	100%	76%
Farm Employment	2,602	4%	3,074	4%	2,526	2%	-3%
Non-Farm Employment	56,487	96%	73,439	96%	101,208	98%	79%
Private Employment	46,643	79%	63,290	83%	89,673	86%	92%
Agriculture, forestry, fishing	924	2%	1,004	1%	2,208	2%	139%
Mining	101	0%	173	0%	275	0%	172%
Construction	3,412	6%	4,055	5%	6,651	6%	95%
Manufacturing	8,830	15%	9,995	13%	10,280	10%	16%
Transportation & public utilities	2,658	4%	3,670	5%	4,785	5%	80%
Wholesale trade	2,645	4%	2,849	4%	2,930	3%	11%
Retail trade	11,814	20%	16,348	21%	22,533	22%	91%
Finance, insurance, and real estate	4,553	8%	4,618	6%	7,498	7%	65%
Services	11,706	20%	20,578	27%	32,513	31%	178%
Government	9,844	17%	10,149	13%	11,535	11%	17%

Source: U.S. Bureau of Economic Analysis, Cogan Owens Cogan

Table III-42 shows employment in Jackson County and the City of Ashland in relation to statewide employment. The City of Ashland's economy is heavily dominated by service sector jobs (47.8%), with a smaller relative share of employment in nearly all other sectors compared to the County and the State. This is due in large part to the substantial number of employees in the education service sector in the City, as well as in the health, entertainment, recreation and personal service sectors.

Table III-42. Wage and Salary Employment by Major Sector, Jackson County/City of Ashland, OR

Employment Sector	Jackson Co. Employment	% of Total Employment	Ashland City Employment *	% of Total Employment	Oregon Employment as a % of Total Employment
Approx. Total Payroll Employment	78,239		7,789		
Est. Farm Employment	4,929	6.3%	267	3.4%	7.5%
Total Non-Farm Payroll	73,310	93.7%	7,522	96.6%	92.5%
Manufacturing Total	8,770	11.2%	575	7.4%	13.1%
Durable Goods Total	7,100	9.1%	363	4.7%	9.6%
Lumber and Wood Products	3,760	4.8%	---		2.9%
Other Durable Goods	3,340	4.3%			6.6%
Non-durable goods	1,670	2.1%	182	2.3%	3.6%
Food Products	530	0.7%	---		1.3%
Other Non-durable goods	1,140	1.5%	---		2.3%
Non-manufacturing total	64,540	82.5%	6,947	89.2%	79.3%
Construction & mining	3,770	4.8%	401	5.1%	5.9%
Trans., Comm., Utilities	3,520	4.5%	322	4.1%	4.5%
Trade	22,680	29.0%	1,856	23.8%	22.7%
Finance & Real Estate	3,190	4.1%	363	4.7%	6.6%
Services	20,130	25.7%	3,725	47.8%	29.4%
Government	11,250	14.4%	280	3.6%	12.6%

Source: U.S. Bureau of Economic Analysis 2000; City of Ashland data from 1998

Jackson County's largest employers include two fruit companies-- Bear Creek Corporation/Harry & David (3,500 employees) and Naumes, Inc. (800)-- and three wood products manufacturers: Boise Cascade (800); Medford Corporation (800); and Timber Products Company (750). As mentioned above, service sector employment accounts for nearly 50% of employment in the City. In addition to the health service and education service sectors, miscellaneous business services, hotels, real estate, car repair and businesses account for a large number of service sector jobs. As noted above, Mt. Ashland's full- and part-time employees represent approximately 0.7% of Jackson County service sector employment and 3.8% of the City of Ashland's service sector jobs.

Future employment growth in Jackson County can be expected to occur in the service sectors, including tourism and recreation related jobs, with potential for continued growth in the high tech industry that has been targeted as a growth sector. The Oregon Office of Economic Analysis has published projections for total employment growth in Jackson and Josephine Counties (Region VIII). Non-farm employment is projected to increase from 96,090 in 2000, to 112,200 in 2010, an increase of 16.8%. This represents an average annual growth rate of approximately 1.2%.

c. Income

Table III-43. Personal and Per Capita Income and Poverty

Year	Per Capita Income					
	Oregon			Jackson County		
	Income	Income in 1990 dollars	Percent Change	Income	Income in 1990 dollars	Percent Change
1990	$18,242	$18,242	---	$16,740	$16,740	---
1991	$18,744	$17,987	-1.4%	$17,307	$16,608	-0.8%
1992	$19,441	$18,111	0.7%	$$17,956	$16,727	0.7%
1993	$20,232	$18,300	1.0%	$18,624	$16,845	0.7%
1994	$21,187	$18,685	2.1%	$19,776	$$17,441	3.5%
1995	$22,362	$19,178	2.6%	$20,407	$17,501	0.3%
1996	$23,270	$19,384	1.1%	$20,988	$17,483	-0.1%
1997	$24,385	$19,857	2.4%	$21,670	$17,647	0.9%
1998	$25,446	$20,404	2.8%	$22,670	$18,178	3.0%
1999	$26,261	$20,602	1.0%	$23,687	$18,583	2.2%
2000	$27,660	$20,944	1.9%	$24,563	$18,643	0.3%
Total Percent Change			15.1%			11.4%

Source: U.S. Bureau of Economic Analysis

Total personal income in Jackson County in 2000 was approximately $4.47 billion, an increase of 52% since 1990 ($2.47 billion) after adjusting for inflation. Per capita income grew from $16,740 in 1990 to $19,498 in 2000, before adjusting for inflation. After adjusting for inflation per capita income grew by 37% during this period, to $3.39 billion in 1990 dollars. Table III-48 illustrates the increase in per capita income for Jackson County and Oregon between 1990 and 2000. Per capita income rose in all but two years for the County, and in all but one year for the State. Per capita income (in 1990 dollars) for the County lagged behind that for Oregon for the entire period, and increased slower in the County than in the State. In 1990, County per capita income was 91.8% of average statewide per capita income. This ratio reached a high of 92.4% in 1992, then fell the to 88.8% in 2000, the lowest figure for the entire decade.

Table III-44 summarizes the change in total income by major source for Jackson County between 1990 and 2000. Net earnings are the number one source of personal income in Jackson County, accounting for 58% of the total in 2000, compared to 66% of the total for the State. Since 1990, the proportion of transfer payments as a percentage of total income has increased from 15.2% to 16.4% in 2000. During this same period, the statewide proportion increased from 12.9% to 13.3%, reaching a peak of 14.4% in 1993. Much of the relative increase in transfer payments in Jackson County can be attributed to increases associated with retirement and disability benefits, and medical payments. This is consistent with a rise in the average age of residents in Jackson County.

Table III-44. Personal Income by Major Source for Jackson County, 1990 - 2000

Year	Personal Income by Major Source (in $1,000s)						
	Net Earnings		Dividends, Interest, Rent		Transfer Payments[1]		Total Income
	Total income	% of total	Total income	% of total	Total income	% of total	
1990	$1,452,209	58.9%	$639,171	25.9%	$375,951	15.2%	$2,467,331
1991	$1,496,398	57.3%	$690,310	26.4%	$425,924	16.3%	$2,612,632
1992	$1,622,353	58.3%	$695,118	25.0%	$465,255	16.7%	$2,782,726
1993	$1,747,079	59.0%	$715,583	24.2%	$499,605	16.9%	$2,962,267
1994	$1,906,596	59.0%	$793,569	24.5%	$533,789	16.5%	$3,233,954
1995	$1,934,254	56.6%	$898,999	26.3%	$582,404	17.1%	$3,415,657
1996	$2,024,326	56.5%	$946,584	26.4%	$612,026	17.1%	$3,582,936
1997	$2,110,053	56.1%	$1,019,465	27.1%	$630,750	16.8%	$3,760,268
1998	$2,250,149	56.2%	$1,083,424	27.1%	$670,946	16.8%	$4,004,519
1999	$2,449,045	57.7%	$1,087,686	25.6%	$709,452	16.7%	$4,246,183
2000	$2,602,620	58.3%	$1,132,112	25.3%	$732,981	16.4%	$4,467,713

(1) Transfer payments primarily include government payments such as unemployment and state worker's compensation, social security, public assistance, veterans benefits, etc. Source: U.S. Bureau of Economic Analysis

In 2000, approximately 12.5% of County residents had incomes below the poverty level, in comparison to a poverty rate of 11.6% in the State of Oregon. The percentage of residents in the City of Ashland below the poverty level in 1999 was 19.6%. This represented an increase since 1990, when the County, State and City poverty rates were 12.9%, 12.1%, and 16.3%, respectively. Based on historical census data, members of minority groups are much more likely to live below the poverty line than whites, in Jackson County.

Earnings by Industry

In 2000, in Jackson County, the manufacturing sector accounted for 14.8% of total earnings and 9.9% of total employment. Conversely, the service sector comprised 26.4% of total earnings and 31.3% of total employment. Earnings in retail trade were 16.2% of the total, while employment was 21.7% of the total. This indicates the relative difference in wages between these sectors, i. e., higher than average wages in the manufacturing sector and lower than average wages in the service and retail trade sectors.

Gross revenues and increase in net assets for the Mt. Ashland Ski Area were $2,103,083 and $-498,104 in 2001/02. Between 1994 and 2002, gross revenues have fluctuated between $1.9 million and $2.5 million. During this same period, increases in net assets (revenues minus expenses) have fluctuated from $-541,793 (in 2001) to $571,865 (in 1995).

d. Public Fiscal Resources

Jackson County revenues from the adopted 2002/2003 budget total $239,741,272. State and local governments account for $54.4 million, or 22.7% of the total. Over 50% of these funds support the Health and Human Services Department. Federal government revenue accounts for 11.5% of total county revenues, most of which comes from Oregon and California (O&C) Railroad land timber revenues. Fees, licenses, and sales made up 14.29% of the total. The majority of the expected revenue falls into the category of "Other," which accounts for $123,561,693, or 51.5% of the budget.

Federal revenues also include payments from three National Forests--the Rogue River, Klamath and Umpqua. Payments from these forests are summarized in Table III-50. In 2000, Congress passed the Secure Rural Schools and Community Self-Determination Act (Public Law 106-393). This law changed the method in which National Forest payments are made to counties. Eligible counties had different options for receiving those payments. In 2001, the first year of the Act's implementation, Jackson County elected to receive their share of the average of the three highest payments made during the fiscal years 1986-1999, otherwise known as the "full payment amount." This accounts for the large increase in payment to Jackson County from the Klamath National Forest in 2001.

Table III-45. National Forest Payments to Jackson County, 1996 - 1998

Year	Rogue River National Forest	Klamath National Forest	Umpqua National Forest
1996	$4,045,573.85	$59,919.23	$123,184.45
1997	$3,907,847.33	$57,637.03	$118,717.18
1998	$3,753,589.24	$55,361.89	$114,030.97
1999	$3,600,778.21	$53,114.68	$109,344.77
2000	$3,446,441.01	$50,831.81	$104,658.57
2001	$5,540,056.00	$369,113.00	$110,887.00

Source: Ashland Ranger District

The City of Ashland owns the ski area facilities and holds the Federal Special Use Permit; the City leases the ski area to the Mt. Ashland Association for $1.00 per year. As a non-profit 501(c)(3) entity, the Mt. Ashland Association does not pay State or local property taxes. However, an annual fee is paid to the Forest Service for use of the National Forest System land on which the ski area operates. The fee for the years 1991-1998 was approximately 3% of the ski area's total gross sales, or approximately $50 - 55,000 per year, except for 1996, when $80,925 was collected. Per Federal policy, the fee was dropped to 1.5% of the total gross sales for fiscal year 2000 and beyond[18]. Since this time the ski association's payments to the Forest Service have averaged approximately $32,000.

The City of Ashland charges a transient lodging tax rate of 7% for hotels, motels and bed-and-breakfast establishments. Transient lodging taxes collected in 2001/2002 totaled $1.2 million. Destination visitors to Mt. Ashland are estimated to contribute a relatively small portion of these revenues. Assuming that 12% of the area's visitors come from more than two hours away and approximately one-third to one-half of these stay overnight in the Ashland area, paying an average rate of $80 per night, they would contribute from $20,000 to $30,000 in transient lodging tax revenues, (approximately 1.7 – 2.4% of the total). These estimates are very approximate, given that no detailed surveys of overnight lodging have been completed and accurate data on average room rates are not available. However, they provide an order-of-magnitude estimate of MASA's contribution to this source of revenues.

In addition, there is a 5% prepared food and beverage tax at restaurants, bakeries and delis in Ashland that helps fund open space acquisition and wastewater treatment upgrades in the city of Ashland. This tax will expire in December 2010 if not renewed. Current revenues estimates from this source are not available at this time.

[18] Section 701(i) of the Omnibus Parks and Public Lands Management Act of 1996 (16 USC 479c) mandated a change to the 1.5% rate for ski areas within the income bracket of MASA.

This page left intentionally blank.