

3.10 Air Resources

3.10.1 Overview

Regulations from the CEQ direct agencies to insure the professional and scientific integrity of environmental analyses in an EIS. This direction includes using the best available science to describe existing conditions in the Project Area; in this case, the UNF. Published, peer reviewed studies are used when applicable to conditions in the UNF; however, in most cases only those studies that are relevant to identifying potential impacts from the proposed action (in Chapter 4) are considered. These studies are cited in the text. The most relevant literature for most resources in Chapter 3 comes from internal Forest Service publications and reports, because this information is based on UNF-specific investigations and assessments. Throughout Chapter 3, the UNF Land and Resource Management Plan (USFS 2003) and associated EIS (USFS 2003a) are the most frequently cited documents. These documents were not peer reviewed within the scientific community, but were written using best available science, open to public comment as dictated by the NEPA process, and revised accordingly by resource specialists.

Air Quality

Air quality within the UNF is generally considered to be good to excellent. However the surrounding urban areas have known air quality issues. Because of the direction of prevailing winds in the region, air quality of adjacent urban areas that are located to the west and north of the UNF may impact the air quality of the UNF. Some of these urban areas are currently designated by the EPA as non-attainment areas for certain air pollutants and there are portions of the UNF that lie within these areas. Maintenance areas are also found near the UNF. Non-attainment and maintenance areas near or within the UNF are shown in figure 3.25: Air Resources Map and are summarized below:

- Utah County Non-Attainment Area (Particulates [PM10], general sources of particulates include burning of wood, diesel and other fuels; industrial plants; agriculture [plowing, burning off fields]; and unpaved roads)
- Provo/Orem Maintenance Area (Carbon Monoxide, general sources of carbon monoxide include burning of gasoline, natural gas, coal, oil etc.)

Air quality in these areas is improving as evidenced by the Provo/Orem non-attainment area being redesignated as a maintenance area. The Utah County non-attainment area is also being considered for redesignation as a maintenance area, further evidence of improving air quality in the region.

Clean Air Act Terms

Air Quality Non-attainment Area:

any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for the pollutant.

Maintenance Area: After air monitoring shows that a nonattainment area is meeting health-based air quality standards, EPA redesignated the areas as attainment. To be redesignated, an area must both meet air quality standards, and have a 10-year plan for continuing to meet and maintain air quality standards and other requirements of the Clean Air Act. Areas that are redesignated to attainment are called maintenance areas.

Existing Emission Sources

Emission sources for a variety of air pollutants are located both within and outside the UNF. Existing or potential sources within the UNF and their criteria pollutants are summarized below:

- Prescribed burning and wildland fires (particulates, nitrogen oxides, and carbon monoxide)
- Construction and use of unpaved forest roads (particulates, nitrogen oxides, and carbon monoxide)
- Residential heating sources (insignificant source)
- Propane generators for cell towers (insignificant source)
- Timber harvest activities (particulates and vehicle emissions [see below])
- Vehicle emissions (particulates, nitrogen oxides, and carbon monoxide)
- Recreational activities, including motorized recreational vehicles such as powered watercraft, motorcycles, ATVs, and snowmobiles. The criteria pollutants of concern from such recreational vehicles are nitrogen oxides, carbon monoxide and particulates, and, to a lesser impact, from VOCs and sulfur dioxide.

Major industrial sources located to the west of the UNF are more likely to impact the UNF due to prevailing winds. The major sources located in the Provo/Orem metropolitan area are associated with typical industrial operations, such as power plants, metal fabrication, chemical production, and coatings. Specific permitted major sources near the UNF are summarized in table 3.33 and shown in figure 3.27. Coal-fired power plants and compressor stations are additional major sources of air pollutants and are located to the south of the UNF.

Regional Haze

Regional haze is caused by fine particles in the air that settle out very slowly. Regional haze occurs over a portion of the State or several States. Because of the harm that haze has on visibility in National Parks and Designated Wilderness Areas, many efforts to control and reduce man-made haze, and the air pollutants that cause it, are under way through national laws and regional collaboration. In general, the greatest impacts from regional haze are expected in the western portion of the UNF because of the nearby urban areas.

3.10.2 Introduction

Air Quality

The climate and climatic conditions in the UNF are one of the major reasons for its very good to excellent air quality. As moist air is forced to rise over the Wasatch Front Range, moisture falls as precipitation. With UNF's mid-continent location and mountainous terrain, it experiences wide temperature variations between seasons. Climates in UNF also vary greatly with elevation. During winter and spring, most of the precipitation comes in the form of snow, with a deep snow pack accumulating in many of the high elevations. By late spring, temperatures warm up in the lower elevations, while the mountain snow pack begins to melt. Summer brings warm temperatures to most areas with hot temperatures in the more desert-like, lower elevation areas.

Afternoon thunderstorms become common by June and can be expected into September. Thus, active mixing of air and above-average precipitation for Utah, along with an absence of major air pollution sources, results in low pollutant background values for the UNF. In general, the air quality within the UNF is considered good to excellent (UDEQ 2005).

Although the overall state of air quality in Utah is improving, there are portions of the UNF that lie within areas that have been designated as non-attainment with respect to the National Ambient Air Quality Standards (NAAQS). The air pollution generated in nearby urban parts of Utah County has limited the ability of the Forest Service to implement prescribed burning (USFS 2002b).

The Utah Division of Air Quality (UDAQ), EPA, and the Utah Smoke Management Plan (SMP) have designated the UNF area as Airshed 6 within the State of Utah. Utah Air Quality Control Rule 307-204 of the Air Quality Rules regulates the management of wildfires and prescribed burns. The SMP states that prescribed burns will not cause or significantly contribute to daily PM_{2.5} or PM₁₀ impacts or violate NAAQS. The purpose of the rules is to mitigate the impact of prescribed fire and wildland fire on public health and visibility.

The NAAQS are defined in the Federal Clean Air Act as levels of pollutants above which detrimental effects on human health and welfare may occur. There are seven criteria pollutants for the NAAQS: ozone, carbon monoxide (CO), nitrogen oxide (NO_x), sulfur dioxide (SO₂), particulate matter (PM) with aerodynamic diameter less than or equal to 10 microns and 2.5 microns (PM₁₀ and PM_{2.5}), and lead (Pb). The NAAQS are shown in table 3.33.

Table 3.33. National primary and secondary standards.

Pollutant	Averaging Time	Concentration
Ozone	1 hour	235 µg/m ³ (0.12 ppm)
	8 hours	157 µg/m ³ (0.08 ppm)
Carbon Monoxide (CO)	1 hour	40,000 µg/m ³ (35 ppm)
	8 hours	10,000 µg/m ³ (9.0 ppm)
Nitrogen Oxides (NO _x)	Annual Arithmetic Mean	100 µg/m ³ (0.05 ppm)
Sulfur Dioxide (SO ₂)	3 hours	1,300 µg/m ³ (0.5 ppm)
	24 hours	365 µg/m ³ (0.14 ppm)
	Annual Arithmetic Mean	80 µg/m ³ (0.03 ppm)
Particulate Matter as PM ₁₀ (Aerodynamic diameter < 10 microns)	24 hours	150 µg/m ³
Particulate Matter as PM _{2.5} (Aerodynamic diameter < 2.5 microns)	24 hours	35 µg/m ³
	Annual Arithmetic Mean	15 µg/m ³
Lead (Pb)	Quarterly Arithmetic Mean	1.5 µg/m ³

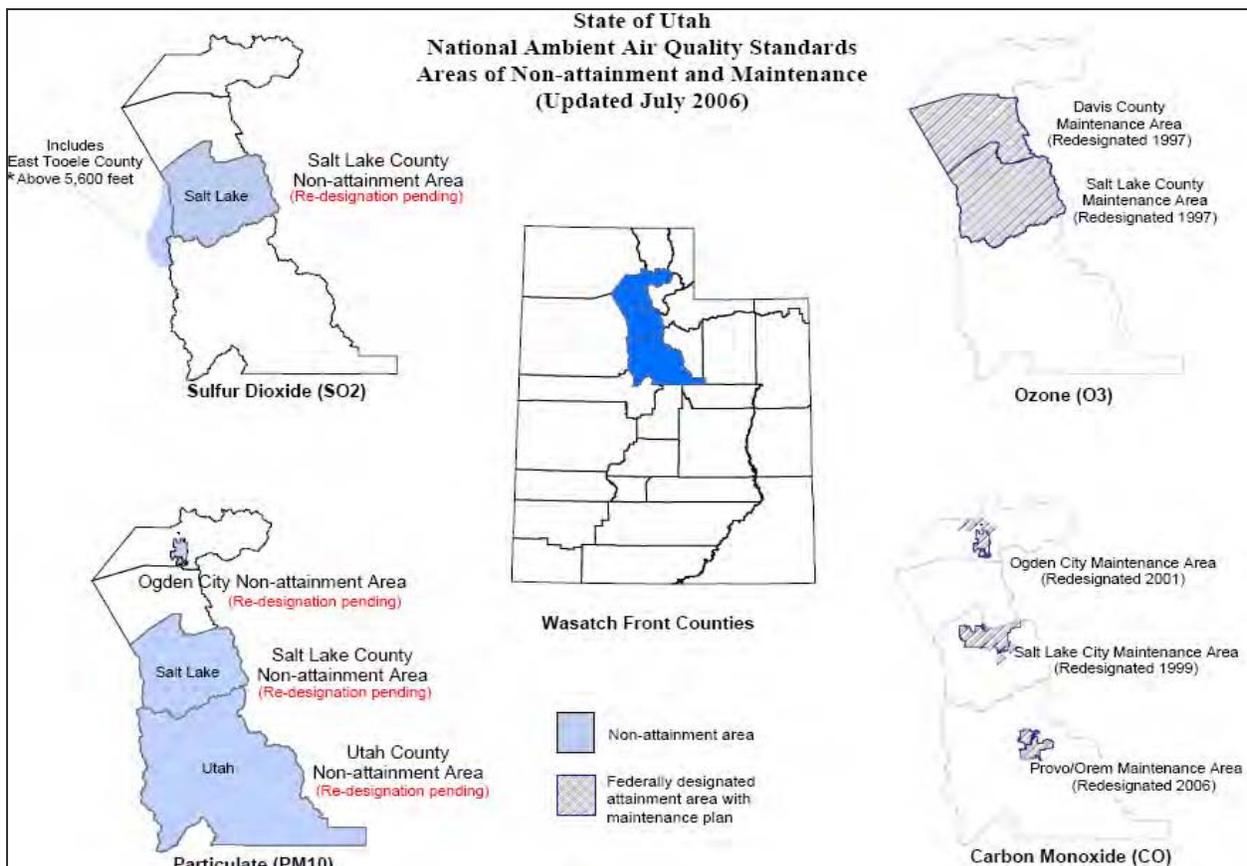
Note: µg/m³ = micrograms per cubic meter; ppm = parts per million.
Source: Code of Federal Regulations, 40 CFR Part 50.

Regulations state that ambient air quality standards for NO_x and SO₂ must not be exceeded at any time during the year in areas with general public access. Short-term standards for CO, NO_x, and SO₂ can be exceeded only once annually. Compliance with the 24-hour PM₁₀ and PM_{2.5} standards is based on the 98th percentile of 24-hour concentrations averaged over three years.

The 3-year average ozone standard of the 8-hour concentration is less than or equal to 0.08 ppm. The 1-hour standard applies only to airsheds that were in non-attainment status when the ozone rules changed in 2002. Non-attainment areas in Utah are displayed in figure 3.25. Based on 2000 census data, the Utah Division of Air Quality estimates that about 71 percent of Utahns reside in non-attainment areas (USFS 2003).

Figure 3.25. Areas of non-attainment and maintenance.

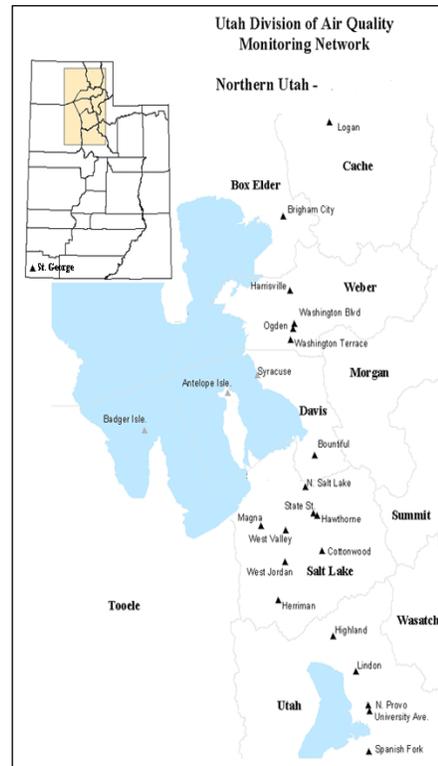
Source: LRMP (original; since updated July 2006 by State of Utah).



The current situation for the criteria pollutants in Utah is briefly discussed below (USFS 2003: 3-72 to 3-73):

- Carbon Monoxide Prior to 1990 levels in Salt Lake City and Provo/Orem frequently exceeded NAAQS. Subsequent monitoring data indicates there were four instances when air quality exceeded NAAQS between 1994 and 1996: once in Utah County and once in Salt Lake County in 1994, and twice in Utah County in 1996. No exceedances were recorded in 1997-2000. The UDAQ projects Salt Lake County should meet the standard for the next 20 years (UDEQ 2005). The rest of Utah is expected to maintain acceptable levels.
- Ozone levels in Utah have dropped significantly over the last 10 years. In the 1980s, Salt Lake and Davis Counties did not meet NAAQS. Emission reductions have improved air quality. In July 1997, Utah was re-designated from a non-attainment to maintenance area. Any future exceedances of the ozone standard in Utah will likely remain confined to major urban areas and locations immediately downwind of those areas. In 2000 ozone was monitored at 11 locations in Utah. In 1998 the one-hour and eight-hour standards in northern Utah were exceeded numerous times, including several eight-hour exceedances in Utah County. In 1999 there was only one excursion from the standard. In 2000 there were nine excursions, but none in Utah County. These exceedances were not of sufficient duration and magnitude to violate the law. In the summer of 2000 there were several more exceedances of the ozone standard that may have some relation to hydro-carbon emissions from wildfires in the West occurring at that time. The relationship between wildfire emissions and ozone exceedances is not well understood.
- Nitrogen dioxide is monitored at five locations in Utah; one of these locations is in northern Provo. Data indicates no violations of the nitrogen dioxide standard have occurred since record keeping was initiated. No violations are expected in the near future; however, increases in traffic along the Wasatch Front are expected to increase nitrogen dioxide emissions by 20 to 30 percent over the next 20 years. Nitrate aerosols are significant contributors to visibility problems along the Wasatch Front.
- Sulfur dioxide emissions are currently monitored at four locations. The EPA has identified Salt Lake County, and the eastern portion of Tooele County above 5,600 feet in elevation, as non-attainment areas. Data (UDEQ 2005) indicate that standards have not been exceeded at monitoring sites in Utah since 1992.
- PM levels have been of concern for many years. Significant pollution controls were implemented between 1992 and 1994 in counties along the Wasatch Front. These

Figure 3.26. Air monitoring stations.
Source: UDEQ 2007.



measures have led to a decrease in particulate pollution. UDAQ monitors PM10 levels at nine to 17 sites annually. In 1994 there were nine recorded exceedances in Salt Lake County. From 1995 and 2000, only three exceedances were recorded: two in North Salt Lake in 1996 and one in Lindon in 1997 (UDEQ 2005).

- Lead levels in Utah meet NAAQS. With the national requirement for unleaded gasoline, Utah has experienced fewer and fewer problems with atmospheric lead and has met the standard for many years (UDEQ 2005).

Sensitive Areas

Class I areas have the highest air quality protection standards while Class II areas have a moderate level of protection. All lands within the UNF have been designated Class II. The locations of sensitive areas that will potentially be impacted that are near the UNF are identified in table 3.34. Based on the designation status from the State of Utah, and several Federal agencies, there are three Federal Class I and six Federal Class II areas that could be impacted by the Project. However all Class I areas are located further away than the 100 kilometers (62 miles) from the study area. The nearest Class I area to the UNF is Capitol Reef National Park which is approximately 83 miles south of UNF. Table 3.34 presents selected Class I and Class II areas that are considered sensitive areas that may be considered when addressing impacts.

Table 3.34. Sensitive areas near the study area.

Federal Class I & II Areas (unless otherwise specified) ^a	Managing Agency ^b	Class Category	State
Arches NP	NPS	Class I	UT
Brown NWR	NPS	Class II	UT
Canyonlands NP	NPS	Class I	UT
Capitol Reef NP	NPS	Class I	UT
Dinosaur NM	NPS	Class II ^{d, e}	UT/CO
Flaming Gorge NRA	FS	Class II ^c	UT/WY
High Uintas WA	FS	Class II ^d	UT
Ouray NWR	FS	Class II	UT
Areas near Mount Olympus, Twin Peaks, Lone Peak, Mount Timpanogos, and Mount Nebo	FS	Class II	UT

^a NP= National Park; WA=Wilderness Area; NWR=National Wildlife Refuge; NM=National Monument; NRA=National Recreation Area.

^b NPS= USDI—National Park Service; FS= USDA—Forest Service.

^c Sensitive Class II areas included in the analysis per CDPHE (BLM 2005).

^d Sensitive Class II areas included in the analysis (BLM 2005).

Air Monitoring

As stated above, a portion of the UNF lies within an area that has been classified as non-attainment. As can be seen in figure 3.25, both Utah and Salt Lake Counties are classified as non-attainment for PM10 and part of the UNF is in Utah County. Salt Lake County is also a non-attainment area for SO2. Also note that part of Salt Lake County (i.e., Salt Lake City) and part of Utah County (i.e., Provo/Orem) are maintenance areas for CO. In addition, Salt Lake County is a maintenance area for ozone (UDEQ 2006b). Although none of the UNF lies within Salt Lake County, it does border the County.

UDAQ monitors air quality at 27 stations. Five of these stations are located in urban areas in Utah County near the UNF. The UNF also cooperates with the National Park Service in operating an IMPROVE air quality monitoring site near Timpanogos Cave located in the Lone Peak Wilderness Area. Nonetheless, this monitor ceased operation in 2001. Table 3.35 represents 2005 monitoring data for the monitoring sites that border the UNF.

Table 3.35. Local air monitoring data.

Monitoring Location	CO (PPM)	NOx (PPM)	O3 (PPM)	PM2.5 (µg/m3)	PM10 (µg/m3)
Cottonwood	1hr—3.9 8hr—2.6	1hr- 0.084 AAM—0.0209	1hr—0.127 8hr—0.1	24hr - 62.9 AAM—11.06	24hr—114 AAM—26.8
Herriman			1hr—0.117 8hr—0.096		
Highland			1hr—0.118 8hr—0.095	24hr - 42.8 AAM—8.14	
Lindon				24hr - 59.8 AAM—10.01	24hr - 86 AAM—20.8
University Ave U3	1hr—4.9 8hr—3.2				
Spanish Fork			1hr—0.144 8hr—0.110	24hr—43.7 AAM—8.0	

Blanks indicate that pollutant is not monitored at that particular station.

AAM—Annual Arithmetic Mean.

University Ave. U3 closed in June 2006.

Source: UDEQ 2006a.

Since the air quality monitoring stations are located in urban areas with high emissions, the monitoring data listed in table 3.36 are expected to be overestimates of the pollutant concentrations that may be found on the UNF.

Based on observations of the monitoring data and the Air Quality Index (AQI) for Salt Lake and Utah counties, it appears that the air quality in the area is improving. Although Salt Lake and Utah counties are designated as non-attainment for the PM10 NAAQS, the State of Utah has requested that the EPA re-designate them as Maintenance areas. The State of Utah has also requested that Salt Lake County be re-designated as a maintenance area for SO2 (UDEQ 2006b). Table 3.36 summarizes the AQI for Salt Lake and Utah Counties for 2004, 2005, and 2006 (first three quarters). The AQI is a daily EPA rating system that accounts for all measured criteria air pollutants in a geographic area and assigns the rating a qualitative description. For example, if an area has an AQI rating of 100 it is classified as “unhealthy for sensitive groups.”

Table 3.36. Air quality index ratings.

Rating	Salt Lake (number of days with rating)			Utah (number of days with rating)		
	2004 ¹	2005 ²	2006 ³	2004 ¹	2005 ²	2006 ³
Good (0-50)	197	227	197	268	284	196
Moderate (51-100)	132	110	109	75	75	74
Unhealthy / Sensitive Groups (101-150)	31	28	9	16	5	1
Unhealthy (151-200)	6	0	0	7	1	0

¹Salt Lake & Utah 366 days with AQI.

²Salt Lake & Utah 365 days with AQI.

³Salt Lake 273 days with AQI, Utah 271 days with AQI.

Source: EPA 2006.

As shown in Table 3.36, the total number of unhealthy days is consistently decreasing while the number of good and moderate days is increasing. Since the prevailing winds are westerly, these airsheds supply air and the associated pollutants to parts of the UNF. Counties located in the western and southern parts of the UNF have the majority of days identified as “good”.

The UNF supports a lichen biomonitoring program (lichen are sensitive to air quality) that has been in place since 1998. There are 23 lichen monitoring sites along the Wasatch Front. Approximately half of these sites are monitored every five years. Samples were last analyzed in 2004. This analysis indicated that overall pollutant element concentrations have generally declined, although there were elevated levels of iron-titanium ratios and fluoride. The trend of decreasing pollutant levels is likely related to the declining operation of the steel mill in Utah Valley. Twelve sites had overall pollutant element concentrations lower than the original sites (USFS 2006). The analysis previous to the 2004 analysis indicated elevated levels of lead, arsenic, chromium, and nickel in the lichen tissue samples (USFS 2005). This study indicates that activities in Utah County are impacting UNF air quality.

Existing Sources

Emission sources of criteria pollutants exist within the UNF. While most of these sources are associated with mobile vehicles, minor stationary and episodic events can contribute to the overall air quality in the UNF.

Management activities within the UNF, such as prescribed burning and use and construction of unpaved forest roads, can produce PM, NOx, and CO emissions. Prescribed burning and wildland fires are activities with historical and current impacts on air quality. The UNF manages wildland fire use and prescribed fire in accordance with the Utah Smoke Management Plan. This plan requires approval and coordination of prescribed fires and wildland fire use to ensure these actions do not cause an exceedance of NAAQS at, or downwind of, the burn site. The Utah Smoke Management Plan provides for organization and operating procedures, and prescribed fire and wildland fire requirements. Under prescribed fire requirements, several items are required including an annual burn schedule, prescribed fire burn plans, a burn request form, implementation of emission reduction and dispersion techniques, a daily emission report form, surveillance and enforcement, and monitoring (UDEQ 2000b). Similar requirements are expected for wildland fire use (USFS 2003). The UNF has complied with these requirements by meeting annually on at least some prescribed burning activities (USFS 2003a).

Prescribed and agricultural burning currently account for roughly five percent of total PM10 and carbon monoxide emissions in Utah, Wasatch, Summit, and Juab Counties, and less than two percent of the nitrogen oxide emissions. A large part of these emissions are currently generated off the UNF, especially in Juab County (USFS 2003).

In addition to management activities of the UNF, there are recreational activities within the UNF that are sources of air pollution. These include motorized recreational vehicles such as powered watercraft, motorcycles, ATVs, and snowmobiles. While there is an effort to improve emissions from these types of motors, the typical 2-stroke engine emits significantly more pollutants than those of more regulated highway vehicles. The criteria pollutants of concern from such recreational vehicles are NO_x, CO, and PM, and, to a lesser extent, from VOCs and SO₂.

Minor stationary air emission sources within the UNF include residential heating sources (i.e., boilers and heaters) and propane-combustion electrical generators for cell towers. These sources are considered either minor or insignificant.

The UNF allows timber harvest activities within-the forest in order to achieve management goals and provide opportunities for the local timber dependent industry. In 2004, a total of 39 acres were clear-cut. As part of the clear cutting, 9.7 miles of road were reconstructed. There were no clear cutting activities in 2005 (USFS 2005 and 2006). It is estimated that timber harvesting occurs on 150 to 600 acres of the UNF annually (Pope 2006). These activities result in particulate emissions from timber harvesting activities and haul road usage in addition to NO_x, CO, and PM from the trucks used to haul the timber.

Existing Surrounding Sources

A large percentage of air pollutants within Utah originate from the urban Wasatch Front area. Davis, Salt Lake, and Utah Counties account for roughly one-third of the statewide emissions of PM10, volatile organic carbons, carbon monoxide, and sulfur dioxide. More than 50 percent of these pollutants and up to 80 percent of PM10 emissions come from motor vehicle exhaust. The UNF is generally downwind from these sources. Prevailing westerly winds transport pollutants from the Wasatch Front into the UNF. Studies indicate that air quality on most of the UNF is not seriously impacted, but some pollution effects can be seen (St. Clair 1996 and 1996a). Historical data from the Lone Peak IMPROVE site validates the conclusions of these studies (USFS 2003).

Major industrial sources located to the west of the UNF are more likely to impact the study area due to prevailing winds. The major sources located in the Provo/Orem metropolitan area are associated with typical industrial operations, such as power plants, metal fabrication, chemical production, and coatings. Table 3.37 lists the major sources that border and are downwind of the UNF. Figure 3.27 shows the location of these sources in reference to the entire UNF. Major coal-fired power plants and compressor stations are sources located to the south of the study area. Associated with these power plants are provincial coal mines located in the Carbon County vicinity.

Table 3.37. Permitted major sources.

Source	County or City, State
Western Pipe Coaters	Vineyard, UT
BYU	Provo, UT
Pitt-DesMoines	Provo, UT
Geneva Nitrogen	Vineyard, UT
Global Coatings, Inc	Provo, UT
Provo City Power	Provo, UT
Powder River and Livestock	Provo, UT
Pacific States Cast Iron Pipe	Provo, UT
Payson Power	Payson, UT
RT Manufacturing	Orem, UT
Utelite	Coalville, UT
Carbon Power Plant	Carbon, UT
Sunnyside	Carbon, UT
Huntington Power Plant	Emery, UT
Oak Springs Turbine Compressor	Spring Glen, UT
Nebo Payson Power Plant	Utah

The UDAQ and oil and gas stakeholders are currently determining the impact of oil and gas exploration and production in the Uinta and Duchesne County area. A recent inventory of the area for 2005 showed that oil and gas operations emit 5,130 tons in NOx, 5.3 tons per year (tpy) SO2, 28,795 tpy VOC, and 647 tpy PM10. These are the total emissions for five fields and approximately 4,526 wells. The total emission averages are 1.13 tpy of NOx, 0.012 tpy of SO2, 6.36 tpy of VOCs, and 0.835 tpy of PM10 per facility (UDEQ 2005a). (Note: not all operators in the area participated in this emission inventory. This emission inventory was a joint effort initiated by the Utah Petroleum Association and UDAQ.)

Regional Haze and Visibility

Regional haze is caused by fine particles in the air that settle out very slowly. Regional haze occurs over a portion of the State or several States. Because of the harm that haze has on visibility in National Parks and Designated Wilderness Areas, many efforts to control and reduce man-made haze, and the air pollutants that cause it, are under way through national laws and regional collaboration. Such a collaboration, involving States, Indian Tribes, industry, and environmental advocates, is being coordinated by the Western Regional Air Partnership (WRAP) which is a successor organization to the Grand Canyon Visibility Transport Commission (GCVTC). The State of Utah is a member of WRAP and has been involved with developing visibility protection programs. Federal and State laws provide visibility protection for the 156 mandatory Class I areas in the U.S. Visibility protection programs are being developed for Class I areas in the West; these programs should also result in some visibility protection and improvement in the Class II Wilderness Areas on the UNF. The State of Utah, through its involvement in WRAP, has been a leader in developing visibility protection programs in the West.

Utah submitted its 2003 State Implementation Plan (SIP) and is in the process of developing an update to the current SIP. The current SIP addressed many issues including emissions from a wide variety of sources, including vehicles and anthropogenic fire. Smoke emissions are controlled with an Enhanced Smoke Management Plan. The updated SIP will address a backstop trading program for sulfur dioxide from large industrial sources. The backstop trading program is essentially a “cap and trade” program. A cap and trade program would set a cap on the maximum amount of SO₂ emissions and allocates emission allowances to the affected sources. So long as the cap is not exceeded, various emission controls and trading of emissions between sources may take place. In addition, the updated SIP will assess the impact of Utah sources of emissions on protected areas—Federal Class I areas—in adjacent States, and the impact of emission sources in adjacent States on Utah’s protected areas, and will set forth appropriate control measures as needed. Finally, the SIP update will address the effects of nitrogen oxide and PM emissions from Utah’s large industrial sources on protected areas in Utah and adjacent States (UDEQ 2006b).

3.10.3 RFOGDs

Currant Creek Group

The Currant Creek Group is on the eastern side of the UNF. The eastern portion of the UNF is not in an area classified as non-attainment, nor are there any air monitoring stations in or near this portion of the UNF. Therefore, the air quality of the Currant Creek Group is considered excellent.

The emission sources in the Currant Creek Group are from UNF management activities including prescribed burns, timber harvest, use and construction of forest roads, and recreational activities such as off-road vehicles. These activities result in criteria pollutant emissions of PM, NO_x, SO₂, and CO.

There are no existing major sources located near the Currant Creek Group (figure 3.27). A Chevron pipeline passes along the northeast border of the Currant Creek Group. Pigging (cleaning the pipeline) of pipeline operations requires launchers and receivers and can cause the release of VOCs into the atmosphere, although no major launchers or receivers have been identified. Exploratory oil wells may be present beyond the eastern border of the Currant Creek Group, but prevailing winds likely vent the pollutants toward the east.

Regional haze and visibility have the potential to be better along the eastern portion of the UNF than the western side which borders urban areas of Utah.

Deer Creek Group

The Deer Creek Group is along the western portion of the UNF and lies within an area that has been classified as non-attainment for PM₁₀ emissions. There is also a portion of the Deer Creek Group that is designated as a maintenance area for CO emissions around the Provo-Orem area.

The existing emission sources in the Deer Creek Group are the same as those for the Currant Creek Group except there are no major reservoirs or bordering oil field development in this part of the UNF. In addition to forest management and recreation activities, Highway 189 passes through the northern portion of the Deer Creek Group resulting in vehicle emissions. The criteria pollutants emitted are the same as those in the Currant Creek Group.

There are nine existing major sources along the western border of the Deer Creek Group (figure 3.27). Pollutants from the Salt Lake and Utah Counties' non-attainment areas are more likely to impact this RFOGD, compared to the other RFOGDs.

The Deer Creek Group is along the western edge of the UNF; as such, regional haze may be worse than other areas of the UNF due to its proximity to urban areas.

Diamond Fork Group

The Diamond Fork Group has the same air quality issues as the Deer Creek Group. As such, it has the same criteria emissions as the Deer Creek Group. However, the Diamond Fork Group does not lie within any areas that have been designated as maintenance areas for CO emissions.

There are no major sources bordering the Diamond Fork Group. However, there are nine major sources to the north of the Diamond Fork Group bordering the Deer Creek Group. With the dominant prevailing westerly winds, both the Payson Power Plant and the Nebo Payson Power Plant could impact existing air quality in this RFOGD (figure 3.27).

Since the Diamond Fork Group also borders urban areas, the regional haze of the Diamond Fork Group is much the same as the Deer Creek Group.

Payson Group

Like the Deer Creek Group, the Payson Group also partially lies within a non-attainment area for PM10 emissions. Therefore, the air quality of the Payson Group is similar to that of the Deer Creek Group, as are the criteria pollutant emissions. Highway 189 borders the western side of the Payson Group, although no major highways pass through it.

The two major sources, Payson and Nebo Power Plants, are located to the north of the Payson Group (figure 3.27).

The Payson Group is also in close proximity to urban areas and, as such, has the same regional haze as the Deer Creek and Diamond Fork Groups.

Spanish Fork Group

The Spanish Fork Group is on the southern border of the UNF. Like the Diamond Fork Group it is in an area that is classified as non-attainment for PM₁₀ emissions. As such it has the same air quality issues and criteria air pollutants as the Diamond Fork Group.

Although there are no major sources that border the Spanish Fork Group, Highway 6 borders the southern portion of the group.

With the Spanish Fork Group being on the southern border of the UNF, the regional haze and visibility are likely to be better than the western portion of the UNF that is near urban areas.

Strawberry Group

Like the Currant Creek Group, the Strawberry Group lies in the eastern portion of the UNF. As such, the air quality of the Strawberry Group is much the same as the Currant Creek Group, as are the criteria pollutant emissions. However, State Highway 40 runs through the northern portion of the Strawberry Group, resulting in emissions from vehicles traveling on the highway. Motor boating and other powered recreational watercraft on Strawberry Reservoir have the potential to impact air quality due to seasonal fossil fuel combustion emissions.

There are no existing major sources located near the Strawberry Creek Group (figure 3.27).

Since the Strawberry Group is along the eastern portion of the UNF, the regional haze is similar to that of the Currant Creek Group.

American Fork Group

The American Fork Group is in the northwestern portion of the UNF. This portion of the UNF is in an area classified as non-attainment for PM10 emissions.

The emission sources in the American Fork Group are similar to those identified for the Currant Creek Group with the exception of recreational activity.

There are nine existing major sources along the western border of the UNF along the American Fork and Deer Creek Groups (figure 3.27). Pollutants from the Salt Lake and Utah Counties' non-attainment areas are more likely to impact these RFOGDs, compared to the other RFOGDs.

The American Fork Group is along the western edge of the UNF; as such, regional haze may be worse than other areas of the UNF due to its proximity to urban areas.

Upper Provo Group

The Upper Provo Group is in the northeastern portion of the UNF. This portion of the UNF is not in an area classified as non-attainment. Therefore the air quality of the Upper Provo Group is considered excellent.

The forest management and emissions are the same as those in the Currant Creek Group. The Chevron pipeline also passes by the eastern border of the Upper Provo Group just as it does the Currant Creek Group. There are also exploratory wells to the east of the Upper Provo Group resulting in the same air quality issues as the Currant Creek Group.

The regional haze and visibility in the Upper Provo Group are the same as the Currant Creek Group.

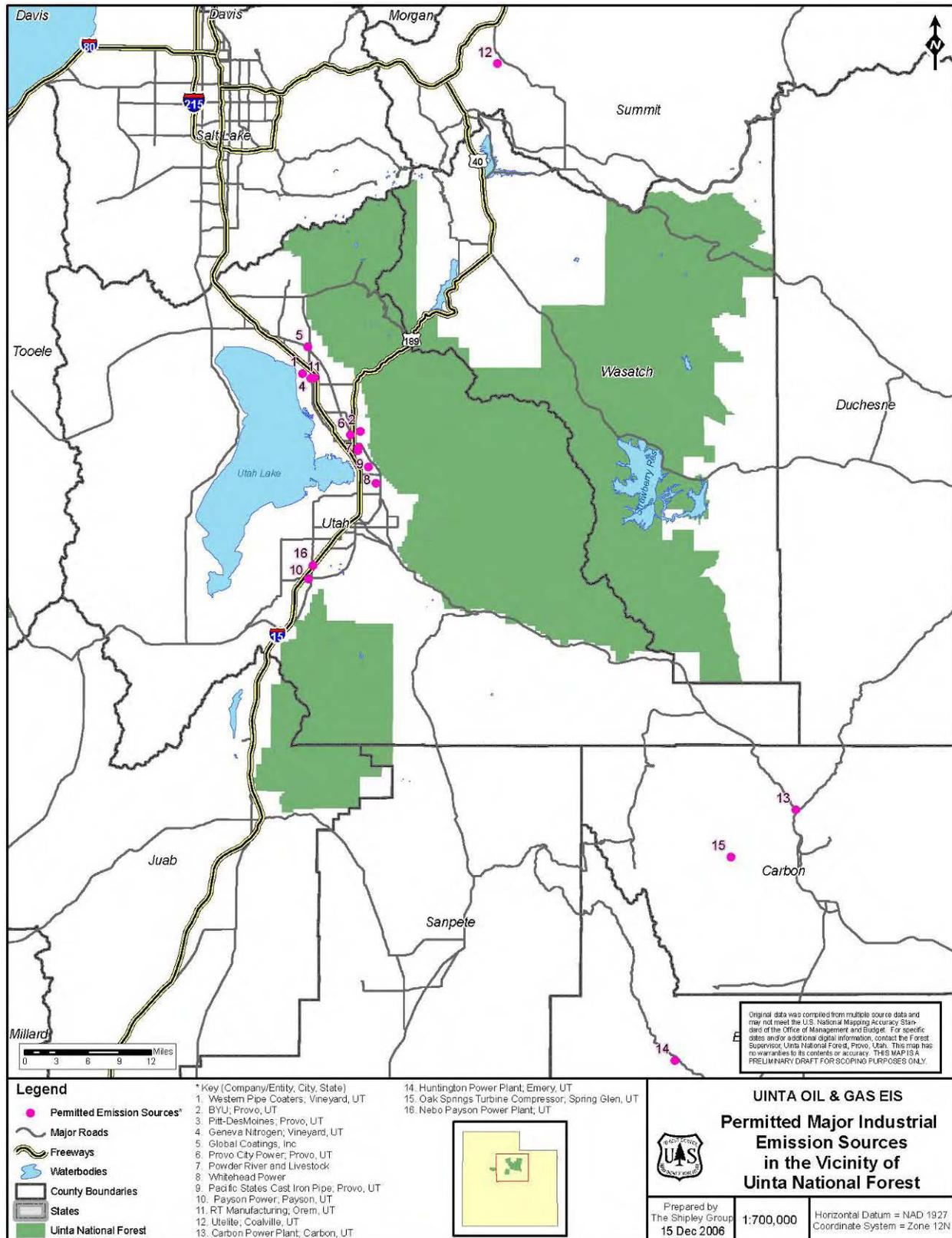
Vernon Group

The Vernon Group is approximately 30 miles west of the southern portion of the main UNF in Tooele County. The Vernon Group is not in an area that is designated as non-attainment. As such the air quality of the Vernon Group is considered to be excellent.

There are no existing major sources near the Vernon Group. Highway 6 is along the eastern border but no major highways cross the Vernon Group.

The regional haze and visibility of the Vernon Group is the same as the Currant Creek Group since is not near any urban development areas.

Figure 3.27. Permitted sources.



3.11 Visual Resources

3.11.1 Introduction

Regulations from the CEQ direct agencies to insure the professional and scientific integrity of environmental analyses in an EIS. This direction includes using the best available science to describe existing conditions in the Project Area; in this case, the UNF. Published, peer reviewed studies are used when applicable to conditions in the UNF; however, in most cases only those studies that are relevant to identifying potential impacts from the proposed action (in Chapter 4) are considered. These studies are cited in the text. The most relevant literature for most resources in Chapter 3 comes from internal Forest Service publications and reports, because this information is based on UNF-specific investigations and assessments. Throughout Chapter 3, the UNF Land and Resource Management Plan (USFS 2003) and associated EIS (USFS 2003a) are the most frequently cited documents. These documents were not peer reviewed within the scientific community, but were written using best available science, open to public comment as dictated by the NEPA process, and revised accordingly by resource specialists.

Scenery is an important natural resource of the UNF. It has been shown that high-quality scenery can enhance peoples' lives and benefit society, particularly natural scenery such as is associated with National Forests (USFS 1995). It is primarily through their visual sense that most visitors perceive the Forest and its interrelated components. Benefits derived from scenic settings include identity, self-image of communities and individuals, and enhanced quality of life. Sight-seeing, driving for pleasure, and outdoor photography are among the nation's leading recreational activities. As demand continues, the need to preserve high quality visual resources will also increase (USFS 2003).

3.11.2 Affected Environment

The scenic environment varies by location and is largely influenced by existing natural features including vegetation, water, landforms, and geology. Scenic resources are important to the forest and help maintain the UNF's popularity as a recreation destination (USFS 2003). The natural setting, of which aesthetics is a key component, can influence the quality and values of the recreation experience. Natural settings and cultural features are valued for their ability to stimulate the senses and nurture the mind (USFS 1995). Common recreational uses in the UNF are directly related to the quality of visual resources. The most popular activities identified by visitors (general use to escape urban lifestyles and viewing natural features), are dependent upon preserving the natural landscape of the UNF (USFS 2002).

Visual Quality Objectives

The term Visual Quality Objective (VQO) refers to the degree of acceptable visual alteration of the landscape and is defined as a desired level of scenic excellence based on physical and sociological characteristics of an area. Typically, more stringent VQOs are incorporated to protect the most highly visible and frequently seen areas that have the greatest amount of variety in vegetation and other naturally occurring features (USFS 2003).

Long-term VQOs are based on a process called the Visual Management System (VMS), which has been used by National Forests for the last 25 years. Although inherently subjective, this VMS framework can facilitate the attainment of aesthetic goals while balancing other equally important resource needs. Table 3.38 summarizes the VQOs that are applicable to the UNF.

Table 3.38. Visual quality objectives applicable to the UNF.

VQO	Description
Preservation	Allows for ecological changes only. Management activities, except for very low visual impact recreation facilities, are prohibited.
Retention	Management activities may only repeat the form, line, color, and texture frequently found in the characteristic landscape. Changes should not be evident to the casual forest visitor, and all retention activities to restore the area to a naturally appearing condition should be accomplished either during the operation or immediately after. In short, a visitor to the Forest should not notice the management activity.
Partial Retention	Management activities remain visually subordinate to the characteristic landscape. Management activities should repeat form, line, color, or texture elements common to the characteristic landscape, but structures can introduce these elements that are found infrequently or not at all in the characteristic landscape. Reduction in form, line, color, and texture to meet Partial Retention should be accomplished as soon after project completion as possible, or at a minimum, within the first year. In other words, any management activity must be blended into the landscape so as to attract little attention
Modification	Management activities may visually dominate the original characteristic landscape. However, activities involving vegetative and landform alteration must borrow from naturally established form, line, color, or texture so completely and at such a scale that its visual characteristics are those of natural occurrences within the surrounding area or character type. Additional parts of these activities such as structures and roads must remain visually subordinate to the proposed composition. In summary, this broad objective allows for most forms of management activity including those such as structures which are more visually obtrusive, provided they are designed to fit the context of the natural surroundings at all viewing distances.

Source: USFS 2003.

Of the acres in the UNF with designated VQOs, the majority are partial retention (47 percent) and modification (32 percent) (figure 3.28: Forest-wide map of VQOs; table 3.39). Visually, as partial retention, management activities may not interrupt the characteristic natural landscape. Activities would be managed so as to retain the line, form, color, or texture of the natural landscape as much as possible, so as to blend in to the landscape and not attract attention. Nearly one-third of scenery acres (32 percent) have a VQO of modification; in these areas management activities may dominate the landscape or may be visually obtrusive. However, structures and activities should be designed to fit the context of the natural surroundings. Approximately one-fifth (22 percent) of the scenery acres are preservation or retention in the UNF. These areas are managed so that activities are not perceptible to the viewer.

Table 3.39. Visual objective acres in UNF.

Objective	Acres	Percent
Modification	279,443	32
Preservation	58,943	7
Partial Retention	413,085	47
Retention	128,476	15

Source: UNF GIS shapefile. GIS rounding creates a small acreage discrepancy.

Scenic Byways

The National Scenic Byways Program is part of the U.S. Department of Transportation, Federal Highway Administration. The program recognizes certain roads as All-American Roads or National Scenic Byways based on one or more archeological, cultural, historic, natural, recreational, or scenic qualities (USDOT 2006). The UNF has three scenic byways valued for their diverse landscapes and magnificent views. These scenic drives are popular with recreational visitors and are important to the visual resources of the forest. Specific scenic byways are discussed under the RFOGDs in which they are located.

Wild and Scenic Rivers

Utah contains no rivers designated by Congress into the National Wild and Scenic Rivers System created by the Wild and Scenic Rivers Act of 1968 (BLM 2006). The Wild and Scenic Rivers Act of 1968 designated and provided immediate protection for over 100 rivers. It also provided for the evaluation of other rivers to determine their eligibility for inclusion in the Wild and Scenic Rivers System and outlined a process for the addition of suitable segments to the system. The act ensured that these streams would remain free-flowing and that their natural character would be preserved (USFS 2003).

Currently, the USFS Intermountain Region is conducting a Wild and Scenic Rivers suitability study for National Forest System Lands in Utah and preparing a legislative EIS (LEIS). The LEIS is being prepared to determine which eligible river segments are suitable for inclusion in the National Wild and Scenic Rivers System. Wild and Scenic River recommendations as they are reported in this EIS may change as a result of the LEIS.

Under the LRMP, standards are applied to protect the essentially free-flowing character and the outstandingly remarkable values that qualify these rivers to be considered eligible for the National Wild and Scenic Rivers System. These standards are applied within a corridor extending the length and one-quarter mile from the bank on both sides of the eligible segments. These standards remain in effect pending a suitability determination (see paragraph above), and may also be applied to segments determined to be suitable and to rivers designated until such time as a River Management Plan can be adopted. Future management of segments determined not to be suitable will be determined as part of the suitability analysis process (USFS 2003).

Although Utah does not have any designated rivers, there are four segments within the UNF that have been classified as eligible. Segments of the South Fork, American Fork River (1.4 miles) and the North Fork, Provo River (1.3 miles) are eligible as wild rivers. Both rivers also have a very short section potentially eligible as a recreational river (see Section 3.13: Recreation). In addition, a reach of Fifth Water Creek (7.8 miles) is classified as scenic, and a segment of Little Provo Deer Creek (2.6 miles) including and directly downstream from Cascade Springs is

classified as recreational (USFS 2003). The Deer Creek and Diamond Fork Groups contain the lower North Fork Provo River (0.5 miles) and Little Provo Deer Creek which are managed under MP 2.3 for Wild and Scenic Rivers: Recreational Classification. Recreation development, including structures, may be established in close proximity to the river, but extensive development is not required. Vegetation management is allowed with restrictions to protect the immediate river environment, water quality, scenic, fish and wildlife, and other values. Livestock grazing is permitted to the extent currently practiced as long as there is not a substantial adverse effect on the natural-like appearance of the river area. Existing low dams, diversion works, riprap, and other minor structures are allowed, provided the waterway remains generally natural in appearance.

This section will only discuss the segment that has been designated as scenic (Fifth Water Creek). Segments designated as wild are managed under MP 2.1 for Wild and Scenic Rivers: Wild Classification (South Fork, American Fork River and the North Fork, Provo River). Because of their location within a wilderness area, they will not be analyzed further in this EIS.

3.11.3 Visual Quality Objectives by RFOGD

Table 3.40. Summary of approximate acres of VQOs for each MA grouped by RFOGD.

RFOGD	MA	Visual Quality Objective (Approximate Acres)			
		Modifi- cation	Preser- vation	Partial Retention	Retention
Currant Creek	Currant Creek	14,337	268	25,502	2,464
	West Fork Duchesne	20,623	0	17,970	3,014
	Currant Creek RFOGD Subtotal	37,311	25,514	59,748	19,745
Deer Creek	Deer Creek Reservoir	4,035	0	28,685	5,383
	Hobble Creek	12,565	0	50,200	8,425
	Lower Provo	13,200	6,111	16,218	27,951
	Deer Creek RFOGD Subtotal	29,801	6,111	95,102	41,759
Diamond Fork	Diamond Fork	27,726	0	65,346	3,977
	Diamond Fork RFOGD Subtotal	27,726	0	65,346	3,977
Payson	Mona	0	15,199	510	471
	Nephi	2,753	7,452	14,554	7,874
	Payson	1,384	4,666	14,722	13,569
	Thistle	6,502	0	26,908	3,263
	Payson RFOGD Subtotal	10,638	27,317	56,693	25,177
Spanish Fork Canyon	Upper Spanish Fork	23,707	0	18,283	2,328
	Spanish Fork Canyon RFOGD Subtotal	23,707	0	18,283	2,328
Strawberry	Strawberry Reservoir	35,699	0	43,876	29,594
	Willow Creek	5,495	0	18,464	0
	White River	12,358	0	13,401	0
	Strawberry RFOGD Subtotal	53,552	0	75,741	29,594
American Fork	American Fork	2,351	25,246	16,276	14,267
	American Fork RFOGD Subtotal	2,351	25,246	16,276	14,267
Upper Provo	Upper Provo	16,940	0	30,899	5,894
	Upper Provo RFOGD Subtotal	16,940	0	30,899	5,894
Vernon	Vernon	54,313	0	11,273	0
	West Sheeprock	25,456	0	0	0
	Vernon RFOGD Subtotal	79,769	0	11,273	0
Forest-wide Total		279,443	58,943	413,085	128,476

3.11.4 Scenic Byways and Wild and Scenic Rivers by RFOGD

If applicable, information about scenic byways and wild and scenic rivers is included for each RFOGD below. Wild and Scenic River: Scenic Classification or scenic byways are not located within the following RFOGDs:

- Currant Creek Group
- Deer Creek Group
- Spanish Fork Canyon Group
- Strawberry Group
- Upper Provo Group
- Vernon Group
- American Fork Group

Deer Creek Group

Scenic Byways

The majority of the Provo Canyon Scenic Byway is located in the Lower Provo MA and a short section is located in the Deer Creek MA. Provo Canyon Scenic Byway (US 189 and SR 113) officially begins in Provo City at the intersection of SR 52 (800 North in Orem) and US 189 (University Avenue). The 32-mile byway continues up Provo Canyon (US 189) to the town of Charleston in Wasatch County. At the intersection of SR113 and US 189 the byway continues to the town of Midway, then to Heber City with the final destination at the intersection of 113 (100 South, Heber). This scenic drive includes seven observation points (Utah Tourism 2006).

Diamond Fork Group

Wild and Scenic Rivers

Fifth Water Creek is managed under MP 2.2 for Wild and Scenic Rivers: Scenic Classification. This prescription prohibits all water dams or diversions. Vegetation management is permitted, provided there are no substantial adverse effects on the river and its immediate environment. Grazing is permitted to the extent currently practiced as long as there is not a substantial adverse effect on the natural-like appearance of the river area. Large-scale public use facilities such as campgrounds are permitted, but must be screened from the river. Motorized travel may be permitted, prohibited, or restricted. Roads occasionally bridge the river and short stretches of conspicuous and longer stretches of inconspicuous, well-screened roads are allowed (USFS 2003).

Payson Group

Scenic Byways

Nebo Loop Scenic Byway crosses the UNF between the cities of Nephi and Payson. It climbs to over 9,000 feet in elevation and provides excellent views of Utah valley, the Wasatch Mountains and 11,877-foot Mount Nebo, the tallest mountain in the Wasatch Range (Utah Tourism 2006).

American Fork GroupScenic Byways

Alpine Loop Scenic Byway climbs American Fork Canyon (Hwy. 92) through the UNF to Provo Canyon (Hwy. 189). This 20-mile drive winds through rugged alpine canyons of the Wasatch Range offering excellent views of Mount Timpanogos and other glacier-carved peaks.

Timpanogos Cave National Monument and the Sundance Resort are located along the route, as is Cascade Springs. This natural mountain spring is accessible by a 1/4-mile boardwalk, leading out over clear pools and cascading terraces filled with fish and aquatic plants (Utah Tourism 2006).

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3.12 Cultural Resources

3.12.1 Introduction

A Class I existing data review for this EIS was conducted. The project area includes all lands (approximately 897,400 acres) administered by the UNF. The objective of the data review was to ascertain the extent of previous cultural resource investigations and to determine the number, locations, types, and significance of previously documented archaeological sites within each of the nine UNF oil and gas RFOGDs identified in the EIS. RFOGDs include Currant Creek, Deer Creek, Diamond Fork, Payson, Spanish Fork Canyon, Strawberry, American Fork, Upper Provo, and Vernon. To ascertain the extent of previous cultural resource investigations and the numbers and distributions of documented archaeological sites, an archival records search was conducted at the UNF Supervisor's Office in Provo, Utah from 31 January–2 February, 2007.

MOAC conducted the study under U.S.D.I. (FLPMA) Permit No. 06-UT-60122 in compliance with Federal and State legislation, including the Antiquities Act of 1906, the National Historic Preservation Act (NHPA) of 1966 (as amended), the National Environmental and Historic Preservation Act of 1969, the Archaeological and Historic Conservation Act of 1972, the Archaeological Resources Protection Act of 1979, and the American Indian Religious Freedom Act of 1978.

Lands administered by the UNF are located in five central Utah counties, including Juab, Utah, Tooele, Wasatch, and Sanpete. Specifically, the UNF encompasses 897,400 acres along the Wasatch Front from Salt Lake City south to Nephi and east beyond Strawberry Reservoir. In addition, discontinuous sections encompass the Sheeprock Mountains west of Eureka and Nebo Mountain east of Mona. The UNF is bounded, or in close proximity to, the WCNF to the north, the Manti-La Sal National Forest to the south and east, and the Ashley National Forest to the east.

The UNF encompasses a variety of environmental settings located either in the Great Basin portion of the Basin and Range physiographic province or the Colorado Plateau physiographic province. The Great Basin is a large internally draining region bounded on the west by the Sierra Nevada Mountains and on the east by the Wasatch Mountains. Topographically, the Great Basin is characterized by a series of north-south trending mountain ranges bounded by flat, wide valleys. These ranges include the Sheeprock Mountains and the Wasatch Mountains. Formed 100 million years ago, the Sheeprock Mountains are located within the Thomas Mountains-Tintic Mountains physiographic subdivision of the Basin and Range physiographic province (Stokes 1986). According to Stokes (1986), the Sheeprock Mountains, as well as others within this unit, are more equidimensional in shape than most Great Basin ranges, include high proportions of igneous rock, complex internal structure, and high degrees of faulting. In addition, volcanic and intrusive rocks in the southeast portion of the range are rich in minerals (UNF Plan 2003). As to vegetation, the Sheeprock Mountains lay within the sagebrush/grass, mountain brush, and juniper habitats (UNF Plan 2003). Vegetation includes, but is not limited to, sagebrush and native and exotic grasses in low elevations; pinyon-juniper forest and oakbrush in the uplands; and spruce and Douglas fir in higher elevations. The range reaches a maximum elevation of approximately 9,300 ft a.s.l.

Marking the eastern boundary of the Great Basin, the Wasatch Mountains rise abruptly from the Utah Valley floor to elevations above 11,000 ft in the Mount Timpanogos and Mount Nebo Wilderness Areas. From north to south, the range extends from southern Idaho to the Salt Creek drainage near Nephi, Utah (Stokes 1986) and trends through several UNF management units. Unlike the igneous and metamorphic composition of the Sheeprack Mountains, the Wasatch Range includes fault uplifted and deformed marine sedimentary rocks (USFS 2003). In addition to fault block mountain building, glaciation and stream activity has resulted in a dissected landscape that includes a diversity of plant communities. Generally, pinyon-juniper communities are present in the lower elevations along the foothills and near the mouths of canyons. Above the pinyon-juniper community, the mountain brush community including oak and maple develops. In the highest elevations the slopes include blue spruce, Douglas fir, and lodgepole pine, while the valleys and wet meadows include aspen, willow, sagebrush, and various sedges, grasses, and forbs.

The Colorado Plateau Province, encompassing most of southern and southeastern Utah, includes UNF administered lands east of the Wasatch Mountains. Generally, the landscape is characterized by flat-lying sedimentary rock of marine and continental origin and can be subdivided into numerous provinces based on specific geology. Within the UNF, sub-provinces include the Green River, Wasatch, Colton, Flagstaff, North Horn, Duchesne River, and Uinta Formations (USFS 2003). Vegetation communities are similar to those found in the Great Basin portion of the forest.

3.12.2 Overview

A knowledge of the extent of previous cultural resource investigations within the project area and the number, locations, types, and significance of previously documented cultural resources within it are essential in predicting and evaluating potential impacts to archaeological resources resulting from oil and gas development.

On the UNF, a total of 447 compliance or research-related cultural resource studies have been conducted, resulting in the inventory of approximately 87,046 acres (136 square miles) or 8.8 percent of the entire Forest. Although approximately 896,664 acres (1,401 square miles) remain uninventoried, previous investigations have resulted in the documentation of 522 archaeological sites across the Forest. Therefore, throughout the entire Forest, site density is approximately 3.8 sites/square mile. However, site density varies considerably across the Forest. Within the Vernon group, site density is approximately 13.3 sites/square mile while the remaining eight groups combined exhibit a site density of approximately 2.8 sites/square mile.

Sites within the UNF are classified into two types: prehistoric and historic. Documented prehistoric sites reflect temporally broad and mostly seasonal use of the Forest. Although culturally diagnostic artifacts are rare, those documented suggest Archaic through Late Prehistoric use along the Wasatch Range and Paleo-Indian through Late Prehistoric use in the Vernon area. Documented historic sites suggest temporary and sporadic use as indicated by trash scatters, camps, etc., and long-term use associated with mineral extraction, logging, and ranching. Of the 522 documented archaeological sites, 173 (33 percent) are eligible for the National Register of Historic Places, 259 (49 percent) are not eligible, and 66 (13 percent) are unevaluated for eligibility. In addition, 24 sites (5 percent) are of unknown National Register status.

3.12.3 Affected Environment

Methodology

The data described and utilized here comes from a Class I data review conducted by personnel at the UNF Supervisor's Office in Provo, Utah. Tables, including information regarding previously conducted cultural resource investigations and documented archaeological sites were generated from GIS coverages and the Forest Service Corporate Heritage Resources Infrastructure Database provided by the UNF. Additionally, in order to determine site type and distribution across the Forest, site tables were generated for each of the nine RFOGDs. Site tables include, when available, state number, Forest number, site type, cultural affiliation, and National Register eligibility status. Condensed site tables are also provided below in the site type and distribution per RFOGD section.

Cultural Resource Inventories

The Class I data review revealed 447 previously conducted cultural resource inventories and research-related projects on UNF system lands. Compliance and management projects include locating cultural resources in advance of road and trail construction, timber sales, land exchanges, pipeline and powerline construction, and recreational facility improvements. Generated from GIS coverages, table 3.41 illustrates the approximated total acreage of, and surveyed acreage within, each RFOGD. As the table indicates, moderate to intensive survey has occurred in the Diamond Fork, Spanish Fork, Strawberry, and Upper Provo RFOGDs, while low to moderate survey has occurred in the American Fork, Currant Creek, Deer Creek, Payson, and Vernon RFOGDs. Research-oriented investigations, as opposed to compliance and management inventories, include limited archaeological testing and various types of mitigation efforts. While small in scale, such studies typically occur in conjunction with a host of research questions or hypotheses archaeologists aim to answer or test. Research-oriented projects conducted on UNF system lands include the American Fork Cave test excavations, Passport in Time projects near Vernon, the Wolf Springs site excavation, and military camp excavations in Strawberry Valley.

With less than 10 percent of the UNF inventoried for cultural resources, it is difficult to predict site type, location, and density. The vast majority of surveys have been conducted in advance of development projects. Therefore, the documented types, numbers, and distributions of sites may not reflect the UNF as a whole. Additionally, biases, such as access, rugged topography, elevation, geology, and other factors, may have contributed to a skewed representation of cultural resource density and distribution. However, given the available information, rough predictions can be made regarding site density and type, particularly if the Vernon group is treated separately and the remaining eight groups are combined.

As previously noted, the majority of sites documented on the UNF occur in the Vernon Group. Interestingly, this high site density does not appear to reflect survey intensity as only 8.6 percent of the group has been inventoried. Regardless, we can anticipate that site density within the Vernon group is approximately 13.4 sites/square mile. The American Fork Group also has a high site density; the estimated density of 14.5 sites/square mile reflects a very high frequency of mining related sites such as adits and mining camps. In the remaining seven RFOGDs the expected site density ranges between 1.3 and 5.2 sites/square mile.

Table 3.41. Total acreages and survey intensity per RFOGD.

RFOGD	Total Acres	Acres Surveyed	% of Area Surveyed	# Sites Recorded	Estimated Sites/mile ²
Currant Creek	84,480	6,049	7.2	21	0.2
Deer Creek	173,544	9,607	5.5	38	0.1
Diamond Fork	97,060	23,507	24.2	46	0.3
Payson	119,863	4,175	3.5	34	0.2
Spanish Fork Canyon	44,320	4,985	11.2	36	0.5
Strawberry	175,330	20,139	11.5	57	0.2
American Fork	58,090	3,437	12.2	78	0.9
Upper Provo	53,754	6,533	12.2	31	0.4
Vernon	91,030	8,614	9.5	180	1.3

Archaeological Site Typology

Approximately 522 archaeological sites have been entered into the UNF Heritage Resource database. Archaeological sites identified fall into a qualitative typology provided by the UNF Heritage Resource program. Initially, sites are classified as either prehistoric or historic. Prehistoric site types include rock art, lithic scatters/concentrations, rock shelters, animal processing locations, ceramic scatters, or lithic quarries. Within the database, cultural affiliation is provided only when temporally diagnostic artifacts (i.e., projectile points, rock art, or ceramics) are present. If diagnostic artifacts are absent, cultural affiliation is Unknown Aboriginal. Generally, historic sites consist of a variety of site types related to mining, farming/ranching, logging, development, administrative and/or Civilian Conservation Corps/Works Progress administration, and recreation. There are also many historic sites across the forest that cannot be easily classified into general land use schemes.

The following is a brief description of the prehistoric site types documented on UNF system lands. Prehistoric rock art sites consist of petroglyphs and pictographs. Petroglyphs include those elements of rock art that are etched, carved, or pecked onto a rock surface, and pictographs are painted with organic or mineral pigments. Rock art ranges from individual elements to complexes containing numerous panels. Prehistoric lithic scatters/concentrations consist of open sites containing lithic debris scattered across the surface. Typically, lithic scatters often do not contain any surface indications of features such as hearths, grinding slicks, or architecture, but may contain buried features. Prehistoric rock shelters are those sites that include artifacts, ephemeral features, or both, that occur in a natural rock alcove. Prehistoric animal processing sites include artifacts consistent with animal butchering and processing. Artifacts may include, but are not limited to, knives, utilized flakes, and scrapers. Prehistoric ceramic scatters consist of open sites containing ceramic shards scattered across the surface. Generally, ceramic scatters do not contain any indications of features such as hearths or architecture. Prehistoric lithic quarries include artifacts consistent with tool-stone raw material acquisition. Artifacts may include tested cobbles, cores, early flake stages, and hammerstones.

The following is a brief description of historic sites documented on UNF system lands. Historic mining sites can include adits, shafts, or mining camps. Generally located in higher elevations, mining sites are most common in the Sheeprock and Wasatch Ranges. Farming/ranching sites include corrals, irrigation ditches, homesteads, log buildings, earthen features, or trash dumps.

Farming/ranching sites are scattered across the Forest and typically occur in lower elevations near permanent water sources.

Logging sites include camps, portable saw mills, and trash scatters. Generally, logging sites occur in higher elevations near permanent water sources. Administrative sites include United States Forest Service facilities and/or Civilian Conservation Corps/Works Progress Administration locations. These sites include terraces, ranger cabins, camp sites, trash dumps, or earthen features.

Development sites include railroad camps or grades; linear features such as trails or roads; reclamation features including ditches, berms, or earthen dams and camp sites.

3.12.4 RFOGDs

Currant Creek

Of the nine RFOGDs, the Currant Creek group includes the fewest number (20) of documented archaeological sites (see table 3.42). The low total may reflect minimal inventory (GIS coverages indicate few surveys have been conducted in this area) or a lack of prehistoric or historic occupation in the region. Regardless, of the 20 sites, five are prehistoric, 12 are historic, and three are of unknown cultural affiliation.

Without exception, all prehistoric sites are lithic scatters of Early Archaic, General Archaic, or Unknown Aboriginal cultural affiliation. Of the five prehistoric sites, two are eligible, one is not eligible, and two are unevaluated for eligibility.

The historic sites of European/American affiliation include three log structures, two portable saw mills, two corrals, two historic trash dumps, one camp site, and two sites of unknown type scattered across the region. Of the 12 historic sites, three are eligible, eight are not eligible, and one is unevaluated for eligibility.

Sites identified in the Currant Creek Group include both prehistoric and historic cultural resources, though the diversity in the historic record is greater than its prehistoric counterpart. The prehistoric sites reflect a long period, although apparently sporadic, of use in the area dating to at least the early Holocene. The presence of a single prehistoric site type, lithic scatters in this case, likely indicates relatively unintensive, temporary land use, likely for the procurement of specific subsistence resources. Conversely, the historic site types are more diverse and indicate multiple land uses including ranching and timber harvesting. The presence of log structures likely indicate either long-term or multiple, possibly sequential occupations of portions of the Currant Creek area.

Table 3.42. Sites located within the Carrant Creek RFOGD.

Site Type	Cultural Affiliation	# of Sites
Lithic Scatter/Concentration	Unknown Aboriginal	3
Lithic Scatter/Concentration	Archaic (General)	1
Lithic Scatter/Concentration	Early Archaic	1
Log Structure	European/American	3
Portable Saw Mill	European/American	2
Corral	European/American	2
Historic Trash Dump	European/American	2
Camp Site	European/American	1
Unknown	European/American	2
Unknown	Unknown	3
Total		20

Deer Creek

A total of 38 sites, including 10 prehistoric, 22 historic, and six sites of unknown type are located within the Deer Creek group, site type, cultural affiliation, and National Register eligibility status are identified in (see table 3.43).

Prehistoric sites include six lithic scatters of unknown cultural affiliation, three Fremont rock art sites, and one Fremont lithic scatter. The lithic scatters are located in the northwestern and northeastern portion of the area, while the rock art sites are located along the western side of the Wasatch Range east of Provo. Prehistoric sites include six eligible, two non-eligible, and two unevaluated for National Register inclusion.

Historic sites of European American affiliation include five trash dumps, three Civilian Conservation Corps-related sites, two irrigation ditches, two corrals, two flumes, two mining camps, one historic inscription/rock art panel, one mining-related site, one earthen feature, one linear feature, and two sites of unknown type. Generally, the historic sites are located along major transportation corridors or Forest access roads. Of the 22 historic sites, four are eligible, thirteen are not eligible, and five are unevaluated for eligibility.

Although the majority of the prehistoric sites remain ambiguous in regard to cultural affiliation, there is a clear indication of late prehistoric use of the Deer Creek area by Fremont peoples. Collectively, the presence of lithic scatters with few, if any, indications of features, suggest temporally-limited land use practices geared towards the collection of specific subsistence resources. As elsewhere throughout the Great Basin and northern Colorado Plateau, the occurrence of rock art remains a functional mystery; however, its presence is indicative of some form of communication system, possibly relating to hunting conditions or territoriality. The richness of historic site types is moderately high and implies multiple types of land use. Two land uses include ranching and mining activities.

Table 3.43. Sites located within the Deer Creek RFOGD.

Site Type	Cultural Affiliation	# of Sites
Lithic Scatter/Concentration	Unknown Aboriginal	6
Rock Art	Fremont	3
Lithic Scatter/Concentration	Fremont	1
Historic Trash Dump	European/American	5
Multiple Site Types associated with the Civilian Conservation Corps	European/American	3
Irrigation Ditch	European/American	2
Corral	European/American	2
Flumes	European/American	2
Mining Camp	European/American	2
Rock Art	European/American	1
Mining-related	European/American	1
Earthen Feature	European/American	1
Linear Feature	European/American	1
Unknown	European/American	2
Unknown	Unknown	6
Total		38

Diamond Fork

The Diamond Fork group includes 41 documented archaeological sites of which 2 are prehistoric, 37 are historic, and 2 are of unknown type, cultural affiliation, and eligibility (see table 3.44).

Prehistoric sites include one Early Archaic lithic scatter and one Late Prehistoric lithic scatter. The former is listed as eligible for inclusion on the National Register, and the latter has been determined not eligible. Historic sites of European/American affiliation include seven homestead/ranching locations, six camp sites, five trash dumps, five earthen dams, three corrals, one linear feature, two USFS administrative sites, one irrigation ditch, one mining site, one recreation site, one historic community, and four sites of unknown type. There are 13 eligible, 22 non-eligible, and two unevaluated historical sites.

Despite the relatively high survey intensity, the site density on the Diamond Fork Group is low, particularly in regard to prehistoric sites. That only two prehistoric sites have been identified in the group implies a very low intensity of use. While many factors affect site preservation, post-despositional process alone cannot account for the low prehistoric site frequency. It remains to be determined why so few prehistoric sites occur in this group relative to other parts of the forest and surrounding areas. The number of historic sites in the group is significantly higher than prehistoric sites, but the overall site density is still low. Both ranching and water conservation activities are common in the Diamond Fork area, though the data is unclear on the strength of association between these two activities. Likewise, the relationship between the ranching-related sites and the numerous historic trash scatters and camps remains unevaluated. The presence of spatially associated ranching sites, camps, trash scatters, and water conservation features are probably manifestations of the same historic economic system. Other land uses such as mining and recreation are of secondary economic importance.

Table 3.44. Sites located within the Diamond Fork RFOGD.

Site Type	Cultural Affiliation	# of Sites
Lithic Scatter/Concentration	Early Archaic	1
Lithic Scatter/Concentration	Late Prehistoric	1
Homestead/Ranching	European/American	7
Camp Site	European/American	6
Historic Trash Dump	European/American	5
Dams	European/American	5
Corral	European/American	3
Linear Feature	European/American	1
USFS Administrative Site	European/American	2
Irrigation Ditch	European/American	1
Mining Site	European/American	1
Recreation Site	European/American	1
Historic Community	European/American	1
Unknown	European/American	4
Unknown	Unknown	2
Total		41

Payson

The Payson group includes 34 archaeological sites of which four are prehistoric, 27 are historic, and three are of unknown type, cultural affiliation, and eligibility (see table 3.45).

Prehistoric sites include two lithic scatters, one lithic quarry of unknown aboriginal cultural affiliation, and one Ute military site. The latter is the original burial location of Ute Chief Blackhawk. Of the four prehistoric sites, two are not eligible and two are unevaluated for eligibility.

Historic sites of European/American affiliation include ten mining-related locations, five trash dumps, three earthen features, two USFS administrative sites, two Civilian Conservation Corps sites, one linear feature, one flume, one logging camp, one portable saw mill, and one road/trail. Of these, seven are eligible, twelve are non-eligible, and eight are unevaluated for eligibility.

Prehistoric use of the Payson Group area is similar to other areas across the forest in that the number of sites is very low and limited primarily to ephemeral subsistence-related activities. However, the presence of a prehistoric lithic quarry suggests that raw material procurement also occurred. Historically, mining and timber harvesting were important economic activities.

Table 3.45. Sites located within the Payson RFOGD.

Site Type	Cultural Affiliation	# of Sites
Lithic Scatter/Concentration	Unknown Aboriginal	2
Lithic Quarry	Unknown Aboriginal	1
Military	Ute	1
Mining Camp, Adit, or Shaft	European/American	10
Historic Trash Dump	European/American	5
Earthen Feature	European/American	3
USFS Administrative Site	European/American	2
Civilian Conservation Corps	European/American	2
Linear Feature	European/American	1
Flume	European/American	1
Logging Camp	European/American	1
Portable Saw Mill	European/American	1
Road/Trail	European/American	1
Unknown	Unknown	3
Total		34

Spanish Fork Canyon

Scattered mostly along the southern boundary of the area, the Spanish Fork Canyon group includes 36 sites of which five are prehistoric, 30 are historic, and one is of unknown type, affiliation, and National Register status (see table 3.46).

The prehistoric sites consist of four lithic scatters of unknown aboriginal affiliation and the only documented Traditional Cultural Property on the Forest. Of the five prehistoric sites, two are eligible, two are not eligible, and one is unevaluated for eligibility.

Historic sites include 10 trash dumps, seven camp sites, six logging sites, three corrals, two mining-related sites, and two homestead/ranching locations. Of these, eight are eligible, 21 are not eligible, and one is unevaluated for eligibility.

While the lithic scatters in the group portray a fairly limited use of the area, the historic use is substantially more diverse, reflecting multiple economic activities including ranching, timber harvesting, and to a limited extent, mining. The distribution and frequency of ephemeral historic sites, such as camps and trash scatters, however, cannot be tied to any particular economic endeavor.

Table 3.46. Sites located within the Spanish Fork Canyon RFOGD.

Site Type	Cultural Affiliation	# of Sites
Lithic Scatter/Concentration	Unknown Aboriginal	5
Historic Trash Dump	European/American	10
Camp Site	European/American	7
Logging	European/American	6
Corral	European/American	3
Mining Site	European/American	2
Homestead/Ranching	European/American	2
Unknown	Unknown	1
Total		36

Strawberry

A total of 56 sites, including 21 prehistoric, 34 historic and one site of unknown type, cultural affiliation, and National Register eligibility status are located within the Strawberry group (see table 3.47).

Prehistoric sites include 15 lithic scatters of unknown aboriginal affiliation, five Archaic (general) lithic scatters, and one Late Archaic lithic scatter. Of these, 15 are eligible, five are not eligible, and one is unevaluated for eligibility.

Historic sites include eight trash dumps, eight corrals, four earthen features, three earthen dams, two historic communities, two military sites, two USFS administrative sites, one log building, one mine shaft or adit, one road/trail, one irrigation ditch, and one camp site. Of these, seven are eligible, 26 are not eligible, and one is unevaluated for eligibility. Although small clusters are present in the northern and central portions of the region, generally, sites are well distributed throughout the area.

Relative to the other groups, except the Vernon group, the frequency and density of prehistoric sites in the Strawberry Group are particularly high even when survey intensity is taken into consideration. The few temporal indicators identified in the lithic scatters indicate a long use of the area by aboriginal inhabitants dating to at least the middle Holocene. Despite the longevity of use, the lack of any site types other than lithic scatters point to only limited or transitory subsistence behavior of the prehistoric peoples, regardless of cultural affiliation. Similarly, the majority of historic sites also appear to be mostly ephemeral and related to ranching activities. While the Strawberry Group contains two mining-related communities, there is only one recorded mine adit, suggesting that such activity is underrepresented in the existing data.

Table 3.47. Sites located within the Strawberry RFOGD.

Site Type	Cultural Affiliation	# of Sites
Lithic Scatter/Concentration	Unknown Aboriginal	15
Lithic Scatter/Concentration	Archaic (General)	5
Lithic Scatter/Concentration	Late Archaic	1
Historic Trash Dump	European/American	8
Corral	European/American	8
Earthen Feature	European/American	4
Dam	European/American	3
Historic Community	European/American	2
Military Site	European/American	2
USFS Administrative Site	European/American	2
Log Building	European/American	1
Mine Adit or Shaft	European/American	1
Road/Trail	European/American	1
Irrigation Ditch	European/American	1
Camp Site	European/American	1
Unknown	Unknown	1
Total		56

American Fork

A total of 77 sites, including 11 prehistoric, 65 historic, and one site of unknown type and cultural affiliation, are located within the American Fork group (see table 3.48).

Although uncommon, prehistoric site types, which include five lithic scatters, four rock art sites, one rock shelter, and one animal processing location, have a relatively high diversity. The presence of archaic rock shelters may reflect seasonal, as opposed to transitory, use of the area, further reflecting a possible difference in socio-spatial organization relative to other areas across the forest (e.g. foraging rather than logistically-related subsistence pattern). As noted for the Deer Creek Group, the presence of rock art is related to communication systems, but is functionally ambiguous. Prehistoric cultural affiliation includes Archaic and Fremont. Of the 11 prehistoric sites, eight are eligible, one is not eligible, and two are unevaluated for eligibility.

Historic sites of European/American cultural affiliation include 50 mining camps, adits or shafts, two USFS administrative facilities, two Civilian Conservation Corps sites, two historic trash dumps, one human burial, one railroad grade, one flume, one earthen feature, and five sites of unknown type. Of the 65 historic sites, 17 are eligible, 38 are not eligible, and 10 are unevaluated for eligibility. The single site of unknown type and cultural affiliation is also of unknown National Register status.

Generally, the prehistoric sites cluster along canyon bottoms near permanent water sources, suggesting prehistoric land use was influenced by the steep topography of the region. However, the number and distribution of prehistoric sites may simply reflect survey intensity as transportation and riverine corridors have likely received more archaeological attention. As expected, mining sites associated with the American Fork Mining District clustered in the northeast section of the region, are the dominant historic site type in the area.

Table 3.48. Sites located within the American Fork RFOGD.

Site Type	Cultural Affiliation	# of Sites
Lithic Scatter/Concentration	Unknown Aboriginal	2
Lithic Scatter/Concentration	Archaic (General)	2
Lithic Scatter/Concentration	Fremont	1
Rock Art	Archaic (General)	2
Rock Art	Fremont	2
Rock Shelter	Archaic (General)	1
Animal Processing Site	Archaic (General)	1
Mining Camp, Adit, or Shaft	European/American	50
USFS Administrative Site	European/American	2
Civilian Conservation Corps	European/American	2
Historic Trash/Dump	European/American	2
Human Burial	European/American	1
Railroad Grade	European/American	1
Flume	European/American	1
Earthen Feature	European/American	1
Unknown	European/American	5
Unknown	Unknown	1
Total		77

Upper Provo

A total of 31 sites, including 11 prehistoric, 19 historic, and one site of unknown type, cultural affiliation, and National Register status are located in the Upper Provo group (see table 3.49).

Prehistoric sites include 11 lithic scatters of either unknown aboriginal affiliation or Archaic affiliation. Of these, four are eligible, six are not eligible, and one is unevaluated for eligibility.

Historic sites of European/American affiliation include 13 portable saw mills, one trash dump, one logging site, one USFS administrative site, one Civilian Conservation Corps site, and one site of unknown type. Of these, five are eligible and 13 are not eligible for National Register inclusion. The majority of documented sites are located in the eastern portion of the region.

Given that the majority of the lithic scatters in the area are unaffiliated and have limited interpretative potential without additional research. That the known sites are clustered toward the middle of the Upper Provo Group reflects survey intensity and not necessarily behavioral patterning. Just under half of the historic sites relate to timber harvesting. There are few sites related to other economic activities in the group.

Table 3.49. Sites located within the Upper Provo RFOGD.

Site Type	Cultural Affiliation	# of Sites
Lithic Scatter/Concentration	Unknown Aboriginal	9
Lithic Scatter/Concentration	Archaic (General)	2
Portable Saw Mill	European/American	13
Historic Trash Dump	European/American	1
Logging	European/American	1
USFS Administrative Site	European/American	1
Multiple Site Types associated with the Civilian Conservation Corps	European/American	1
Unknown	European/American	1
Monument	Asian/American	1
Unknown	Unknown	1
Total		31

Vernon

A total of 179, or 34 percent of all sites entered into the UNF Heritage Resource Database are located within the Vernon group (see table 3.50). Of the 179 sites, 104 are prehistoric, 72 are historic, and three are of unknown type, cultural affiliation, and National Register status. Most significantly, the prehistoric sites, including lithic scatters, ceramic scatters, and lithic quarries, span the entire prehistory of the North America from Paleo-Indian through Late Prehistoric times. Of these, 49 are eligible, 30 are not eligible, 23 are unevaluated, and two are of unknown National Register status.

Historic sites include 51 mining sites, seven homestead/ranching locations, five historic trash dumps, three camp sites, three earthen features, one irrigation ditch, one logging site, and one USFS administrative facility. Of these, 20 are eligible, 49 are not eligible, and three are unevaluated for eligibility.

There is strong spatial clustering of sites within the Vernon Group; this clustering is among sites in general and within the two major temporal divisions (prehistoric and historic). Clustering of historic sites is influenced by the high frequency of mining-related sites. Qualitatively, the location of lithic quarries, the general topography of the area, and the distance to water appear to strongly sway the location of prehistoric sites.

Table 3.50. Sites located within the Vernon RFOGD.

Site Type	Cultural Affiliation	# of Sites
Lithic Scatter/Concentration	Unknown Aboriginal	75
Lithic Scatter/Concentration	Early Archaic	8
Lithic Scatter/Concentration	Fremont	8
Lithic Scatter/Concentration	Paleo-Indian	5
Ceramic Scatter	Fremont	2
Unknown	Unknown Aboriginal	2
Lithic Scatter/Concentration	Archaic (General)	1
Lithic Scatter/Concentration	Late Prehistoric	1
Lithic Quarry	Late Prehistoric	1
Lithic Quarry	Unknown Aboriginal	1
Mining Camp, Adit, or Shaft	European/American	51
Homestead/Ranching	European/American	7
Historic Trash Dump	European/American	5
Camp Site	European/American	3
Earthen Feature	European/American	3
Irrigation Ditch	European/American	1
Logging Site	European/American	1
USFS Administrative Site	European/American	1
Unknown	Unknown	3
Total		179