

CHAPTER 3

AFFECTED ENVIRONMENT

Chapter 3 describes the physical, biological and human resources which may be affected by implementation of any of the proposed alternative programs for oil and gas leasing. The study area encompasses portions of the Uinta and Ashley NFs, rated as having a high to medium potential for oil and gas resources. Approximately 203,670 acres are within the Ashley NF and 197,270 acres are within the Uinta NF for a total of approximately 400,940 acres in the study area. Included within this study area are the south unit of the Duchesne Ranger District (Ashley NF) and an area to the west and south of Strawberry Reservoir on the Uinta NF.

Information presented in this chapter describes the existing conditions and is used to determine and compare the anticipated effects of various alternatives. Twelve separate sections are presented to address key issues identified during public scoping and by Forest Service resource specialists. Each section gives (1) a general description of the resource, (2) information on Forest Service management direction as given in the Ashley and Uinta NF Land and Resource Management Plans (Forest Plans), (3) identification of the issue(s) associated with the resource, and 4) if needed, a further discussion on specific sensitive components of the resource which were identified as of special concern.

3.1 GEOLOGY/MINERALS

This section provides a description of the existing condition of and the issues related to geology and minerals that could be affected by oil and gas leasing in the Western Uinta Basin. Geology as it relates to groundwater is discussed in Section 3.2, Watershed Resources. The reader is referred to the glossary (Chapter 8) for an explanation of geologic terms used in this section.

3.1.1 General Description

The study area is located in portions of the Tavaputs Plateau of the Colorado Plateau province and the adjacent Wasatch Hinterlands sub-section of the Middle Rocky Mountains province (Stokes 1986). Most of the Ashley NF portion of the study area lies within the

Book Cliffs-Roan Plateau sub-section and most of the Uinta NF portion of the study area lies within the southern end of the Wasatch Hinterlands sub-section (Stokes 1986). The dividing line between the two physiographic sub-sections is roughly defined by the southwest-northeast trending Willow Creek Ridge and the eastern drainage divide for Tie Fork Creek.

Cenozoic and Mesozoic rock formations are exposed at the surface within the study area (State of Utah Geologic and Mineral Survey 1980). The predominate Cenozoic units in descending order are the Uinta Formation, Green River Formation, Wasatch/Colton Formation, and North Horn Formation. The Uinta and Green River formations form the upland plateaus surfaces and canyon walls which comprise much of the study area. Exposed Wasatch/Colton, North Horn, Price River, Flagstaff, and the mesozoic rocks (including in descending order the Mesaverde, Morrison, Curtiss, Entrada sandstone, Carmel, Nugget sandstone, and Chinle shale-Garten sandstone) are present only below Strawberry Ridge in the incised canyons of Diamond Fork Creek and its tributaries and Spanish Fork Canyon.

Strata in the study area range in age from Precambrian to Tertiary (Eocene). Stratigraphic units from the Ordovician, Devonian, Silurian, and later Tertiary periods are missing from the record (State of Utah Geologic and Mineral Survey 1980). The stratigraphic column is characterized by Precambrian metasedimentary and siliciclastic rocks, Cambrian sandstone, shale, and carbonate rocks, Late Paleozoic carbonates and sandstones, Mesozoic sandstones and shales, and Cenozoic sandstones, shales, and conglomerates. Paleozoic and Precambrian rocks are present in the subsurface only.

The structural features east of Strawberry Ridge are associated with Laramide phase deformation of paleocene and eocene age. The study area is located on the south flank of the asymmetrical synclinal Uinta Basin downwarp which is linked to the uplift of the Uinta Mountains north of the study area. Beds dip northeastward at approximately 10 degrees. Northeast trending anticlinal noses and faults are present in the Strawberry Ridge area.

The Strawberry Thrust is the main structural feature that controls stratigraphy in the western end of the study area. Much of the Wasatch Range Fault block is located on the upper plate of the west dipping Strawberry Thrust sheet. The Strawberry Thrust is part of the Sevier orogenic belt and is mid-Jurassic to Eocene in age. Displacement along the fault

is often more than 5 miles. Displacement of the thrust sheet in the study area has created folds within the strata of the sheet. Two folds, the Thistle Dome Anticline and the Diamond Fork Anticline exist within the study area (Walton 1954). Several oil and gas exploration wells have been drilled on these anticlinal features.

3.1.2 Forest Plan Management Direction

For geologic resources, both the Ashley and Uinta Forest Plans address only the minerals and energy component. The Ashley Forest Plan defines the following goals for the management of the resources:

- Provide orderly exploration, development, and production of mineral and energy resources consistent with the use and protection of the other resource values.

The Uinta Forest Plan defines the following goals for the management of their mineral/energy resources:

- Manage activities related to energy minerals including oil and gas in conformance with objectives of the Forest Plan and in accordance with mineral laws, regulations, and policies.
- Based on a valid "purpose and need" for energy production and transmission, cooperate with energy companies, private individuals, and other government agencies to provide space for facilities consistent with laws, regulations, and policies established for the protection and management of National Forest resources and uses.

3.1.3 Issues

The public scoping process produced three issues related to geology/minerals (see Section 1.8):

Issue 6: The effects of restrictive stipulations and mitigation measures on oil and gas exploration and development

Issue 7: The effects of oil and gas leasing and subsequent activities on soils and geologic formations

Issue 13: The effects of oil and gas exploration and development on other mineral resources and production

Specific areas of concern summarized in Issue 6 are the possible development and application of stipulations/mitigations that would be restrictive to oil and gas development. This issue is addressed as part of the overall analysis presented in this EIS. Issue 7 summarizes concerns regarding effects of oil and gas activities on the stability of soil and geologic materials, and in turn, the hazards posed by unstable soils and/or geologic materials to potential oil and gas development activities/facilities. These concerns are addressed in the subsequent Section 3.2 Watershed Resources of this EIS. Issue 13 summarizes concerns raised over the potential effects of oil and gas development on other mineral development and exploration.

In response to the above scoping issues for this leasing analysis, the presence of minerals (includes oil and gas) and accessibility to mineral resources from both the regulatory and technical capability aspects were identified as sensitive resource components related to geology/minerals and are described in the following section.

3.1.4 Sensitive Resource Component(s)

Mineral Resources

Federally owned mineral resources are separated by laws and regulations into categories of locatable, saleable, and leasable. Within the Western Uinta Basin study area, no specific mineral development proposals for locatable minerals (i.e., precious metals, copper, and molybdenum) or saleable minerals (i.e., sand, gravel, and stone) have been identified. Several sites within the study area have likely provided gravel for FS road and facilities construction and maintenance. The principal minerals of interest within the study area are oil and gas deposits.

The existence of geologic formations and structures that are important to the formation and storage of hydrocarbons, particularly natural gas, make the study area potentially attractive for exploration and development by the petroleum industry. The Uinta Basin play is the principal prospective oil and gas play in the study area. This play comprises approximately 380,000 acres of high potential areas within the approximately 400,940-acre study area. An area of moderate potential is located along the western edge of the study area on the Uinta NF (Figure 3-1). Detailed geologic and petroleum information are provided in the project files (Kaldenback 1991a and b).

Slipsheet for Figure 3-1

Historic Activity. Oil and gas production in or near the study area is found in two producing fields and one shut-in field. Production from the Gulf #1 Chokecherry in 1959 started the first flurry of drilling activity in the study area which lasted until 1966. Two of the oil wells produced a cumulative total of 9,700 barrels of oil before they were abandoned. Subsequently, starting in 1976, five additional wells were drilled which showed proven gas production potential from the Green River Formation. These wells, known collectively as the Sowers Canyon field are currently shut-in (see Figure 1-2). This field is awaiting the construction of a gathering system and sales pipeline before production becomes viable.

Other production near the study area includes the Altamont-Bluefield field in the center of the Uinta Basin. Production is from naturally fractured reservoirs in the Tertiary Wasatch and Green River Formations at depths down to 17,000 feet. Two miles north of the study area, the Brundage Canyon Field has produced over one million barrels of oil and 1.6 million cubic feet (Mmcf) of gas from Green River Formation sandstones. The Duchesne field is located approximately 10 miles north of the Sowers Canyon area, southwest of the city of Duchesne. Production is from the Uinta, Green River, and Wasatch Formations.

Fluids. Hydrocarbon accumulations in the eastern portion of the study area, including the Sowers Canyon area, are usually controlled by stratigraphic traps. Stratigraphic controls include composition, thickness, distribution, porosity, and permeability of the rock beds. Structural controls are more dominant in the western portion of the study area due to the presence of two northeast plunging anticlinal noses. In order for these structures to successfully trap hydrocarbons, an up-dip barrier such as a fault or stratigraphic change also needs to be present. There are traps present throughout the study area that will trap hydrocarbons. The difficulty is finding the structural and stratigraphic components in favorable positions relative to each other to form the seals necessary to trap oil and gas.

Although both oil and gas have been produced in the study area, gas is the primary hydrocarbon produced. Much of the study area to the east will have more of a stratigraphic component for concentrating hydrocarbon deposits because the area is part of the Uinta Basin play with traps created by stratigraphically controlled porosity and permeability variations in the Green River and Wasatch Formations. Production in the eastern portion of the study area will likely come from the Tertiary Green River Formation at depths of

approximately 4,500 feet. Only two wells in this area produced oil in minor quantities and were subsequently abandoned.

Commercial accumulations of oil and gas have not been found in the western portion of the study area to date. The closest productive areas are 20 miles east of Strawberry Reservoir and 30 miles south of the reservoir, including the Nutter Canyon, Castle Peak, and Duchesne fields. Several wells have been drilled as a result of two oil and gas plays in the area: the Uinta Basin play and the Strawberry Thrust play. The Uinta Basin play is again the most prospective oil and gas play in this part of the study area. Fourteen wells have been drilled in this play within the study area. The target zones were the Permian-Pennsylvanian Park City Formation and the Tertiary Green River and Wasatch Formations. The most significant show of oil occurred five miles southeast of Strawberry Reservoir where Gulf #1 Tribal well reported 120 feet of highly gas cut oil on a drill stem test. Thistle dome has been the target of 2 exploratory wells and the most recent well was drilled by Petroleum Inc. seven miles northeast of the old Gulf #1 Tribal well.

The Strawberry Thrust play at the western end of the study area is composed of two large anticlinal noses in the study area that have been targets for oil and gas drilling in the past. Within the study area, nine wells have been drilled in this play. All of the wells were drilled on the Diamond Fork Anticline. Drill stem tests indicated that test intervals in the Park City and Oquirrh Formations lacked permeability.

Land/Mineral Ownership. The Mineral Leasing Act of 1920, as amended, and the Mineral Leasing Act of 1947, as amended, provide that all public lands are open for oil and gas leasing unless a specific order has been issued to close the area. There are approximately 438,500 acres within the Western Uinta Basin study area. Currently, there are six federal leases involving approximately 6,393 acres on the Ashley NF portion of the study area and one lease of 880 acres on the Uinta NF portion of the study area. Private, tribal and other mineral rights cover approximately 95,700 acres (see Figure 1-2).

Leasing itself does not directly affect NFS lands. National Forest resources are affected when the lessee acts upon the rights granted under a lease. An oil and gas lease grants rights to extract and develop these resources as stated in the following excerpt from a typical oil and gas lease:

This lease is issued granting the exclusive right to drill for, mine, extract, remove and dispose of all oil and gas (except helium) in the lands described in item 3 together with the right to build and maintain necessary improvements thereupon for the term indicated below, subject to renewal or extension in accordance with the appropriate leasing authority. Rights granted are subject to applicable laws, the terms, conditions, and stipulations of the lease, the Secretary of the Interior's regulations and formal orders in effect as of the lease issuance, and to regulations and formal orders in effect as of the lease issuance, and to regulations and formal orders hereafter promulgated when not inconsistent with lease rights granted or specific provisions of this lease.

Leases are issued for a specific term under the Federal Onshore Oil and Gas Leasing Reform Act of 1987; competitive and noncompetitive leases are both issued for a primary term of 10 years. Within the study area, all leases not held by production will expire by the year 1997 unless production is established prior to lease expiration. Expired leases will become available for issuances under stipulations/limitations set by this EIS. A list of existing leases detailing the lease number, location, acreage, and expiration date is available in the project file. Current leases in the study area include stipulations for environmental protection in addition to the Standard Lease Terms.

Potential Hydrocarbon Production Areas. The Western Uinta Basin study area has been divided into three sub-areas based on occurrence potential for each forest. These three areas are described below.

Sowers Canyon area. The currently-shut-in Sowers Canyon field is located in the eastern third of the study area in the Ashley NF. This portion of the Ashley NF (Southern Duchesne Ranger District) has been rated high for oil and gas potential by the Forest Service in the reasonably foreseeable development scenario (RFDS) (Kaldenback 1991b). The location of the Sowers Canyon area is shown in Figure 1-1.

Stratigraphic controls are the primary mechanism for trapping hydrocarbons in the Sowers Canyon area. Primarily gas accumulations are trapped in Green River Formation sandstones due to updip changes in porosity and permeability as a result of facies and/or cementation variations. The only structural component is the gently dipping beds that dip

northeast at 10 degrees. Five shut-in wells comprise the Sowers Canyon field (See Figure 1-2). The initial production potential of these wells range from 200 mcf per day to 3000 mcf per day.

Pre-Tertiary formations may provide hydrocarbon occurrences in the Cretaceous Mesaverde formation, and the Ferron and Dakota Sandstones. Traps will be in the form of sandstone pinchouts or cementation variations.

The potential is quite high for oil and gas development in the Sowers Canyon field. The field has proven gas production from the Green River Formation with estimated gas reserves of 100 billion cubic feet (bcf) (Utah Division of Oil, Gas, and Mining 1977). Based on the estimate of reserves, this field could support the drilling of 30 additional development wells.

Based on estimates by the Energy Information Administration that natural gas prices could reach \$3.00 per mcf by the year 2000, it seems reasonable that development will begin around the year 2000.

The mineral rights in the Sowers Canyon area are owned by the federal government. Nearly all of the lands are currently held under active oil and gas leases, which indicates that interest is high in developing the hydrocarbons in this field.

Ashley NF - Outside of Sowers Canyon area. The remainder of the Ashley NF portion of the study area, outside the Sowers Canyon area, comprises the remainder of Southern Duchesne Ranger District and Unit C of the RFDS (see Appendix D) (Kaldenback 1991b). Stratigraphic traps in the Green River Formation similar to Sowers Canyon are expected to occur throughout this area. These traps involve sandstone pinchouts and cementation variations. In the western portion of Unit C, northeast trending structural noses and faults add a structural component to hydrocarbon entrapment. The Green River Formation remains only partially explored in the areas outside the Sowers Canyon area.

Only one well has penetrated the pre-Tertiary rocks on this unit. The Cretaceous Mesa Verde Formation, Ferron and Dakota Sandstones are the prospective horizons. Similarly, as with the Tertiary, stratigraphic and structural traps will control oil and gas accumulations in the pre-Tertiary strata. Stratigraphic traps will be the primary objectives in the eastern

half of the unit and stratigraphic traps with a structural component will be the objectives in the western half of the unit.

Potential for oil and gas remains high throughout the rest of Unit C. The production potential of the eastern portion of the unit could be delineated with two to four additional exploration wells. In the west, three to four exploration wells would be needed to test the Tertiary and deeper stratigraphic units. Based on an estimated average drilling rate of 0.3 wells per year, five additional explorations wells will be drilled in the next 15 years. This rate is calculated from past and current activity and the geological potential for oil and gas.

Mineral rights on Unit C are owned by the federal government. Almost all of the lands are held by oil and gas leases, which indicates that interest is high in the oil and gas potential of Unit C.

Uinta NF. The RFDS Units A and B of the Uinta NF are located on NFS lands west and south of Strawberry Reservoir (see Appendix D) (Kaldenback 1991a). Both stratigraphic and structural controls provide traps for hydrocarbon accumulations in the study area. In the eastern portion of Unit A, stratigraphic controls are the most dominant. Accumulations are related to facies and cementations changes in the Tertiary Green River and Wasatch/Colton Formations. In the western portion of Unit A, structural traps such as faults and structural noses associated with the Strawberry Thrust assist in trapping hydrocarbons. Prospective formations include the Tertiary Green River and the Cretaceous Mesaverde, and Ferron and Dakota Formations.

Unit B is located on the leading edge of the Strawberry Thrust. Traps are a combination of structural and stratigraphic. The structural traps include faults and anticlinal closures. The stratigraphic traps involve sandstone pinch outs and cementation changes in the Green River, Mesa Verde, Ferron, and Dakota Formations, and facies changes in carbonates of the Park City Formation.

Unit A is located in the Uinta Basin on the west end of the Uinta Basin play. The potential is high for occurrence of oil and gas in the area. Production has been established 20 miles east of the unit in the Uinta Basin. The same types of traps, source rocks, and reservoir rocks that exist there are present in Unit C of the Ashley NF portion of the study area.

Four of the 14 wells that were drilled on the unit reported shows of oil and gas. The 14 wells tested the most prospective areas, and only one well showed substantial volume of hydrocarbons. Many of the prime targets may have been tested for gas potential which could lower industry interest in Unit A of the Uinta NF. Based on the information presented in RFDS (Kaldenback 1991a), one well is expected to be drilled on Unit A in the next 15 years.

No oil and gas production currently exists on Unit B; however, established production exists 25 miles east of the unit in the Uinta Basin. The same source rocks and reservoir rocks that exist there are present in Unit B. Both structural and stratigraphic traps exist in the unit as previously discussed. The Diamond Fork Anticline, which is located on Unit B, has been a previous target for oil and gas exploration.

Most of the elements required for hydrocarbon accumulations are present in this unit; however, no significant shows of oil and gas have been reported from the seven wells drilled on the unit. These wells tested the most prospective targets. Therefore, interest in this area as an exploration target has been substantially reduced. Based on the above information, no wells are expected to be drilled in Unit B in the next 15 years (Kaldenback 1991a).

Over half of the mineral rights are held by the federal government. The remainder of the mineral rights are held privately or held in trust for Native Americans. A large percentage of the mineral rights on Unit A are not leased, indicating only moderate past interest for oil and gas exploration.

3.2 WATERSHED RESOURCES (GEOMORPHOLOGY, SOIL, WATER, VEGETATION)

This section describes the existing condition of and issues related to various watershed features such as geomorphology, soils, water resources, vegetation, and wetland and riparian areas in the study area. These features are often described separately in an EIS, but in this case they are combined because of their inherent interrelatedness and the issues brought up during scoping (e.g. concerns about erosive soils relate to surface water quality and gullyng, soil productivity and loss, and vegetation cover; concerns about wetlands and riparian areas relate to narrow canyon bottoms and water quality).

3.2.1 General Description

Geomorphology/Soil

Principal geomorphic features/landforms of the study area include:

- Mountain/hill crests, ridges, and sideslopes
- High ridges at the edge of plateau surfaces
- Plateau surfaces
- Canyon/valley sideslopes
- Canyon/valley bottoms

Soils forming on these landforms reflect the complexity of the geomorphic, geologic (parent material), and biological conditions; climatic conditions including precipitation and temperature as influenced by elevation, aspect, and slope; and man's activities including clearing, livestock grazing, and timber harvesting. The stability of both soils and subsurface geologic materials are also similarly affected by the combination of conditions and factors. Soil productivity, the ability of a soil to support protective vegetation to the extent land use goals are met, is also controlled by the same conditions and factors. Soil survey information for the study area are presented in the Land Inventory Survey for Uinta NF and the General Soils Survey for Ashley NF (available in the project file).

The part of the study area located roughly east/north of the elevation divides created by Strawberry, Willow Creek, and Reservation Ridges is dominated by a dissected plateau which slopes roughly 10 percent to the north-northeast. Elevations of the plateau drop from highs of over 10,000 feet to less than 7,000 feet. This plateau is dissected by a number of deeply incised drainages which drain into the Colorado River drainage basin. The principal drainages from east to west are the left and right forks of Antelope Canyon, Nutters Canyon, Wire Canyon, Sowers Canyon, Cottonwood Canyon, left and right forks of Indian Canyon, left and right forks of Lake Canyon, Avintiquin Creek, Timber Canyon, Slab Canyon, and Beaver Canyon. These drainages have created deep, steep-sided canyons/valleys. Most of these canyons/valleys contain segments of bottom lands which are narrow and/or have been gullied. Sandstones and shales of the surface-exposed Uinta, Green River, and Wasatch/Colton formations are the sources of soil parent material.

High Plateau Ridges. The ridges of the high plateau areas along Reservation Ridge, Willow Creek Ridge, and the ridges surrounding Timber Canyon are occupied by mostly cool to cold soils which have dark, organic-rich surface horizons (Borolls). Soil depths range from shallow to deep depending on parent material and geomorphic position. Textures are loamy skeletal to fine-loamy; some sandy-textured soils occur on an old surface above either side of Timber Canyon at about mid-canyon. Slopes of these ridge surfaces range from 1 to 35 percent.

Plateau Surfaces. The plateau surfaces of the study area occur mostly in the Ashley NF portion. Soils forming on these surfaces are a mix of Borolls, shallow depths to hard rock soils (Orthents), and dry, organic-poor (Orthids). Soils depths range from shallow to deep; textures are loamy skeletal and fine-loamy. Slopes of these surfaces range from 5 to 35 percent and trend generally to the north-northeast.

Canyon/Valley Sideslopes. Soils occurring on the canyon/valley sideslopes of the dissecting drainages are again a mix of Borolls, Orthents, and Orthids. Where soil is present on the mostly steep slopes, depths range from shallow to deep; depths are mostly shallow to moderately deep for most of the canyon sideslopes. Textures are predominantly loamy skeletal with some areas of fine-loamy on well stabilized slopes beneath conifer, aspen, or sagebrush. Slopes are steep to extremely steep ranging from 35 to 75 percent.

Canyon/Valley Bottoms. Soils of the canyon/valley bottoms range from mostly Borolls in upper valley bottoms and heads of drainages, to Orthents on 5 to 25 percent slopes of alluvial fans from tributary canyons, to recent alluvial soils (Fluvents) of the floodplains (2 to 5 percent slopes). Soil depths are mostly deep; textures range fully from fine to gravelly clays. Gullies with depths greater than 10 feet have developed in a number of side-canyons and in a number of the main drainage bottoms.

West and south of the ridge divides, the remainder of the study area is dominated by crests, ridges, and steep slopes of mountains/hills; remnant plateau surfaces and scarps, stream canyon sideslopes, and canyon bottoms. The predominate features are the deep canyons cut into the sedimentary strata on the fringe of the Uinta Basin and the remaining upland

mountain/hill and plateau/scarp highs. The White River watershed drains to the south of the ridge divides into the Colorado River Drainage basin. Upper Spanish Fork and Diamond Fork watersheds drain to the south and west of these divides into the Great Basin. Elevations range from highs of over 9,000 feet along Strawberry Ridge to a low of about 5,200 feet where Diamond Fork drainage leaves the study area. Sandstones and shales of the Uinta, Green River, Wasatch/Colton, and North Horn formations and smaller areas of exposed mesozoic rocks (see Section 3.1) are the principal sources of soil parent material in this portion of the study area.

Mountain/hill Crests/ridges/slopes. Soils of the mountains/hills are predominately Borolls; moist, organic-poor, young soils showing early evidence of development (Ochrepts); cool, light-colored (less organic matter) of woodlands (Boralfs), and intermittently dry to continuously dry in the summer Mollisols (Ustolls and Xerolls, respectively). Soil depths are shallow to deep depending on slope and position; textures are predominately loamy-skeletal (cobbly and gravelly loams). Slopes range fully from 3 to more than 70 percent.

Plateaus/scarps. Soils of the remnant plateau surfaces and scarp edges are predominately Borolls, Boralfs, and Ochrepts. Soil depths range from shallow to deep. Textures are sandy loams to loams on sandstone parent materials and clay loams on shale parent materials. Slopes range from about 5 to 35 percent.

Stream Canyon Sideslopes. Soils of the canyon sideslopes include predominately Borolls, Ustolls, Xerolls, Boralfs, Orthents, and Ochrepts. Soil depths range from shallow to deep; textures are mostly loamy skeletal with areas of fine-loamy and fine soils. Slopes range from about 25 to more than 70 percent.

Stream Bottoms. Soils of the stream canyon bottoms are Fluvents, Borolls, and Xerolls within the floodplain; warm and moist, dark, and organic-rich soils (Udolls) on the terraces above the floodplains. Soil depths are deep; textures are mostly loamy-skeletal. Slopes range from 3 to 8 percent in the bottoms to 15 percent on some of the upper terraces.

Surface Water

Water resources of the study area include 426 miles of perennial stream/reservoir, 1,279 miles of intermittent stream/ponds, 6 miles of aqueduct connecting Sixth Water Creek to Strawberry Reservoir, and 34 springs (USFS 1992a). Most of the intermittent streams originate as headwaters in the Ashley NF. Most of the perennial streams occur on the Uinta NF. The majority of the springs are located between Timber Canyon and Left Fork Indian Canyon on the Ashley NF.

Annual precipitation for the study area ranges from approximately 14 to 30 inches depending on elevation. Most precipitation occurs as snowfall during the October to April period. The area is also subject to local thunderstorm activity from May to September. On occasion, high streamflows can be caused by rainfall on snow or a thick snowpack that melts rapidly due to a rapid rise in temperature. In lower elevations (for example, western portion of the Ashley NF), high streamflows may also be caused by thunderstorms (USGS 1986).

Stream flow has been measured at several gaging stations within or near the study area by the U.S. Geologic Survey (USGS) since 1919. Table 3.2-1 summarizes basin, climatic, and discharge data for relevant gaging stations. The gaging stations within or just outside the boundary of the study area are found on Strawberry River, Diamond Fork, White River, Willow Creek, Tie Fork, Duchesne River, Hobble Creek, Current Creek, Spanish Fork, Sowers Creek, and the West Fork of Avintaquin Creek. Peak flows at these stations generally occur from May to July; however, flow on the Strawberry River is regulated by the Strawberry Dam as is the flow on Diamond Fork, much of which is diverted from Strawberry Reservoir to this drainage via a tunnel. Low flows generally occur between November and March (USGS 1991; USGS 1983).

Detailed stream descriptions are available for only select streams on the Ashley NF; specifically Sowers Canyon, Left Fork Indian Canyon, Right Fork Indian Canyon, Avintaquin Creek, Reserve Canyon, First Canyon, Horse Ridge Canyon, Mill Hollow, West Fork Avintaquin, and Timber Canyon (Table 3.2-2). These streams have been classified according to Rosgen's 1985 stream type classification system. In general, these streams are single thread

Slipsheet for Table 3.2-1

Slipsheet for Table 3.2-2

channels, well or moderately confined; parts of Avintaquin Creek are classified as unconfined. The width/depth ratio and sinuosity are generally lower toward the headwaters and higher further downstream. Stream slope is variable, with a tendency toward steeper slopes at the headwaters and more gradual slopes further downstream. Channel material consists primarily of gravel, cobble, or silt/clay. Left Fork Indian, Right Fork Indian, and Avintaquin Creek also have areas of sand substrate; boulders are found in Timber Canyon (USFS 1992b).

Primary uses of the surface water resources within the study area include recreation, wildlife and fish habitat, livestock watering, and water supply. Boating and fishing occur on Strawberry Reservoir. Several transmountain diversions lead to and from the reservoir. Water is primarily diverted from the Colorado River basin to the Great Basin. Some of the streams in and around the study area may have reduced streamflows due to water diversions.

Groundwater

Nearly all accessible groundwater in the study area is derived from two formations, the Uinta and Green River Formations, or through superficial alluvial deposits in stream valleys. The south flank of the Western Uinta Basin is underlain at the surface by the Uinta formation of Eocene age, which has a maximum thickness of 4,000 feet beneath the Central Uinta Basin (State of Utah Department of Natural Resources 1976). Underlying the Uinta formation and exposed west and south of Strawberry, Willow Creek, and Reservation ridges is the Green River formation, with a reported maximum thickness of about 5,000 feet. In the study area these formations slope generally less than 5° north toward the center of the Uinta Basin. In view of the gentle dip and great thickness of the Uinta and Green River Formations, all developed groundwater necessarily is from these two units.

The Uinta formation is described as consisting of calcareous shale, some limestone, claystone, siltstone, and sandstone (State of Utah Department of Natural Resources 1976). The primary porosity of these consolidated sediments is low, and modest yields from wells apparently are of water moving through fractures. Yields of wells generally are in the range of 1-10 gpm.

The Green River formation consists mostly of lacustrine shale with some limestone, siltstone, and sandstone. The lacustrine beds interfinger with fluvial deposits of the overlying Uinta formation and underlying Wasatch formations around the margin of the basin. As is the case with Uinta, groundwater yielded to wells appears to be largely derived from fractures, as the matrix permeability of the lacustrine deposits should be negligible.

Movement of groundwater should be generally northward in the leasing area from uplands around the southern and western margins of the basin, where annual precipitation is 20 to 30 inches per year. Toward the center part of the basin, under natural conditions, groundwater discharges to the Duchesne River and tributaries. The depth to groundwater depends upon topographic position. Near stream beds where groundwater discharges the depth is shallow but it may be several hundred feet beneath interstream uplevels.

Vegetation

The study area comprises a wide range of vegetation types which support many of the traditional uses of NFS lands such as grazing, timber, and wildlife habitat. The vegetation can be described as a mosaic of plant communities strongly influenced by the geology, landforms, soils, and differences in major drainages that characterize the study area (Goodrich 1992). The current vegetation patterns have been influenced by previous management activities such as grazing, timber harvest including chaining, and natural events such as forest and range fires and insect outbreaks.

Livestock grazing is the predominant use of the land, both currently and historically, throughout most of the study area. Most of the study area is included in range allotments. Sheep, cattle, and horses are permitted to graze on the 57 allotments within the study area; more sheep than cattle use the area. The allotments vary greatly in size and the number of livestock per allotment ranges from approximately 10 to 1,200 animals. Each allotment has seasonal restrictions. Animal unit months, or AUMs (the amount of forage necessary to support one 1,000-lb cow or five sheep for one month) range from approximately 100 to 5,000 AUMs per allotment on the drier, eastern portion of the study area; on the western portion of the study area, which generally receives more moisture and has larger allotment sizes, AUMs range from 750 to 11,795.

Commercial timber sales are not an important use of the lands included in the study area. There have been, and will likely continue to be, small fuelwood sales, post and pole sales, and Christmas tree cutting. The purpose of most timber harvests in the study area is wildlife habitat or watershed improvement (DePietro 1992; Goodrich 1992).

The predominant plant communities found in the study area are typical of semi-arid mountainous regions and include the following (Goodrich 1992; USFS 1985a; USFS 1985b):

Shrub communities - These communities are primarily made up of greasewood (*Sarcobatus vermiculatus*), various species of sagebrush (*Artemisia tridentata* var. *tridentata*, *A. tridentata* var. *pauciflora*, *A. tridentata* var. *wyomingensis*, *A. cana*, *A. nova*, and *A. spiciformis*), rubber rabbitbrush (*Chrysothamnus nauseosus*), and yellowbrush (*Chrysothamnus viscidiflorus* var. *lanceolatus*). These communities are common throughout the study area. *Sarcobatus vermiculatus*, *Artemisia tridentata* var. *tridentata*, and *Chrysothamnus nauseosus* are on canyon bottoms and deep alluvial soils. These communities generally extend up to elevations of approximately 8,400 feet, however *Artemisia tridentata* var. *tridentata*, *Artemisia tridentata* var. *pauciflora*, *Artemisia spiciformis*, and *Chrysothamnus viscidiflorus* var. *lanceolatus* extend up to 10,000 feet. *Artemisia cana* is found on deeper soil areas, often where the water table has been drawn down on former wetlands.

Mountain brush communities - These communities are primarily made up of mountain mahogany (*Cercocarpus montanus*), curleaf mahogany (*Cercocarpus ledifolius*), serviceberry (*Amelanchier alnifolia*), gamble oak (*Quercus gambellii*), and maple (*Acer spp.*). These communities are found within the study area on canyon sideslopes and broad ridges in soils derived from marly mudstones or sandstone limestone shale. Large stands of gamble oak and maple are found on the western-most portion of the study area on the Uinta NF.

Pinyon/juniper communities - These communities are dominated by pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*). Black sagebrush (*Artemisia nova*) is a common understory species. Pinyon/juniper communities are common throughout the study area, particularly in the southeastern portion of the study area across the Tavaputs Plateau, and in Spanish Fork Canyon. This

community is primarily found between elevations of 5,000 to 8,000 feet in soils derived from sandstone, shale, and conglomerate.

Grassland communities - Common species found in these communities are Salina wildrye (*Elymus salinus*), bluebunch wheatgrass (*Agropyron spicatum*), slender wheatgrass (*Agropyron trachycaulum*), and mountain brome (*Bromus marginatus*). In the study area, grassland communities are most often found on slopes and ridges and occasionally in openings in aspen and coniferous forests.

Aspen communities - Climax (mature) aspen (*Populus tremuloides*) stands are more common on the west side of the study area (particularly in the Strawberry Reservoir area), but aspen in various successional stages, occasionally mixed with lodgepole pine (*Pinus contorta*) or spruce/fir stands, can be found throughout the study area. Aspen stand characteristics vary, depending on soil type, aspect, and elevations at which they occur.

Douglas-fir, subalpine fir, and spruce communities - Douglas-fir (*Pseudotsuga menziesii*) stands are mostly limited to cool exposures (e.g., north facing slopes or drainages) in the lower to mid elevations of the study area. Douglas-fir is found primarily in the drainages west of the Avintaquin drainage and in a large stand (approximately 3,000 acres) on the north side of Spanish Fork Canyon on the Uinta NF, but Douglas-fir stands occur as far east in the study area as the Antelope drainage. Blue spruce (*Picea pungens*) is occasionally found in habitats similar to that of Douglas-fir. Subalpine fir (*Abies lasiocarpa*) and Engelmann spruce (*Picea engelmannii*) stands are found at the heads of drainages and on ridge tops at the higher elevations.

Bristlecone pine communities - Bristlecone pine (*Pinus longaeva*) communities are found only in scattered locations within the study area. They are generally found on windswept slopes and ridges where white or gray marly mudstone is often exposed. Five stands of birstlecone pine totalling approximately 3 acres are present on the Ashley NF.

Riparian communities are also found in the study area. Riparian areas are discussed later in Section 3.2.4.4.

3.2.2 Forest Management Plan Direction

The management of watershed resources are addressed in the Forest Plans for both forests. Note that the management direction for vegetation is based on the use of the vegetation resource (e.g., rangeland and timber). The Ashley NF Forest Plan defines the following goals for the management of soil, water, and vegetation resources:

- Improve and conserve the basic soil resource.
- Maintain or improve soil stability, site productivity, and repair or stabilize damaged watersheds.
- Stabilize road corridors and control road use to reduce soil erosion.
- Increase water yields from NF Watersheds
- Improve and conserve the basic soil and water resources
- Achieve satisfactory ecological conditions on all rangelands. Maintain or obtain plant diversity to meet requirement of NFMA.
- Optimize wood fiber production to meet public demands consistent with other resource objectives and environmental constraints.
- Protect and enhance the unique and valuable characteristics of riparian areas through the maintenance and improvement of riparian areas/ecosystems and riparian-dependent resource values including wildlife, fish, vegetation, species diversity, watershed, and recreation.

The Uinta NF Forest Plan defines the following goals for the soil, water, and vegetation resources:

Soil

- Forest soils are to be managed so that they are in a nondegrading state over time.
- Develop specific projects with the primary purpose of improving, maintaining, or restoring the soil resource.
- Utilize opportunities to increase watershed management benefits to other resource uses and activities by coordinating with other agencies.

- Develop plans for the protection and improvement of soil and water resources and the stabilization of deteriorated watershed land, giving emphasis to System and non-System roads. Include provisions for restoration or improvement of degraded wetlands, flood plains, or riparian habitats.
- Conduct needed soil and hydrologic inventories to meet Forest land management planning and other resource needs as mandated.
- Maintain an active watershed restoration program, with watershed restoration work taking priority over watershed enhancement work.
- Through improvement and maintenance programs, conduct investigations regarding success of previous projects, inventory needed maintenance projects, and provide necessary liaison on projects needing coordination.
- Initiate a monitoring effort consistent with the intensity of management and probability for significant change of watershed values, to ensure that watershed objectives are achieved and watershed productivity is not substantially or permanently impaired.
- Obtain sufficient quantity of water, in accordance with legal authority, to provide for the development, use, and management of the National Forest, considering other user needs.
- Achieve satisfactory ecological condition on all rangelands. Maintain or obtain plant diversity to meet the requirements of NFMA.
- Conduct and maintain range inventories in accordance with the standards and guidelines and Region 4 direction.
- Manage the range resource to maintain plant diversity. Improve forage and soil conditions, maintain stable watershed and wildlife habitat, and manage threatened, endangered, and sensitive plant species.
- Develop range allotment plans as directed by FSM, Regional guidelines, NFMA, RPA, Rangeland Improvement Act, Executive Orders, and Forest standards and guidelines.
- Install improvements needed to implement range management plans in harmony with other uses, values, and activities.
- Maintain range structural improvements at an acceptable condition level.
- Manage fuelwood, Christmas trees, and other products as a service to the public and to enhance other resource management.

- Improve utilization of the pinyon-juniper and aspen types for energy and to meet Forest management needs through cooperation with the State.
- Reforest commercial timberlands where suitable and economically efficient in compliance with regulations.
- Utilize the Northern Utah Timber Service Center in the overall management of the timber resource. Plan and administer timber sale offerings to maintain or enhance wildlife, water, recreation, timber, and other resources, and to provide for the needs of industry, giving emphasis to those lands having the greatest potential for total resource benefits.
- Manage and protect floodplains, wetlands, and riparian habitat to preserve and enhance the natural and beneficial values through the completion of resource inventories, avoidance of impact, and development of management plans and mitigation responsive to the ecosystem-basis for these habitats.

3.2.3 Issues

Concerns related to watershed resources that were identified during the public scoping process are summarized in Issues 4, 7, and 10 (see Section 1.8).

Issue 4: The effects of oil and gas leasing and subsequent activities on air and water resources

Issue 7: The effects of oil and gas leasing and subsequent activities on soils and geologic formations

Issue 10: The effects of oil and gas leasing and subsequent activities on vegetation

Specific concerns summarized in these issues include the potential impacts of oil and gas activities on unstable surfaces (including erosive soils, accelerated erosion events, gullying, steep slopes, and geologic/soils stability hazards); long-term productivity of affected soils with limitations affecting revegetation; potential effects of oil and gas exploration and development activities (such as access, drilling, and petroleum transport) on contamination of aquifers and surface water; cumulative effects on water quality, watershed conditions, and subsequent effects on in-stream sediment sources such as stream bank stability; potential road construction associated with oil and gas operation, which would involve

channeling of surface runoff (road ditches and culverts) and possible acceleration of or re-activating gullies in the valley bottoms; and effects on riparian areas, particularly those situated in narrow canyon or V-Shaped valley bottoms.

In response to the above scoping issues, the following sensitive resource components were identified and are described in the following section: geologic hazards/unstable soils (slope/surface instability, landslides, soil movement, steep slopes, stream and gully erosion, narrow canyon/valley bottoms), soil productivity, water quality, and riparian/floodplains/wetlands.

3.2.4 Sensitive Resource Component(s)

3.2.4.1 Geologic Hazards/Unstable Soils

Areas of past and potential landslides or slope collapse, soil movement including slumps and creep, active rock falls, and soil erosion are the predominant forms of mass wasting and geologic hazards within the study area. All are forms of surface/slope destabilization, failure, movement, and deposition. Such events would likely pose a hazard to facilities or activities located on or below areas of unstable geologic/soil conditions. Mass wasting events range in severity from massive landslides to simple rock falls. Soil erosion by water ranges in severity from excessive stream channel erosion and the activation or expansion of gullies to lesser sheet erosion of soil particles from a soil surface. Both landslides and gullying have and continue to occur in the study area. A combination of mass wasting and erosion, a debris flow, is a form of geologic hazard which occurs in particularly the narrow side-canyons where surface facilities could be damaged or buried beneath deposits during a flow event.

Approximately 18,000 acres of high potential hazard for slope and surface instability, which include old landslides, active soil movement areas, and active rock slides in the Uinta NF portion of the study area; and narrow valley bottoms in the Ashley NF portion of the study area have been mapped within the study area (Figure 3-2). All of the acreage of high potential hazard within the Uinta portion of the study area (approximately 9,500 acres) occurs west and south of the Strawberry, Willow Creek, and Reservation ridge divides. Approximately 27,000 acres of this same Uinta NF portion of the study area has been

mapped as areas of moderate potential for landslides. These areas of moderate potential are mostly underlain by unstable shales.

Within the Ashley NF portion of the study area, the high potential hazard areas of narrow valley bottoms of drainages total approximately 2,370 acres in Sowers Canyon field and 6,200 acres within the remainder of the Ashley NF portion of the study area. Areas of moderate potential hazard for mass wasting/landslides correspond to areas of steep slopes and unconsolidated bedrock on canyon side-slopes in the Ashley portion of the study area. Table 3.2-3 lists several of the drainages located on the Ashley NF and describes the valleys in terms of valley form, valley bottom gradient, valley width, and valley side slopes. The table also indicates whether the stream flow in the drainages is intermittent or perennial and whether or not riparian areas are present. In most cases, the valley form is V-shaped or trough-like towards the headwaters and further downstream changes to a flat-bottom. Similarly, the valley bottom gradients tend to be steeper at the headwaters and level off to a low or moderate gradient further downstream. Most of the valleys are narrow (10 to 30 meters wide), at least in part, primarily at the headwaters. Several of the valleys have steep side slopes (i.e. > 60%), particularly those on the western half of the Ashley NF.

3.2.4.2 Steep Slopes

Steep slopes (slopes greater than 35 percent) by simply their steep angle of repose can fail regardless of whether or not the rocks are prone to slide. Slope failures can occur on steep, seemingly stable surfaces especially if slope or moisture conditions are changed, for example during construction and operations of facilities such as a well pad or access road. Steep slopes can also exacerbate accelerated soil erosion in steep areas of disturbance. Steep slopes total approximately 154,000 acres of the study area (Figure 3-3). Acreages and approximate locations of these steep slopes by portion of the study area are:

- Uinta NF - 58,670 acres occupy slopes beneath Strawberry, Willow Creek, and Reservation Ridges, mountain sides, and canyon side slopes of Diamond Fork Creek and its tributaries, Sheep Creek, and Tie Fork.
- Ashley NF (outside the Sowers Canyon area) - 83,710 acres occupy canyon side slopes of Slab Canyon, Timber Canyon, Avantiquin Creek, right and left forks of Indian Canyon, and Cottonwood Canyon.

- Sowers Canyon area - 11,710 acres occupy mostly canyon side slopes of Sowers and Wire Canyons, Nutters Canyon, and the right and left forks of Antelope Canyon.

3.2.4.3 Stream Erosion

Erosion and gullying are of particular concern on the Ashley NF. Table 3.2-4 lists those drainages on the Ashley NF that have areas of deteriorated or vulnerable streambank or gully conditions and Figure 3-4 shows these areas. The following characteristics are indicators of vulnerable conditions: inadequate bank rock content (total of 20.8 miles on the Ashley NF portion of the study area), inadequate bank protection, e.g. little vegetation (9 miles), and active gullies (2.6 miles). The following characteristics are indicators of deteriorated conditions: excessive bank cutting (13.7 miles), excessive mass wasting (12 miles), and immature discontinuous gullies (33.9 miles) (USFS 1992c). Immature gullies are characterized by unstable channels, active erosion, and increased sedimentation.

Slipsheet for Figure 3-2

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Slipsheet for Table 3.2-3

Slipsheet for Table 3.2-3 (concluded)

Slipsheet for Figure 3-3

Slipsheet for Figure 3-3 (concluded)

Slipsheet for Table 3.2-4

Slipsheet for Figure 3-4

In some cases, for example Sowers Canyon, and Left and Right Forks Indian Canyon, several of these conditions occur in the same area and thus are particularly sensitive. The Ashley NF has rated portions of these streams as having "poor" channel conditions, along with a part of Avintaquin Creek that has excessive mass wasting, inadequate bank rock content, and inadequate bank protection, for a total of 9.7 miles of "poor" channel condition. The Ashley NF has also rated portions of various streams as having "good" channel condition totaling 20.7 miles; including parts of Left Fork Indian Canyon, Reserve Canyon, First Canyon, Horse Ridge Canyon, Mill Hollow, West Fork Avintaquin, and Timber Canyon (USFS 1992d).

3.2.4.4 Soil Productivity

Areas of limited reclamation potential occur within the study area. Areas of limited reclamation potential include areas at or above timber line where wind erosion of soil growth media and cold temperatures and wind-produced desiccation limit the effectiveness of revegetation efforts. Acreages above timberline include approximately 1,500 acres of the Ashley NF (none in Sowers Canyon area) located along the high ridges in the western part of the Ashley NF portion, and along the high ridges and mountain crests of the Uinta NF (Figure 3-3). Soils with minimal capabilities to be revegetated once disturbed include soils forming in shales of the Green River Formation exposed in the White River watershed and extremely rocky soils of the mountains located north of Strawberry Reservoir. The Green River shale soils appear to have phytotoxic characteristics for many desirable plants; the extremely coarse textured mountain soils would lack water holding capacity and nutrient retention for support of revegetation. Poor revegetation capabilities of these two soil types total approximately 8,700 acres.

3.2.4.5 Water Quality (Surface and Groundwater)

Surface Water

Table 3.2-5 lists selected streams/drainages within the study area; reports concentration levels for water quality parameters for each stream (STORET - U.S. EPA national water quality data bank), where available, in comparison to listed Utah Surface Water Quality Standards; and provides state classifications for use and condition for each. All listed streams are designated class 3A (protected for cold water species of game fish and other

cold water aquatic life including the necessary aquatic organisms and their food chain) and class 4 (protected for agricultural uses including irrigation of crops and stock watering)(UAC 448-2). All but Soldier Creek, Diamond Fork, and Sixth Water are also designated class 1C (protected for domestic purposes with prior treatment processes as required by the Utah Department of Health). In addition, all surface waters in the study area are protected under Utah's Antidegradation Policy.

In general, water quality of the streams in the study area is good, with the exceptions of concentrations for arsenic, boron, fluoride, and phosphorous, which exceed state water quality standards in one or more of the listed streams. The source of these higher levels of constituents in waters of the study area is likely the soils and stream sediments within and upstream of the study area (Ebens and Shacklette 1982). Geologic parent materials of these soils and stream sediments are the sandstones and shales of the Uinta, Green River, and Wasatch/Coulton formations. Lithic materials of the Green River Formation are known to have higher concentrations of trace elements than

Slipsheet for Table 3.2-5

Slipsheet for Table 3.2-5 concluded

rocks of the Uinta and Wasatch/Coulton formations (Dean et al. 1979). Representative ranges of concentration for arsenic, boron, and fluoride for soils and stream sediments in the Uinta Basin exceed mean or average concentrations for these elements in normal or U.S. soils and sediments (Kabata-Pendias and Pendias 1992; Ebens and Shacklette 1982).

Groundwater

A map of chemical quality of groundwater in Price and Waddell (1973) indicates that the dissolved solids content to be less than 500 mg/l in the western most part of the study area and between 500 and 1,000 mg/l in the area to the east. A single analysis from the general area (Price and Waddell, 1973, well 6) showed water from 1,875 feet depth as containing only 310 mg/l. The water was of calcium-bentonite-sulfate composition.

In most of the Uinta Basin the Green River Formation contains saline water; however, around the basin margins fresh to saline water is encountered in water wells. Feltis (1968) reported three samples from the Green River Formation on the south flank of the basin as containing 381 to 818 mg/l of dissolved solids.

Groundwater quality of selected wells in or near the study area is shown in Table 3.2-6. State of Utah groundwater quality standards are also presented. These standards were not exceeded by any of the selected wells.

To summarize, groundwater from the Uinta Formation should generally contain less than 1000 mg/l dissolved solids. Groundwater from the Green River Formation may be less than 100 ug/l near the outcrop area around the flanks of the basin, but highly saline water containing 10,000-35,000 mg/l of dissolved solids is found in the Green River Formation on the central part of the Basin beneath the Uinta formation.

3.2.4.6 Wetlands/Riparian/Floodplains

In the study area, wetlands and riparian areas are primarily found on the floodplains and valley bottoms of the numerous perennial and intermittent streams (Figure 3-5). The Uinta NF has mapped wetlands, buffered streams, and riparian areas on the Uinta NF portion of the study area, and the Ashley NF has mapped riparian areas on the Ashley NF portion. These wetland, riparian, and buffered stream areas comprise approximately 9,400 acres

within the study area. Of this total, 876 acres of wetlands, 6,200 acres of buffered streams, and 1,859 acres of riparian occur on the Uinta NF, and 463 acres of riparian occur on the Ashley NF, of which 17 acres are located in the Sowers Canyon field area.

Wetlands protected under Section 404 of the Clean Water Act must meet the legal definition of a jurisdictional wetland. These wetlands are generally defined by the presence of three conditions: (1) permanent or seasonal water, (2) hydrophytic (water-loving) vegetation, and (3) soil characteristics influenced by saturated conditions. Riparian areas (geographically definable areas in the transition zone between aquatic ecosystems and the adjacent terrestrial ecosystems) and floodplains (lowland areas adjacent to streams or other inland waterways that may be submerged by floodwaters) frequently meet the legal standards for classification as wetlands. The jurisdictional

Slipsheet for Table 3.2-6

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Slipsheet for Figure 3-5

Slipsheet for Figure 3-5 (concluded)

status of the wetlands, riparian and floodplain areas, and buffered streams in the study area has not been determined.

3.3 AIR QUALITY

3.3.1 General Description

A review of monitoring data collected by the state revealed that there are no air quality monitoring stations within the study area. However, the air quality of the region is generally considered very good, with no exceedences of the state and federal ambient air quality standards expected. This is due to the sparse population and the lack of major pollutant sources in the area.

The Prevention of Significant Deterioration (PSD) section of the 1977 Clean Air Act Amendments (40 CFR Part 52.21) classified areas of the country as Class I, II, or III. Class I areas were defined as all International Parks, National Wilderness Areas larger than 5,000 acres, National Memorial Parks larger than 5,000 acres, and National Parks larger than 6,000 acres. All other areas were designated as Class II, but can be redesignated by the state at a later time.

There are no Class I areas in the vicinity of the study area. The Uinta and Ashley NFs are designated as Class II areas. As such, specific increases in sulfur dioxide, nitrogen dioxide, and particulate emissions above a baseline concentration are allowed. This allowed increase is called a PSD increment. Table 3.3-1 provides a summary of the state and federal ambient air quality standards and PSD increments for Class I and Class II areas. As there are no known emission sources in the study area, some release of pollutants would likely be allowed in the study area during future development activities.

3.3.2 Forest Management Plan Direction

The Ashley NF Forest Plan defines the following goals for the management of the Forest's air quality:

- Manage for the maintenance of air quality related values.

- Control and minimize air pollutant impacts from land management activities.

The Uinta NF Forest Plan addressed air quality only as it pertained to the Lone Peak Wilderness.

3.3.3 Issues

The public scoping process produced a single issue related to air quality (See Section 1.8):

Issue 4: The effects of oil and gas leasing and subsequent activities on air and water resources.

Slipsheet for Table 3.3-1

3.3.4 Sensitive Resource Component(s)

Unlike some of the other resources addressed in this EIS, air quality in itself is of concern based on the issues. Air quality is described above in Section 3.3.1.

3.4 WILDLIFE AND FISHERIES

3.4.1 General Description

The study area for wildlife and fisheries resources extends beyond the leasing study area considered for other resources in this EIS. This extended boundary includes lands adjacent to the leasing study area perimeter. The additional area accounts for characterization of species migration and critical use areas.

Predominant plant communities within this study area include shrub, mountain brush, pinyon/juniper, grassland, aspen, Douglas-fir, subalpine fir, spruce, and riparian. The various habitats found within this area provide for a great diversity of big game, small game, upland game birds, waterfowl, fish, songbirds, raptors, amphibians and reptiles. A description of plant communities is provided in Section 3.2.1.

Characteristic wildlife species include game species such as elk, black bear, mule deer, moose, pronghorn, mountain cottontail, beaver, skunk, red fox, bobcat, cougar, ruffed grouse, sage grouse, blue grouse, and chukar; raptor species such as Cooper's hawk, red-tailed hawk, kestrel, marsh hawk, great horned owl, and northern goshawk; amphibian and reptile species such as leopard frog, tiger salamander, western chorus frog, boreal toad, short-horned lizard, tree lizard, rubber boa, garter snake, gopher snake, and Great Basin rattlesnake; and passerine species such as mourning dove, rufous hummingbird, common flicker, black-billed magpie, black-capped chickadee, mountain chickadee, American robin, yellow-rumped warbler, western tanager, evening grosbeak, Cassin's finch, pine siskin, red crossbill, horned lark, tree swallow, white breasted nuthatch, hermit thrush, and mountain bluebird.

A number of streams originate in the study area, some of which flow into the Colorado River Basin, and others that flow westward into the Great Basin. Fisheries resources that potentially occur within the study area include cold water species such as Bonneville

cutthroat trout, Colorado cutthroat trout, rainbow trout, brook trout, brown trout, longnose dace, redbreast shiner, and mountain sucker.

In 1983-84, floods scoured many of the canyons, removing natural pools and riparian vegetation that provided shade and enhanced fish production. The combination of inadequate vegetative cover and periodic heavy runoff has created heavy sediment loads that limit natural reproduction in some streams. Most streams lack enough suitable spawning areas and pools for optimum reproduction.

The NFMA to 1976 provides direction for selecting management indicator species for Forest planning. Management indicator species are certain wildlife species found in specific habitat types whose habitat requirements and population changes are believed to indicate effects of management activities on a broader group of wildlife species in the ecological community. Table 3.4-1 lists the management indicator species identified in the Ashley and Uinta Forest Plans.

3.4.2 Forest Plan Management Direction

The Forest Plan Management direction for wildlife and fisheries resources is provided in the Forest Plans for the Uinta NF (USFS 1985b) and the Ashley NF (USFS 1986a). The management direction for wildlife and fisheries is based on the protection and preservation of threatened and endangered species and habitat, and critical use areas for game species, i.e., elk calving/mule deer fawning areas, sage grouse strutting grounds, and critical winter range. A few management directions from each Forest are listed below for each resource.

Wildlife

The management direction for wildlife is to maintain cooperation with government agencies, environmental organizations and special interest groups, and to maintain or improve habitat quality, species diversity and productivity.

Specific wildlife management directions in the Uinta Forest Plan include:

- Develop implementation plans to improve key ecosystems, including riparian, aspen, snag, and old growth.

- Coordinate with state, county and city governments and with private landowners to protect important game winter range.
- Maintain provisions for adequate protection and management of essential critical habitat.
- Ensure that legal and biological requirements of threatened, endangered, and sensitive plant and animal species and habitat are included in forest planning.

Specific wildlife management directions in the Ashley Forest Plan include:

- Identify and map elk calving areas, deer fawning areas, sage grouse strutting and nesting areas for assessing cumulative impacts.
- Establish and maintain thermal and security cover needs to meet the Forest's big game and Management Indicator Species (MIS) habitat objectives.
- Maintain adequate wildlife cover within 100 feet of an opening of 10 or more acres.

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Slipsheet for Table 3.4-1 (concluded)

- Allow resource management activities only if they will not adversely affect any threatened, endangered or sensitive species.

Fisheries

Fisheries management direction for the Uinta NF is to manage habitat to improve quantity and quality of fisheries; consult with government agencies, environmental organizations, and special interest groups for land use programs and to increase species diversity and productivity.

Specific fisheries management directions in the Uinta Forest Plan include:

- Maintain a close coordination and planning liaison with Utah Division of Wildlife Resources (UDWR), U.S. Department of the Interior, Fish and Wildlife Service (FWS), and other fish and wildlife management organizations.
- Maintain high quality water for fish and wildlife use and evaluate aquatic habitat improvements annually and continue maintenance efforts.
- Ensure that legal and biological requirements of endangered, threatened, and sensitive fish species and habitat are included in forest planning.
- Maintain provisions for adequate protection and management of essential critical habitat.

Specific fisheries management directions in the Ashley Forest Plan include:

- Analyze the need for, and acquire when appropriate, conservation pools in reservoirs to maintain fisheries habitat.
- Allow resource management activities only if they will not adversely affect any threatened, endangered or sensitive species.

3.4.3 Issues

The following issue was identified from public scoping and from management concerns (see Section 1.8):

Issue No. 2: The effects of oil and gas leasing and subsequent activities on wildlife

Specific concerns for key wildlife populations and habitat are sage grouse leks (strutting/breeding grounds), critical big game winter/summer ranges, elk calving areas, mule deer fawning areas, and raptor habitat and safety. Specific concerns for fisheries include cumulative effects on aquatic habitat; and any adverse effect to threatened, endangered, or sensitive species and their habitats that are known to or may potentially occur in the area.

Potential impacts to threatened, endangered, and sensitive species was also brought up as a concern related to wildlife and fisheries. Threatened, endangered, and sensitive species are described in Section 3.5.

3.4.4 Sensitive Resource Component(s)

3.4.4.1 Sage Grouse Habitat

Sage grouse habitat has been identified on the Ashley NF portion of the study area both within (12,890 acres) and outside (12,140 acres) the Sowers Canyon area. Due to the importance of the sagebrush ecosystem to sage grouse, the UDWR has recommended that all sagebrush habitat on Antro Mountain, Nutters Ridge, Cottonwood Ridge, and Antelope Ridge in the Ashley NF be considered as potential habitat for sage grouse.

Sage grouse leks, or traditional strutting/breeding grounds have not been specifically mapped within the study area, however they, are extremely important to the survival of the species in any particular area. Barring the complete elimination of the physical lek itself, the leks are used generation after generation. Breeding generally occurs on the leks during late March and April with nesting and young rearing in May, June, and July. Sage grouse hens construct nests within 7-10 days following breeding generally beneath sagebrush plants in the vicinity of the lek. During the summer, the sage grouse feed on succulent forbs and insects at higher elevations. During the winter the sage grouse move to lower

elevations or wind blown areas for feed and cover. The sage grouse never get too far from the sagebrush ecosystem throughout the year. Sage grouse surveys will need to be performed to confirm either their presence or absence.

3.4.4.2 Big Game Winter Range

Big game (elk, mule deer, and moose) habitat within the study area has been mapped using GIS to identify location and acreages of winter range. The condition and amount of available winter range is a critical factor governing big game populations. Big game can be found throughout the study area in secure habitat with an abundance of thick cover for security, ample forage, and very limited accessibility by humans. Elk and mule deer generally congregate in large herds during the winter, and forage on grasses and browse at lower elevations on south or southwest facing slopes that provide thermal cover, security, and escape cover. Moose commonly occur in small groups and browse on many woody plants in winter such as twigs, bark, and saplings. Winter range is a limiting factor to big game populations and an important critical use area.

Elk critical winter range within the study area encompasses 174,970 acres (Figure 3-6). The largest portion of critical range is located in the Ashley NF portion of the study area where 48,170 acres are within Sowers

Slipsheet for Figure 3-6

Slipsheet for Figure 3-6 (concluded)

Canyon and 101,600 acres are outside the Sowers Canyon area. The Uinta NF contains 25,200 acres of critical elk winter range. In the spring, elk move to the higher country as snow cover recedes.

Mule deer critical wintering range within the study area encompasses 22,080 acres (Figure 3-7). The majority of critical winter range is located along Spanish Fork Canyon and Diamond Fork Creek within the Uinta NF (9,210 acres). On the Ashley NF portion of the study area, critical mule deer winter range occurs in Left Fork Indian Canyon, on Reservation Ridge, and other ridgetops within the Sowers Canyon area. In the Ashley NF, 9,950 acres are outside the Sowers Canyon area and 2,920 acres are within the Sowers Canyon area. In the spring, mule deer move to the higher country as snow cover recedes.

Within the study area, 4,222 acres have been identified as critical yearlong range for moose. This area is located along drainages south of Willow Creek Ridge on the Uinta NF (Figure 3-7). No critical yearlong moose range is found in the Sowers Canyon area.

3.4.4.3 Big Game Summer Range

The quality and quantity of big game summer range is also of importance in governing populations. Big game species concentrate on summer range from June to September. High quality forage, security and lack of human disturbance are characteristics of this area. Summer range may be less critical than winter range in the study area, because habitat conditions appear to be adequate throughout the non-winter months.

Within the study area, 6,550 acres have been identified as critical summer range for elk, all within the Uinta NF, and 12,360 acres as critical yearlong range (Figure 3-6). The summer range is of particular importance because of its "buffering effect" on critical calving areas. The critical summer habitat is generally located at the headwaters of Sixth Water Creek and Cottonwood Canyon.

Critical summer habitat for mule deer within the study area encompasses 35,430 acres; 28,220 acres on the Ashley NF outside the Sowers Canyon area and 7,210 within Sowers Canyon. The critical summer range is generally located along Left Fork Indian Canyon and extending east along Reservation Ridge (Figure 3-7). This area is also of particular importance due to its capacity to serve as fawning areas.

3.4.4.4 Elk Calving/Mule Deer Fawning Areas

Elk calving occurs on ridge tops and slopes surrounding Strawberry Reservoir. After calving, the cows and calves gather in large nursery groups at higher elevations where human disturbance is low. There are approximately 18,010 acres of elk calving area within the study area, all located in the Uinta NF (Figure 3-6). These areas are generally located at the headwaters of several creeks near the Strawberry Reservoir. During the summer and early fall, elk are generally found at high elevations for breeding activity.

Mule deer typically give birth to 1 to 3 fawn(s) during June-July following a seven-month gestation period. Mule deer fawning do not have specific fawning areas which are used year after year, but generally occurs in summer range. Within the study area, 35,430 acres have been identified as critical summer range. The majority of critical summer range is generally located along Left Fork Indian Canyon and extending east along Reservation Ridge (Figure 3-7).

3.4.4.5 Elk Yearlong Range

Elk are present year-round in pinyon-juniper and mountain brush habitats at lower elevations where accumulation of snow is light. As with more migratory elk, the most sensitive periods are winter and calving.

Elk critical yearlong habitat is located in the study area almost entirely within the Sowers Canyon area. There are 12,250 acres of critical yearlong habitat in the Sowers Canyon area, and 110 acres on adjacent portions of Ashley NF.

3.4.4.6 Raptor Habitat

The study area provides abundant and diverse raptor habitat for species ranging from grassland species such as American kestrels, and Swainson's hawks, to forest species such as the northern goshawk. Raptors (birds of prey) that may be located in the study area include: Cooper's hawk, red-tailed hawk, kestrel, marsh hawk, great horned owl, ferruginous hawk, flammulated owl, and goshawk. Raptors can occupy a wide range of habitats but typically nest in secluded areas (i.e., cliffs, tall tree stands, etc.) near a adequate

supply of prey. Raptors prefer nesting areas with minimal disturbance. Forage areas are generally dictated by prey availability. Raptors can easily be disturbed and not return to a historic nesting site. Several raptor species are classified as threatened, endangered, or sensitive species. A more detailed description of these species and their distribution and habitat requirements are presented in Section 3.5, Threatened, Endangered, and Sensitive Species.

3.5 THREATENED, ENDANGERED AND SENSITIVE SPECIES

3.5.1 General Description

Threatened, endangered, and sensitive species are plants and animals that are protected under the Endangered Species Act (ESA) (50 CFR 17) of 1973, as amended, or other state or Forest Service or BLM regulations. In general, the protection afforded imperiled species under the ESA includes prohibition from harming or trafficking in endangered species, and, under Section 7, the federal government is forbidden to take any action that is likely to jeopardize an endangered or threatened species or to degrade its critical habitat.

Under the ESA, an endangered species is one in danger of extinction throughout all or a significant portion of its range; a threatened species is one likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Candidate species are those being considered for listing as threatened or endangered. Sensitive species status (from Forest Service Manual 2670.5) are those plant and animal species identified by the Regional Forester for which population viability is a concern as evidenced by (1) significant

Slipsheet for Figure 3-7

Slipsheet for Figure 3-7 (concluded)

current or predicted downward trends in population numbers or density or (2) significant current or predicted downward trends in habitat capability that would reduce a species existing distribution.

Threatened, endangered, and sensitive species and their habitat either known to occur or have the potential for being found in the study area are described below. Surveys for imperiled animal species have been conducted to determine the occurrence, status, or range of these species and information is available for the Uinta NF. The Ashley NF, however, has not conducted these surveys on the South Unit of the Duchesne Ranger District and, therefore, habitat and incidental sightings information are used to provide some indication of species occurrence.

Federal endangered species that potentially occur within the study area or the area of influence of the study area include two birds, the bald eagle (*Haliaeetus leucocephalus*) and peregrine falcon (*Falco peregrinus anatum*); four fish, the Colorado River squawfish (*Ptychocheilus lucius*), humpback chub (*Gila cypha*), bony-tail chub (*Gila elegans*), razorback sucker (*Xyrauchen texanus*); and one plant species, *Phacelia argillacea*. It is unlikely that any of the endangered Colorado River fish species would potentially occur within the study area, however, the FWS states "that any depletion of water from the Colorado River system, including water used in drilling, is considered a "may affect" on the four Colorado River fish" (FWS 1992, see Chapter 5, FWS letter to Peter Karp Uinta NF Supervisor dated 8/13/92; USFS 1992h; USFS 1992i). The plant species *Phacelia argillacea*, could potentially occur in the study area, but there are no known locations on NFS lands (Peterson 1992).

Only one threatened species, a plant (*Spiranthes diluvialis*), is known to occur within the study area. Specifically, it is known to occur on the Diamond Fork in the Uinta NF.

Candidate species that may potentially occur in the study area include mountain plover (*Charadrius montanus*) and the spotted frog (*Rana pretiosa*).

Sensitive species (as listed by the Forest Service) within the study area include three birds, the northern goshawk (*Accipiter gentilis*), flammulated owl (*Otus flammeolus*), and northern three-toed woodpecker (*Piccoides tridactylus*); four mammals, the northern American lynx (*Felis lynx*), North American wolverine (*Gulo gulo*), spotted bat (*Euderma*

maculatum), and Townsends big-eared bat (*Plecotus townsendii*); two fish, Colorado cutthroat trout (*Oncorhynchus clarki pleuriticus*) and Bonneville cutthroat trout (*Oncorhynchus clarki utah*); and one plant, the Untermann fleabane (*Erigeron untermannii*).

Bristlecone pine (*Pinus longaeva*) is not protected by a government agency; however, bristlecone pine communities are a unique resource found only in scattered locations within the study area. They are generally found on windswept slopes and ridges where white or gray marly mudstone is often exposed. Five stands of bristlecone pine totalling approximately 3 acres are present on the Ashley NF.

Specific information pertaining to threatened, endangered, and sensitive species is provided below.

Endangered Species:

Bald Eagle The bald eagle generally build nests in trees, although cliffs are sometimes used. Nests are usually located within 2 miles of water and are built where they provide a good view of the surrounding area. No known or potential bald eagle nest sites occur within the study area. Wintering bald eagles tend to concentrate at communal roost sites that provide adequate thermal cover and access to readily available food supplies. Wintering bald eagles have been observed in the vicinity of Strawberry Reservoir and Current Creek on the Vernon Division, and drainages of Salt Creek, Nebo Creek, Spanish Fork River, and Diamond Fork Creek. The Uinta NF has designated 3,955 acres as a bald eagle wintering zone along the Diamond Fork Creek located in the western portion of the study area (Figure 3-6). This area contains an abundance of bald eagle winter roost sites. Suitable nesting or wintering habitat for bald eagles in the Ashley NF is highly unlikely (FWS 1992; USFS 1991; USFS 1986a; USFS 1986b; USFS 1985b; USFS 1984).

Peregrine Falcon The peregrine falcon is typically found in inaccessible mountain cliffs, prairie escarpments, and canyon walls near water sources. No nest is built; eggs are laid in a scrape or on a ledge or recess of a cliff. Peregrines display strong nest site fidelity and sites may be revisited yearly. Peregrines may travel more than 18 miles from the nest site to hunt for food; however a 10-mile radius around the nest is an average hunting area, with 80 percent of foraging occurring within a mile of the nest. This species historically

occurred within the project area of influence on the east face of the Wasatch front in the Uinta NF (USFS 1991; FWS 1992).

Colorado Squawfish The Colorado squawfish is found in a variety of habitats. Young squawfish inhabit shallow, quiet backwater areas off main river channels and adults are found in big, deep water inhabiting eddies, pools, and other areas adjacent to the main current flow, moving into main channel areas to feed. Squawfish spawn over gravel bars in deep water during mid-summer when water temperatures reach 68 to 72 degrees Fahrenheit (Woodling 1985). This species has been known to occur within the Uinta NF area of influence of the study area (FWS 1992).

Humpback Chub The humpback chub lives where water depth, velocity, and turbidity make direct observation difficult. This species is not found in areas of swift current, but prefer slower eddies and pools of fast moving deep rivers. Spawning occurs when water temperatures are 58 to 62 degrees fahrenheit (Woodling 1985). This species has been known to occur within the Uinta NF area of influence of the study area (FWS 1992).

Bonytail Chub The bonytail chub prefers eddies and pools, not swift current. This species has been known to occur within the Uinta NF portion of the study area (FWS 1992).

Razorback Sucker The razorback sucker is found in strong current and backwaters from 4-10 feet in depth. This species is not found in smaller tributaries and headwater streams. Exact habitat requirements for this species are unknown. The razorback sucker has been known to occur within the Uinta NF portion of the study area (FWS 1992).

Candidate Species:

Mountain Plover The mountain plover nests on the short-grass prairies particularly in association with blue gramma-buffalo grass communities. This species is at home on the higher plains of eastern Montana, Wyoming, and Colorado, and is only a casual migrant in Utah (Hayward 1976).

Spotted Frog Spotted frogs are most likely found near permanent water such as marshy edges of ponds or lakes, in algae-grown overflow pools of streams, or near springs with emergent vegetation during the breeding period. They may move considerable distances

from water frequenting mixed conifer and subalpine forests, grasslands, and brushlands of sage and rabbitbrush. Spotted frogs are thought to hibernate in holes near springs or other areas where water is unfrozen and constantly renewed (USFS 1991; FWS 1992). No populations are known to exist within the study area.

Sensitive Species:

Northern Goshawk The northern goshawk prefers to nest in mature stands of dense conifer forests or mature aspen forests with a two layered canopy within close proximity to water. The northern goshawk generally constructs a tree nest close to the trunk 30-60 feet above the ground. This species tends to use the same nesting site or closely located site year after year. One documented goshawk sighting has been recorded in upper Sowers Canyon (T6S, R7W, Section 36) in a stand of mature Douglas-fir (USFS 1992e). The Ashley NF has determined that preferred habitat does exist within the study area, and it is very probable that a significant goshawk population may exist. This situation also exists on the Uinta NF where some birds have been sighted.

Swainson's Hawk The Swainson's hawk occurs in most grassland habitats and nests typically 6-30 feet above the ground. Although the Ashley NF contains suitable habitat for this species, its presence is unknown.

Ferruginous Hawk Ferruginous hawks prefer open country with few trees and minimal human disturbance. Nests of this species have been documented on adjacent BLM and tribal lands that contain habitat similar to that found within the Ashley NF; however, their presence in the study area is unknown (FWS 1992e).

Flammulated Owl The flammulated owl prefers mature ponderosa pine-Douglas fir forests with open canopies. They have also been found in mixed pine, and hardwood (i.e., aspen and cottonwood) forests. The flammulated owl is largely nocturnal and insectivorous and nests in abandoned flicker or other woodpecker excavated cavities of that size. The study area could potentially provide suitable habitat for the flammulated owl but its presence is unknown.

Northern Three-Toed Woodpecker The northern three-toed woodpecker is a resident of mixed conifer forests at elevations usually greater than 8,000 feet and requires snags for

feeding, perching, nesting, and roosting (Hayward 1976). This species is largely insectivorous and forages mainly in dead trees. They stay on their territories year round, though insect outbreaks may cause irregular movements. The study area contains mixed conifer stands which may support populations of the northern three-toed woodpecker.

North American Lynx The North American lynx usually inhabits northern boreal forests in association with the snowshoe hare habitat. The lynx uses mature forest stands for denning, cover for kittens, as well as travel corridors. It's occurrence is doubtful in the Uinta NF portion of the study area and its habitat does not exist in the Ashley NF portion (FWS 1992e).

North American Wolverine The North American wolverine occupies very large ranges within the high mountain forests. It inhabits tundra and coniferous forest zones, generally at higher altitudes during summer and mid to lower elevations during winter. Low elevation riparian areas may be important winter habitat. Wolverines reportedly prefer to hunt around small meadows, timbered thickets, cliffs, riparian and ecotonal areas (USFS 1991). This habitat does not exist within the described study area and the North American wolverine is very unlikely to occur (FWS 1992E).

Spotted Bat The spotted bat is found in relatively undisturbed ponderosa pine, pinyon-juniper, deciduous forests, and rock crevices high up on steep cliff faces. Narrow (0.8 to 2.2-inch) crevices or cracks in limestone or sandstone cliffs are critical roosting sites (USFS 1991). It is possible that suitable habitat occurs for this species in the study area; however, its presence is unknown.

Townsend's Big-Eared Bat The Townsend's big-eared bat is found in pine, pinyon-juniper, shrub/steppe grasslands, mixed coniferous forests, and deciduous forests from sea level to 10,000 feet. During the winter they roost in old mine shafts, caves, rocky outcrops, and occasionally in old buildings. The Townsend's big-eared bat is very sensitive to human disturbance and abandon roosts if disturbed. Low reproductive rates and limited roost sites make this species vulnerable. Suitable habitat occurs for this species in the study area; however, its presence is unknown.

Colorado Cutthroat Trout Colorado cutthroat trout require cool, clear water and well vegetated streambanks for cover and bank stability. Instream cover, in the form of deep

pools and structures such as boulders and logs, is also important. They reach sexual maturity in 2 to 3 years and spawn in late spring, when the water temperature reaches approximately 45 degrees fahrenheit. This subspecies is adapted to relatively cold water and prospers at high elevations. Similar to all cutthroat, they need cool water and clean gravel for spawning (USFS 1991). The Colorado cutthroat historically inhabited the upper reaches of streams draining into the Colorado River. In the study area Colorado cutthroat occur in Willow Creek, White River drainage (including Tabbyune Creek), along a 5.1-mile section of Timber Creek, and in a 5.5 mile section of the upper reaches of West Fork and Avintaquin Creek (USFS 1992e). Timber Creek, West Fork, and Avintaquin Creek also contain stretches considered to be probable Colorado cutthroat habitat. No cutthroat habitat exists within the Sowers Canyon area. Management implications include protecting the Colorado cutthroat from contact with hybridizing trout.

Bonneville Cutthroat Trout Bonneville cutthroat trout require cool, clear water throughout their lives. Optimum habitat characteristics include areas with a 1:1 pool to riffle ratio and slow, deep water with vegetated streambanks for shade, bank stability, and cover. They prefer summer water temperatures of about 55 degrees fahrenheit, but can survive in water up to 70 degrees fahrenheit. Bonneville cutthroat trout may also inhabit lakes. The Bonneville cutthroat trout historically inhabited streams and lakes in the Bonneville Basin, but pure strains of this subspecies presently are restricted primarily to small headwater streams. Streams on the study area inhabited or potentially inhabited include Little Diamond Creek, First Water, and Fifth Water, as well as the upper reaches (i.e., Shingle Mill, Halls Fork, and Chases) in upper Diamond Fork. Transplants of this species were made from Bear Lake stock following the treatment of Strawberry Reservoir and they now inhabit the tributaries thereto, particularly during spawning season during late May and July.

Untermann Fleabane The Untermann fleabane is found within the study area in the Ashley NF on the Tavaputs Plateau. Found mostly on windswept, sparsely vegetated ridgetops between 7,000 and 9,000 feet, it is associated with the pinyon/juniper, douglas-fir, and limber pine-bristle cone pine plant communities. The soil in which this species is found is a mixture of fine textured sandy-silty soil and flat angular fragments that have weathered from sandstone, shale, and siltstone (USFS no date).

3.5.2 Forest Plan Management Direction

The Forest Plan Management direction for threatened, endangered, and sensitive species is provided in the Forest Plans for the Uinta NF (1985b) and the Ashley NF (1986a). The management direction includes protection and preservation of threatened and endangered species and habitat.

Specific management directions in the Uinta Forest Plan include:

- Ensure that legal and biological requirements of threatened, endangered, and sensitive plant and animal species and habitat are included in forest planning.

Specific management directions in the Ashley Forest Plan include:

- Allow resource management activities only if they will not adversely affect any threatened, endangered or sensitive species.

3.5.3 Issues

The following issue was identified from public scoping and from management concerns (see Section 1.8):

Issue No. 9: The effects of oil and gas leasing and subsequent leasing on threatened, endangered, and sensitive species.

3.5.4 Sensitive Resource Component(s)

Threatened, endangered, and sensitive species are in themselves of special concern based on the issues. They are described above in Section 3.5.1.

3.6 RESEARCH NATURAL AREAS

3.6.1 General Description

Research Natural Areas (RNAs) are areas set aside for maintenance of natural processes where the only uses are non-manipulative research, observation, and study. Their specific objectives include the following:

1. To assist in the preservation of examples of all significant natural ecosystems for comparison with those influenced by humans.
2. To provide educational and research areas for scientists to study the ecology, successional trends, and other aspects of the natural environment.
3. To serve as genepools and preserves for rare and endangered species of plants and animals (Federal Committee on Research Natural Areas 1968).

There are no formally designated RNAs within the study area; however, there are two potential candidate areas: Timber Cow Ridge Candidate RNA and Lance Canyon Candidate RNA. Both are located on the Ashley NF, outside of the Sowers Canyon area (See Figure 3-8). Timber Cow Ridge, located on the ridge between Timber Canyon and Cow Hollow, is 1,280 acres in size. Plant species found in this area include ponderosa pine, aspen, Douglas-fir, and mountain brush. Geologically, the area consists primarily of sedimentary rock. Lance Canyon, located south of Sowers Canyon, is 310 acres in size. Common vegetation communities found in this area include Douglas-fir, pinyon-juniper, and big sagebrush (USFS 1986b).

3.6.2 Forest Plan Management Direction

The management direction for RNAs and candidate RNAs on the Ashley NF, provided in the Forest Plan for the Ashley NF (USFS 1986a), is:

- Manage Research Natural Areas to prevent site deterioration

3.6.3 Issues

The above description on proposed RNAs within the study area was given in response to issue Number 12, identified in public scoping and from Forest management concerns (see Section 1.8).

Issue No. 12: The effect of oil and gas exploration and development on RNAs

3.6.4 Sensitive Resource Component(s)

The RNAs described in Section 3.6.1 are the sensitive components of Special Interest Areas based on issues and management concerns.

3.7 ROADLESS AREAS

3.7.1 General Description

Nine roadless areas totaling over 144,150 acres exist within the Uinta NF portion of the study area. Six are completely within the boundary of the study area, three are partially within. Three roadless areas are found within the Ashley NF portion of the study area (there are no roadless areas within the Sowers Canyon area). Figure 3-9 shows the location of roadless areas. To help the reader gain an appreciation of what roadless areas are, and to help put issues related to this resource in context, a brief description of the roadless inventory process is given in Table 3.7-1. None of the roadless areas in the study area were recommended for wilderness designation in the

Slipsheet for Table 3.7-1

Slipsheet for Figure 3-8

Slipsheet for Figure 3-8 (concluded)

Slipsheet for Figure 3-9

Slipsheet for Figure 3-9 (concluded)

RARE II evaluation or in the Utah Wilderness Act. Besides the RARE II roadless areas, two areas with protected roadless characteristics in the Ashley NF are also included in this section.

Future considerations of roadless areas for wilderness designation during the next Forest Plan revision will depend on how management activities affect the present wilderness attributes. These attributes are those mentioned in the National Wilderness Preservation Act and include natural integrity, apparent naturalness, manageability/boundaries, opportunity for solitude, opportunity for primitive recreation and special features, which include ecological, geological, scenic and cultural values. Descriptions of roadless areas within the study area are briefly summarized below. For more information on these areas the reader is referred to the Uinta National Forest EIS (USFS 1985a).

3.7.1.1 Uinta National Forest

Willow Creek (No. 18709)

The Willow Creek Roadless Area lies five to ten miles south of Strawberry Reservoir in the Willow Creek drainage. Topography varies from gentle to steep. Vegetation is primarily aspen, sagebrush/grass, mountain brush and conifer. Much of the area is natural to natural appearing, and there are opportunities for solitude and primitive recreation.

Recreation use is the highest during the fall deer and elk hunting seasons - other recreation uses include four wheeling, snowmobiling, cross-country skiing, hiking and horseback riding. Summer and winter deer range is important to indigenous herds. The area is considered to be an important watershed.

Management prescriptions (by percent of area) are dispersed recreation/non-motorized (80), dispersed recreation/motorized (10), and grazing improvements (10). Human modifications to the natural landscape include several access roads, fences, and range improvements. Oil and gas potential is high.

Pump Ridge (No. 18712)

The Pump Ridge Roadless Area lies 6 to 10 miles east-northeast of Springville, Utah, in the Hobble Creek drainage. Only a small portion of the far eastern section of this roadless area is within the study area. Topography is moderately steep to steep, vegetation varies from oak brush and maple to aspen. The natural appearance is high, while opportunities for solitude are limited, due to several roads which bound the area. Opportunities for hiking and primitive camping are high.

Recreation use is highest during the fall deer and elk hunting season. Other recreation uses include firewood gathering, dispersed camping, and horseback riding. The area is valuable for watershed purposes and wildlife habitat.

Management prescriptions (by percent of area) include dispersed recreation/non-motorized (62), dispersed recreation/motorized (30), grazing improvements (2), timber harvest (4), and oil and gas (2). Human modifications to the natural landscape include access roads, range improvements, and timber harvesting. Oil and gas potential is moderate.

Two Tom Hill (No. 18713)

The Two Tom Hill Roadless Area lies approximately 15 to 20 miles east of Springville, Utah. Topography varies from gentle rolling land to very steep terrain just under the west side of Strawberry Ridge. Vegetation is primarily mountain brush and aspen. Natural appearance is high; however, opportunities for solitude are limited, due to the close proximity of roads. Primitive recreation opportunities are available, mostly in the form of dispersed camping, hiking, and horseback riding.

Recreation use is generally light, except in the fall hunting season when the area receives very heavy use. Other recreation activities include hiking, horseback riding, and mountain biking. This area provides diverse habitat for many species of wildlife, and contains summer range for deer and elk, and big game calving, and fawning grounds. No significant water bodies are found in this area.

Management prescriptions (by percent of area) include dispersed recreation/non-motorized (80), dispersed recreation/motorized (15), oil and gas development (2), and grazing

improvements (3). Human modifications to the natural landscape include access roads and livestock improvements. Oil and gas potential is moderate to high.

Red Mountain (No. 18714)

The Red Mountain Roadless Area lies 10 to 12 miles due east of Mapleton, Utah, in the Diamond Fork drainage. The topography is generally steep; the vegetation types are primarily oak brush and maple. Natural integrity and appearance are high. Opportunities for solitude are limited due to proximity of roads and private lands. Primitive recreation opportunities are available for dispersed camping, hiking, and horseback riding.

Recreation use includes dispersed camping, hiking, horseback riding, and snowmobiling. This area is heavily hunted during the fall deer and elk season. Watershed and wildlife values are very important.

Management prescriptions (by percent of area) are dispersed recreation/non-motorized (72), dispersed recreation/motorized (3), grazing improvements (5), timber (3), Central Utah Project (12), and oil and gas (5). The Monks Hollow Reservoir is a proposed reservoir associated with the Central Utah Project, which would change recreation opportunities in the southern section of the roadless area. This proposed reservoir would provide flat water recreation activities and increased camping and picnicking facilities. Oil and gas potential is moderate.

Strawberry Ridge (No. 8715)

The Strawberry Ridge Roadless Area lies just under Strawberry Ridge in the Diamond Fork Creek drainage. The portion of this area draining into Sheep Creek was eliminated from the roadless area inventory due to the construction of a segment of the Arterial Travel Route on the ridge between Sheep Creek and the First Water Creek in 1987. Topography is steep close to the ridge, and moderate as you move further west. Vegetation is dominated by oak and maple, with small areas of aspen and conifer at higher elevations. The natural integrity and appearance are high. Opportunities for solitude are limited, due to the long narrow shape of the area, and proximity of roads. Opportunities for primitive recreation are limited to canyon bottoms.

Recreation use is primarily hunting - trails in the areas also provide for hiking and horseback riding. The area provides good summer range for deer and elk, and contains very important watershed values.

Management prescriptions (by percent of area) are dispersed recreation/non-motorized (53), dispersed recreation/motorized (5), grazing improvements (5), oil and gas development (2), Central Utah Project (20), and power transmission (15). As part of the proposed Central Utah Project, a reservoir and power transmission line could be built in this roadless area. Existing human modifications to the natural landscape include access roads and grazing improvements. Oil and gas potential is generally high.

Diamond Fork (No. 18716)

The Diamond Fork Roadless Area lies on the east side of the Diamond Fork road (FR 029). Since originally described this area has been reduced in size slightly by construction activities related to the Central Utah Project including the new road to the proposed Last Chance power plant site. Terrain is steep to moderate, consisting of undulating hills covered with mountain brush and aspen, and slopes are dissected by steep canyons. Natural integrity and appearance is low due to many roads, telecommunication facilities, and powerlines. Opportunities for solitude and primitive recreation are limited to a few canyon bottoms within the area.

Recreation use is greatest during the fall hunting season. Firewood gathering and stream fishing are also available. The Central Utah Project has plans for a reservoir and associated developed recreation sites, which would change recreation opportunities and use. Diverse vegetation provides a wide variety of wildlife habitat, including summer and winter range for deer and elk. The land is valuable as a watershed area.

Management prescriptions (by percent of area) are dispersed recreation/non-motorized (58), dispersed recreation/motorized (10), Central Utah Project (30), and oil and gas (2). Existing human modification to the natural landscape include roads, range improvements, transmission facilities, and powerlines. Oil and gas potential is moderate to high.

Tie Fork (No. 18717)

The Tie Fork Roadless Area lies north of Spanish Fork Canyon (U.S. Highway 6) and extends from Sheep Creek on the west to just north of Soldier Summit on the east. Topography is moderately steep to steep, vegetation is primarily pinyon/juniper and mountain brush. Natural integrity and appearance has been reduced by roads and timber harvest activities. Opportunities for solitude and primitive recreation are limited to canyon bottoms. Since the area was originally described, the DG&T power transmission line has crossed the head of Tie Fork impacting the visual component of this area.

Recreation use is primarily hunting and firewood gathering. The area provides summer deer and elk range; streams are small and except for Tie Fork Creek, generally do not support fish.

Management prescriptions (by percent of area) are dispersed recreation/non-motorized (63), dispersed recreation/motorized (12), oil and gas (5), timber (10), transmission corridor (10).

Human modifications to the natural landscape include roads, range improvements, timber harvesting, and electrical transmission lines. Oil and gas potential is high.

White River (No. 18718)

The White River Roadless Area is located approximately five miles north, northeast of Soldier Summit in the White River drainage. Topography varies from gentle to moderately steep. The area contains many vegetation types including pinyon/juniper, mountain brush, sagebrush/grass, aspen, and conifers. Natural integrity is moderate due to the presence of access roads, however the natural appearance is high since grazing has been the only major management activity. Opportunities for solitude and primitive recreation are limited to small locations in the interior of the area.

Recreation use is primarily deer and elk hunting and firewood gathering. Snowmobiling is popular during the winter months. The area provides deer and elk summer range, watershed values are high.

Management prescriptions (by percent of area) are dispersed recreation/non-motorized (87), dispersed recreation/motorized (5), grazing improvements (5), oil and gas (3). Human

modifications to the natural landscape are limited generally to roads and range improvements. Oil and gas potential is high.

Soldier Summit (No. 18719)

The Soldier Summit Roadless Area lies three to five miles east of Soldier Summit, on the east side of the Right Fork of the White River. Terrain is moderately steep, vegetation varies from sagebrush/grass to aspen, with a few isolated areas of conifers at the higher elevations. Natural appearance and integrity is moderate to high. Opportunities for solitude and primitive recreation exist in the core of the area.

Recreation use is highest during the fall deer and elk hunting seasons. Other recreation activities occurring in this area are primarily horseback riding and snowmobiling. The area provides deer and elk summer range, small streams support limited fisheries.

Management prescriptions (by percent of area) are dispersed recreation/non-motorized (90), dispersed recreation/motorized (5), grazing improvements (2), oil and gas (3). Existing human modifications to the natural landscape include access roads and range improvements.

3.7.1.2 Ashley National Forest

Slab Canyon (No. 01012)

The Slab Canyon Roadless Area is in the northwest corner of the south unit, bordering Timber Canyon on the southeast side and Twelve Hundred Dollar Ridge on the northwest side. Terrain is varied, consisting of ridges and ravines with elevations ranging from 6,800 feet to 10,300 feet. Vegetation is primarily Douglas- and white fir on north facing slopes at higher elevations, with ponderosa pine found intermittently on the ridges. Various shrub and grass species are found throughout the area.

The natural appearance of the area is moderate due to several low standard roads, mining activity and range improvements. Recreational use is the highest during the fall hunting season. Land use authorizations consist of mineral leases and grazing permits. Oil and gas potential is high.

In addition to the Slab Canyon Roadless Area, there are two areas in the Ashley NF that are not inventoried roadless areas but are managed to protect their roadless characteristics. One is located in Cow Hollow, adjacent to the Slab Canyon Roadless Area. The other is located in the upper Left Fork Antelope Canyon drainage, south of Chokecherry Canyon.

There are no roadless areas within the Sowers Canyon area.

3.7.2 Forest Plan Management Direction

No specific management direction is given for Roadless Areas in the Forest Plans; however, there are forest goals and objectives from other resource areas that apply to the roadless resource.

For the Uinta NF they include:

- Manage developed and dispersed recreation use for public safety and enjoyment within the range of demands projected for each Recreation Opportunity Spectrum (ROS) class.
- Manage the off-road vehicle use to protect the Forest environment and renewable resources.
- Maintain and protect visual resources on the Forest.
- Plan for the protection and improvement of soil and water resources and the stabilization of deteriorated watershed lands.
- Maintain and develop suitable habitat for wildlife and game and non-game fish populations by coordination with other resource uses.

For the Ashley NF applicable goals and objectives include:

- Provide a wide range of recreation opportunities within land capabilities and according to recognized public need.

- Implement and manage for adopted Visual Quality Objectives.
- Manage fish and wildlife habitat to maintain or improve diversity and productivity.
- Improve and conserve the basic soil and water resource.

3.7.3 Issues

The above discussion on roadless areas was given in response to issue Number 11, identified from the public scoping process and from Forest management concerns (see Section 1.8).

Issue No. 11: The effects of oil and gas exploration and development on inventoried roadless areas

3.7.4 Sensitive Resource Component(s)

The roadless areas as described above in Section 3.7.1 are in themselves the sensitive resource components.

3.8 RECREATION

3.8.1 General Description

The study area includes sections of both the Spanish Fork and Heber Ranger Districts (Uinta NF) and the south unit of the Duchesne Ranger District (Ashley NF). Recreational opportunities range from dispersed uses such as hiking and hunting to developed recreation including campgrounds and interpretive sites.

Strawberry Reservoir and lands surrounding the reservoir and the Strawberry River are included within the leasing analysis study area, however no leasing decisions will be made for these lands because the mineral rights are held by private entities. Because of the

importance of the reservoir to recreation, and the possibility of indirect impacts to the recreational environment, facilities at the reservoir are generally discussed.

Estimates of the amount of recreational activity occurring on a forest is reported as Recreational Visitor Days (RVDs). One RVD equals 12 hours spent on a forest in recreational activity and could be any combination of people and hours that equals 12 hours. Table 3.8-1 displays RVDs for the Heber and Spanish Fork Ranger Districts and the south unit of the Duchesne Ranger District. Only portions of the Spanish Fork and the Heber Ranger Districts are within the study area.

Popular recreational activities on the Spanish Fork Ranger District include camping, picnicking, automobile travel, hiking, horseback riding hunting, and fishing. This district is in close proximity to high population centers along the Wasatch Front and receives a substantial amount of day use for hiking, horseback riding, and weekend camping. The Diamond Fork area receives a heavy concentration of recreational use as it contains two developed campgrounds and accesses several trails. Popular fishing streams in, or adjacent to, the study area within this district include Diamond Fork and its tributaries, Left, Middle and Right Forks of the White River, and Tie Fork Creek. Roads receiving the most use are U.S. Highway 6 in Spanish Fork Canyon, and Forest Roads in Diamond Fork (FR 029), Sheep Creek-Rays Valley (FR 051), Right Fork (FR 081) and Left Fork (FR 079). Possible future recreational development could occur in Diamond Fork Canyon as part of the Central Utah Project (CUP). This Bureau of Reclamation water project would convey water from the Uinta Basin through the Strawberry Aqueduct and Collection System, down the Diamond Fork and Spanish Fork Rivers to the Bonneville Basin. This project could create up to two reservoirs in the Diamond Fork drainage, creating an increase in recreational use in the area. Improved road access and additional camping facilities may be associated with the CUP project.

The Heber Ranger District includes the Strawberry Reservoir, which is reflected in the comparatively high RVDs for fishing and mechanized travel (includes powered boats) categories. The waters in the Strawberry Valley comprise one of Utah's most important recreational fishing areas, and is used as a destination attraction for fishing, boating, and camping. Facilities include developed campgrounds, day use sites, a commercial boat marina, convenience store, administrative facilities and a visitor center. Fishing in the reservoir had experienced a decline during the late 1980s due to poor fishing success

caused by an overpopulation of non-game fish. The UDWR has implemented a program for controlling non-game fish, which has greatly improved the quality of the sport fishery. The 1992 recreational use figures (RVDs) showed a substantial increase in fishing from previous years. Tributaries into Strawberry Reservoir have a high potential for angling but are currently closed - once fish populations in the reservoir have increased these streams should be available for fishing. The Strawberry River below Soldier Creek Dam is currently open for fishing. Roads in, or adjacent to the study area within the Heber Ranger District which receive the highest use include U. S. 40, and Forest Road (FR) 090 (south side of reservoir), FR 131 (west side of reservoir), FR 042 (Indian Creek) and FR 079 (Trail Hollow, south of the reservoir). Future recreational development is focused mostly on additions to facilities at the reservoir and include a day use area, two fishing access areas, and increased parking capabilities.

On the south unit of the Duchesne Ranger District, the primary recreational activities include camping, hiking, automobile travel, and hunting. Recreational use in this unit, particularly hunting, all-terrain vehicle use, and

Slipsheet for Table 3.8-1

snowmobiling has been increasing in recent years. The Avintaquin campground is the only developed recreation site on the unit. Much of the recreational activities in this area occurs in Indian Canyon and areas to the west of Indian Canyon along Reservation Ridge. U.S. Highway 191 in Indian Canyon has been designated as a scenic byway by the State of Utah. A winter sports site is planned for this area and would be generally located southeast of U.S. Highway 191 in sections 5, 6, 7, 8, T7S, R8W and sections 1, 2, 11, 12, T7S, R8W.

3.8.2 Forest Plan Management Direction

Recreation is an important component of the multiple use management policy outlined in both the Uinta and Ashley National Forest Plans. Management direction and goals which pertain to recreation resources within the study area include:

Uinta NF

- Continue to manage and develop dispersed recreation use for public safety and enjoyment within the range of demands projected for each ROS.
- Manage off-road vehicle use to protect the forest environment and renewable resources.
- Manage reservoir recreation use as a destination experience and provide travel routes between reservoirs in proximity.
- Develop a trail system which meets public, permittee, and management needs, and provides signs for information and safety purposes.

Ashley NF

- Provide a broad range of recreation opportunities within land capabilities and according to recognized public need.

3.8.3 Issues

The recreation report addresses the following issue identified from public scoping and from Forest Service management concerns (see Section 1.8):

Issue No. 3: The effects of oil and gas leasing and subsequent activities on recreational resources.

Specific concerns relating to recreation resources include possible effects to developed recreation sites, effects on semi-primitive recreation opportunities, and effects on trails. These factors are discussed further in the following sections.

3.8.4 Sensitive Resource Component(s)

3.8.4.1 Developed Recreation

The Uinta NF contains two general areas of developed recreation sites. One is the Strawberry Reservoir complex which has the highest concentration of recreational sites within the study area; the other is an area along Diamond Fork Road containing the Palmyra and Diamond campgrounds.

Recreation sites at Strawberry Reservoir include campgrounds at Strawberry Bay, Soldier Creek, Aspen Grove, and Renegade. Other facilities associated with these areas include picnic areas, boat ramp, marina, convenience store, cafe, amphitheater, recreation vehicle rental, and RV storage areas. Day use areas include the Strawberry Visitor Center, Chicken Creek East, Chicken Creek West, Ladders, Haws Point, Soldier Bay, Soldier Dam, and the Strawberry River. These areas provide fishing access, view points and interpretive amenities. Total PAOT (people at one time) for developed sites in the Strawberry Reservoir area is approximately 9,000. Future plans for the areas include the Charlie Chaplin day-use area and trail head, ice fishing access, and additional parking.

The Palmyra and Diamond campgrounds are located off Forest Road 029 along Diamond Fork. These campgrounds are within a short driving distance from high population centers

along the Wasatch Front, including the cities of Spanish Fork, Springville, and Provo. Use of these campgrounds in 1992 was approximately 190,000 RVDs.

The Avintaquin campground, accessed from U.S. Highway 191 in Indian Canyon, is the only developed recreation site on the Ashley NF within the study area. It had approximately 500 RVDs in 1992.

The Sowers Canyon area contains no developed recreation sites.

3.8.4.2 Recreation Opportunity Spectrum (ROS)

The ROS provides a framework for stratifying and defining classes of outdoor recreation environments. It is composed of six classes, with each class defined in terms of its combination of recreational activities, settings and experience opportunities. Table 3.8-2 describes the different ROS classes. Four of these classes are found within the study area, including Semi-Primitive Non-Motorized (SPNM), Semi-Primitive Motorized (SPM), Roaded Natural (RN), and Rural (R). Figure 3-8 shows the location of the various ROS classes found within the study area.

Semi-Primitive Non-Motorized. There are approximately 98,160 acres of SPNM ROS classified lands within the Uinta NF portion of the study area. The Uinta NF contains the greatest number of acres of this recreational setting, in part due to its many areas of steep terrain, dense tree cover and lower density of roads. As Figure 3-8 shows, the SPNM lands are evenly distributed throughout the Uinta NF, including large blocks along Willow Creek, in the headwaters of Middle and Right Forks of the White River and in areas to both east and west of Tie Fork.

Slipsheet for Table 3.8-2

The Ashley NF contains a lower percentage of the SPNM lands, due to its higher density of roads. On the Ashley NF outside of the Sowers Canyon area, approximately 20,760 acres of SPNM lands are found southeast of Timber Canyon near Long Ridge, in an area between the Right and Left Forks of Indian Canyon Creek, in an area between Left Fork Canyon and Cottonwood Ridge, in parts of Broad Hollow and Trapper Canyon north of Sowers Canyon, and in parts of Lance Canyon and Corral, Spring and Trail Hollows south of Sowers Canyon. Two separate areas of SPNM lands occur within the Sowers Canyon area encompassing approximately 4,080 acres. One of these areas is found at the head of Brundage Canyon, the other north of Gilsonite Draw in the northeast corner of the study area.

Semi-Primitive Motorized. SPM lands occur on approximately 66,666 acres throughout the Uinta NF portion of the study area. These areas have most of the same characteristics as SPNM lands but contain primitive roads, and trails that allow motorized use. As shown in Figure 3-8, SPM lands occur generally in buffers along many of the lesser used forest roads within the study area.

Approximately 33,068 acres of SPNM land occur on the Ashley NF outside of the Sowers Canyon area. Blocks of SPM land are found north of Timber Canyon and to the east of the South Fork of Avintaquin Creek. Sowers Canyon development field contains three areas of SPM land, covering approximately 8,238 acres. One is located north of Sowers Canyon in South Lost Hollow, one south of Sowers Canyon in portions of Clem and Mine Hollows and one in the upper reaches of the Right Fork of Antelope Canyon.

Roaded Natural and Rural. Approximately 43,802 acres of RN and 5,647 acres of rural ROS classified land are found within the Uinta NF portion of the study area. RN classified land generally occurs as buffers along the main roads, including the Diamond Fork, Sheep Creek-Rays Valley and the Indian Creek roads. Rural ROS lands (5,647 acres) occur along U.S. Highway 40 north of Strawberry Reservoir and along U.S. Highway 6 in Spanish Fork Canyon.

On the Ashley NF outside of the Sowers Canyon area, approximately 100,245 acres of RN lands occur in large blocks throughout the study area due to the higher density of roads. Seventy five percent of the Sowers Canyon area is classified as RN. There are no rural ROS lands on the Ashley NF within the study area.

3.8.4.3 Trails

Trails within the study area provide for hiking, horseback riding, and in some cases ATV opportunities. Table 3.8-3 lists these trails. High use trails on the Uinta NF portion of the study area include the Center Ridge, Bird Trail, Fifth Water, Right Fork Maple Canyon, and Dry Canyon trails. The Center Ridge and Tie Fork trails are both segments of the Great Western Trail (GWT). The GWT is proposed to run the entire width of the western U.S. from Idaho to Arizona. Within the study area, the trail follows along Strawberry Ridge, which is the high ground within the study area, with many vistas of the surrounding area. Ashley NF lands within the study area, including the Sowers Canyon area, area do not contain any moderate to high use trails.

Slipsheet for Table 3.8-3

3.9 VISUAL RESOURCES

3.9.1 General Description

The study area covers two distinct physiographic regions. The western portion of the study area in the Uinta NF is part of the Wasatch Hinterlands, which is in the Middle Rocky Mountain physiographic province (Stokes 1986). This area is characterized by rolling to steep landforms with a variety of vegetation types. At the lower elevations sagebrush, oakbrush, maple and pinyon/juniper are the dominant vegetation types. At higher elevations, including land near Strawberry Ridge, areas of aspen and conifers are common, providing a mosaic of open grassy areas, mountain brush, and taller species such as aspens and conifer timber. This provides for varying patterns of form, color, and texture. Soil colors range from a chalky white to reddish brown, which are exposed in areas of sparse vegetation cover, primarily at lower elevations. The area is generally natural appearing, with modifications to the landscape generally limited to access roads, range improvements, and a few recreational sites. There are electrical transmission lines in the southern end of study area, north of Spanish Fork Canyon and in the Sheep Creek area. Primary sensitive view locations would include the Diamond and Palmyra campgrounds, high use trails, and roads which are identified in the Recreation section (Section 3.8), and the recreation areas in and around Strawberry Reservoir. Terrain surrounding Strawberry Reservoir is generally flat to rolling. Vegetation is primarily grassland/sagebrush. The middleground and background views from the reservoir include the forested hills to the west and south, which are within the leasing analysis study area. This adjacent scenery adds to the aesthetics of the reservoir environment.

The eastern portion of the study area, including all of the Ashley NF, is located in the Book Cliffs-Roan Plateau and Uinta Basin sections of the Colorado Plateau physiographic province (Stokes 1986). On the Ashley NF, lands east of State Highway 191 in Indian Canyon are generally lower in elevation than lands west of the canyon, and include vegetation types such as sagebrush-grasslands and pinyon/juniper. Terrain in this area varies from rolling to deeply dissected ridges and plateaus. Vegetative cover is often sparse, with the predominately chalky white colored soil visually evident. Modifications to the existing landscape include access roads and a limited amount of oil and gas development. Except during the fall hunting season, there is little recreation activity in this area, with few sensitive viewpoints. West of Indian Canyon, the higher elevations include

additional vegetative types such as aspen, Douglas-fir, and sub-alpine fir and Englemann fir, adding variety to the color, forms and textures of the visual scene. U.S. Highway 191 in Indian Canyon, a state designated scenic highway, contains the highest density of potential viewers in this section of the study area. Other sensitive viewpoints on the Ashley NF include the Avintaquin campground and points along Reservation Ridge, which provides recreationists with panoramic views of the surrounding area. Existing modifications to the landscape are generally limited to access roads.

3.9.2 Forest Management Direction

The management and protection of scenic resources is an important component of the overall management responsibilities of the forests. The projected increase in recreational activities, due to the area's proximity to high population centers along the Wasatch Front, the existing high use of the Strawberry reservoir, and the potential increase in developed recreation sites due to the Central Utah Project, continues to add importance to this resource. Goals for visual resources on the forests, as given in the forest plans, are:

Uinta NF

- Maintain and protect visual resources on the forest

Ashley NF

- Implement and manage for adopted Visual Quality Objectives

3.9.3 Issues

The visual resource report addresses issue number 5 from the public scoping process (see Section 1.8):

Issue No. 5: The effects of oil and gas leasing and subsequent activities on the visual resources of the area

Specific areas of concern for visual resources, based upon public scoping and comments from the Forest Service management team, are related to how oil and gas leasing would

effect Visual Quality Objectives (VQOs), especially those lands that are rated as retention or partial retention VQO.

3.9.4 Sensitive Resource Components

Visual Quality Objectives

Visual resources are described and mapped on the Uinta and Ashley NF using the U.S. Forest Service Visual Management System (USFS 1974). This is a methodology developed by U.S. Forest Service for describing and managing visual resources on NFS lands.

VQOs set standards or goals for the visual management of the landscape and are assigned on the basis of the area's scenic beauty, number and sensitivity of potential viewers, and distance from common viewpoints. There are five VQOs, each describing different degrees of acceptable alteration to the natural landscape. The degree of alteration is measured in terms of visual contrast with the existing characteristic landscape. The five VQO are preservation (P), retention (R), partial retention (PR), modification (M), and maximum modification (MM). See Table 3.9-1 for a description of these VQOs.

VQOs have been mapped for both the Uinta and Ashley NF portions of the study area (see Figure 3-10). The majority of the study area is classified as modification. Other VQOs found in the study areas include retention and partial retention.

Slipsheet for Table 3.9-1

Slipsheet for Figure 3-10

Slipsheet for Figure 3-10 (concluded)

Retention VQO

Activities in areas managed as retention should not be evident to the forest visitor. Any modification to the landscape must repeat the form, line, color and texture of the surrounding landscape.

There are 8,340 acres of retention VQO on the Uinta NF. These areas are found primarily along the Diamond Fork Road between the Diamond campground on the south to Sawmill Hollow on the north. Scattered areas of retention are found in the headwaters of First Water and Sheep Creek, along Willow Creek Ridge near the junction of Forest roads 081 and 079, along the Right Fork of the White River, and in a few locations in Spanish Fork Canyon.

The Ashley NF portion of the study area contains 4,020 acres of retention VQO. These areas are found exclusively along a quarter mile wide buffer along both sides of U.S. Highway 191 in Indian Canyon. The Sowers Canyon area does not contain any lands classified as retention.

Partial Retention VQO

Activities in areas managed as partial retention VQO may be evident to the casual observer, but should remain subordinate to the surrounding landscape. Management activities that take place in these areas may introduce form, line, color and textures that are infrequently or not found in the characteristic landscape, but these introduced contrasts should remain visually subordinate to the surrounding landscape.

The Uinta NF portion of the study area contains 121,430 acres of Partial Retention VQO. Major areas with this classification include lands along the eastern front of Strawberry Ridge that are visible to recreationists at Strawberry Reservoir, scattered areas along Forest Road 051 between First Water and Sixth Water, and large areas on either side of Sheep Creek.

The Ashley NF portion of the study area contains 18,700 acres of Partial Retention VQO. Lands with this classification exist in Indian Canyon, in the headwaters of the South Fork

Avintaquin Creek, and in a narrow strip along Reservation Ridge. The Sowers Canyon area contains no partial retention VQO.

Modification VQO

Management activities in areas managed for modification VQO may visually dominate the surrounding landscape. However, activities should borrow from the naturally established form, line, color, and texture so that its visual characteristics are compatible with the natural surroundings.

The Uinta NF portion of the study area contains 146,395 acres of modification VQO. Large areas of this category are found in the headwaters of Diamond Fork, in the First through Sixth Water Creek drainages west of Strawberry Ridge, most of R5E, T9S (SLM) which includes the headwaters of Monks Hollow, the Willow Creek drainage, and most of the land south of Willow Creek Ridge.

The Ashley NF portion of the study area contains 131,255 acres of modification VQO outside of the Sowers Canyon area. This represents approximately 89 percent of this unit. It is found in all areas except in parts of Indian Canyon and along Reservation Ridge. All of the Sowers Canyon area (50,138 acres) is rated as modification.

3.10 CULTURAL RESOURCES

3.10.1 General Description

Cultural resources are archaeological, historic, and traditional cultural properties. Sites are afforded protection if they are on or eligible for the National Register of Historic Places. Eligibility criteria are found at 36 CFR 60.4. Collectively, any site on or determined eligible for the National Register is known as a historic property.

The Forest Service is mandated by the National Historic Preservation Act (NHPA), as amended, to take into account the effect on historic properties that approving an undertaking will have. The Forest Service must also afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on the effect and the

undertaking (NHPA, Section 106). The procedures for implementing this process are codified at 36 CFR 800.

Compliance with the legislation and regulations is through implementation of a two-step process consisting of Identification/Evaluation of Historic Properties and Assessment of Effects. For this EIS, the first step consisted of identification of known (previously recorded) cultural resources within the study area. That information is included in this section. When specific areas of disturbance are known, a site-specific survey will be conducted to identify resources that may be impacted by the action. This will take place after completion of this EIS and prior to well drilling. The second step is addressed generally in Section 4.10, as site-specific impacts and effects are not known at this time. The Utah State Historic Preservation Officer (SHPO) is consulted during this process, known as the Section 106 consultation process. The Forest Service has initiated this consultation with a letter to the SHPO dated July 20, 1992 (see Chapter 5, Consultation and Coordination).

Other legislation to be considered during the leasing process includes the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) and the American Indian Religious Freedom Act of 1979 (AIRFA). These laws protect American Indian access to religious sites and address treatment of Native American remains.

The following brief overview of the cultural history of the overall study area is taken from Talbot, et al. (1989). Evidence of human use of the general area dates back to 10,000 BC and the Paleo-Indian Period. This period was characterized by specialized hunting of big game animals including the now extinct mammoth, bison, horse, and camel. Archaeological evidence in northern Utah is very scarce for this period, consisting only of a few spear points.

The Archaic Period (6500 BC to AD 400) is much better represented in the archaeological record. Evidence indicates that people living at this time subsisted on a wide range of animal and plant resources. This hunting and gathering strategy necessitated seasonal movement of relatively small groups of people. A number of sites in caves have yielded information concerning this period.

During the Formative Period (50BC to AD 1400), the population became more dependent on cultivation of crops including corn, beans, and squash. The settlement pattern became more sedentary, with larger groups living in permanent villages. The use of ceramic pottery and the bow and arrow are characteristic of this period. In the study area, this culture is classified as Fremont.

The subsistence and settlement patterns of the Late Prehistoric Period (AD 1200 to 1850) were similar to those of the Archaic Period, with a reliance on wild foods and use of brush structures. Seasonal movement of small groups was necessary to utilize the various resources. These people were the Numic-speaking ancestral Utes and Shoshone.

The Dominguez and Escalante expedition of 1776 passed through the study area, signaling the beginning of the Historic Period. Over the next 100 years, trappers, Mormon settlers, surveyors, and military expeditions changed the way the resources of the study area were utilized and resulted in conflict with the original inhabitants. The Uintah Ute Reservation was established in 1861, and Ute groups from Colorado were added to the Utah reservation in 1882. Between 1890 and 1933 over 500,000 acres of the Uintah-Ouray Reservation were taken for homesteading, and in 1906 over 900,000 acres were added to the NFs from the reservation (Clemmer and Stewart 1986, pp. 535 and 544). Historic resource exploitation in the study area includes mining, logging, and oil and gas extraction.

Uinta NF

Cultural resources investigations for a variety of projects have surveyed approximately 8,400 acres (3.6%) of the study area. To date, 84 sites have been recorded. The majority of these sites are lithic scatters; that is, sites showing evidence of stone tool manufacture, resource procurement and processing, and perhaps short-term camping. The sites may date from any of the above periods, but most of them probably are from the Archaic or Late Prehistoric Periods. Additionally, a number of historic sites have been recorded. Although Dominguez and Escalante travelled through and camped within the study area on Diamond Fork Creek (Chavez and Warner 1976), there has been no archaeological evidence recorded for their passage. The historic sites include a military encampment, trash scatters, and evidence of homesteading and animal husbandry. There are also historic dams, diversions, and ditches in the study area. Most of the prehistoric sites have not been reviewed for their eligibility to the National Register of Historic Places, or have been determined not eligible. The smaller ephemeral historic sites such as the trash scatters, have been recommended as not eligible, but no formal determinations (in consultation with the SHPO) have been made.

Ashley NF

Much of the south unit of the Ashley NF was once part of the Uintah-Ouray Ute Indian Reservation. Including the Sowers Canyon area, approximately 5,460 acres (2.7%) have been surveyed for cultural resources. Fifty-seven sites have been recorded by these surveys. In addition to lithic scatters, prehistoric sites also include rock shelters and an Indian trail. Other site types known in the vicinity include burials, vision quests, peeled trees, rock art, and pithouses (Phillips 1992). Historic sites include cabins and a Forest Service guard station. Sites probably date to all the above referenced periods except the Paleo-Indian Period. No determinations of eligibility to the National Register have been made for the majority of the sites. Representatives of the Uintah-Ouray Ute Tribe did not indicate that there were any sites of significance to them in the study area (Loosle 1993).

3.10.2 Forest Management Plan Direction

Both the Ashley and Uinta Forest Plans mandate compliance with national legislation protecting cultural resources including project-by-project inventories prior to ground-disturbing activities. This includes inventory, evaluation, and management of historic properties. Both Forest Plans also list cultural resources interpretation as management policy. The Forest Plans recognize coordination with the Utah SHPO and others as required as being necessary. Impact mitigation is also listed as an option. No cultural resources overviews have been prepared for either forest.

3.10.3 Issues

Cultural resources were not identified as a major issue during public scoping, however there were concerns on how oil and gas leasing would affect significant cultural or historic sites existing within the study area, and the General Description section describes these areas of concern.

3.11 TRANSPORTATION

3.11.1 General Description

This section addresses the existing road network which currently provides access to the study area within the Uinta and Ashley NFs. Discussions will address road length, current maintenance levels, and traffic volumes. The discussion will focus on those road segments which will provide access to the Sowers Canyon area in eastern Ashley NF, and major access roads into western Ashley NF and Uinta NF that would likely service potential exploration wells.

The study area for transportation includes major highways and minor roads in Duchesne, Wasatch, and Utah counties and in the Uinta and Ashley NFs that would serve potential future oil and gas developments. The road network in Duchesne County and the Ashley NF is of primary interest due to expected development in the Sowers Canyon area. Therefore, more detail is given for the roads that serve that portion of the overall study area.

3.11.2 Forest Management Plan Direction

For the Ashley NF, the Forest Plan outlines the following transportation goals:

- Eventual closure of temporary logging roads.
- Providing the same level of public access to the Forest, but with more uniform distribution throughout the Forest.
- Transfer of several arterial routes from federal to county or state jurisdiction.
- Updating the criteria for the Forest Travel Map.

The Ashley NF Plan outlines desired configurations for utility and transportation corridors for various activities. For the range of resource uses and outputs, facility construction may occur as needed to meet management objectives, with maintenance as required. Minerals development has no restrictions other than those in the Standards and Guidelines. Public access is allowed, yet travel will be managed to protect other resources, provide for public safety, and minimize conflicts with other users. Roads and trails are to be located, designed, constructed, reconstructed, and maintained to serve the projected land management objectives at the lowest cost for transportation consistent with environmental protection and safety considerations. Finally, the safety of all dams, canals, bridges, and utilities is to be assured (USFS 1986b).

Transportation goals for the Uinta NF include:

- Plan, develop, and operate a network of roads, including recreation site roads, providing user safety, convenience, and efficiency of operations to accomplish Forest land and resource management and protection objectives. Activities will be coordinated with national, state and local transportation needs.

A number of more specific objectives accompany the discussion of this goal, including monitoring of Forest resource activities to determine transportation support needs in

meeting multiple-use objectives, performance of 100% of maintenance needs, and road and bridge surveys, inspections, and maintenance (USFS 1984).

3.11.3 Issues

The transportation discussion relates primarily to the following issue identified from public scoping and from Forest Service management concerns (see Section 1.8):

Issue 8: The effects of oil and gas leasing and subsequent activities on transportation

Specific concerns focus on federal, state, county and forest road segments which will provide access to the Sowers Canyon area in eastern Ashley NF, and access roads into western Ashley NF and Uinta NF that would likely service potential exploration wells.

3.11.4 Sensitive Resource Components

3.11.4.1 Major Highways

Federal highways provide the main access routes to the study region. The major transportation network in the study area consists of three highways: U.S. Highway 40, which traverses Duchesne and Wasatch Counties roughly 10 miles to the north of the study area; U.S. Highway 6, which parallels the southern boundary of the Uinta NF from Spanish Fork to Price; and U.S. Highway 191, which crosses the Ashley NF between Duchesne and Helper. Descriptions of each highway are presented below. Traffic counts for each of these highways are provided in Table 3.11-1.

U.S. Highway 40 generally trends east/west on the north side of the study area from Heber City through the towns of Duchesne, Roosevelt, and beyond to Vernal. It is an all weather, well maintained, two-lane highway. This highway facilitates access to the northern portions of the Uinta and Ashley NFs.

U.S. Highway 6 is a major north/south highway that connects the Provo/Wasatch Front area with Interstate 70 in eastern Utah. This highway is an important route of access for visitors

to the southern portion of the Uinta NF. It is also an all weather, well maintained, two-lane highway.

U.S. Highway 191 is a two-lane highway that periodically closes during winter after large snowstorms. It trends northeast/southwest from Duchesne in the north to Helper in the south, following the left fork of Indian Canyon and Willow Creek Canyon. It has been designated by the State of Utah as a scenic byway. Highway 191 is one of the most important access routes to the Ashley NF, as it is the only paved road that actually crosses the Forest. The highway provides access to a few unimproved gravel roadways within the Forest.

3.11.4.2 County and Forest Roads

The majority of roads that would be used to access potential oil and gas lease sites within the Ashley and Uinta NFs are either gravel surface or primitive dirt roads. Paved road surfaces are generally limited to the major U.S. highways described above, or are found on only the most heavily used county and Forest Service routes. In general, access to large portions of the study area is limited by rugged terrain. As a result, most of the Forest Service roads follow major drainages or ridgelines.

The following discussion provides a description of the access roads that would be utilized for oil and gas exploration and development activities, including their location in the study area, surface type, and traffic volumes, if available. The information presented was derived from the Forest Service Road Transportation Information

Slipsheet for Table 3.11-1

System (RTIS). The discussion is divided between three regions of the study area: the Uinta NF, the Ashley NF outside the Sowers Canyon area, and the proposed Sowers Canyon area.

Uinta NF Region

Access to the Uinta NF portion of the study area is provided by various county and Forest Service roads that generally originate from either U.S. Highway 40 on the north side of the Forest near Strawberry Reservoir, or U.S. Highway 6, to the south.

Diamond Fork Road (Forest Road (FR) 029) is an important Forest Service access route into the Uinta NF. It originates at U.S. Highway 6 and climbs east, over Strawberry Ridge, and ends near Strawberry Reservoir. The road is paved for 12.3 miles, then turns into a single-lane unsurfaced road at Springsville Crossing, and remains a dirt road the remaining 12.5 miles, passing over Strawberry Ridge to the reservoir. Diamond Fork Road provides the primary route of access to numerous secondary roads that could be utilized for oil and gas exploration. However, due to recent planning, scheduling, and construction activities of the Central Utah Water Project (CUP), access through Diamond Fork may be limited with the proposed construction of a dam at Monks Hollow which is located approximately 8 miles north of U.S. Highway 6 as well as other related infrastructures within Diamond Fork. These secondary roads include FR 036 and FR 115. Other important roads that are accessed by Diamond Fork Road include FR 051, FR 132, and FR 135. These roads are described below.

Sheeps Creek-Rays Valley Road (FR 051) originates at U.S. Highway 6 and connects with Diamond Fork Road near Springsville Crossing. It is an important access route for the south-central portion of the Uinta NF. The road is double-laned and paved for approximately 16 miles. Beyond the pavement the route is double-laned with a gravel surface for about 1.5 miles. The remainder of this road is single lane and unsurfaced.

FR 132 provides access to the northwestern portion of the study area and is reached via Diamond Fork Road, splitting north from Diamond Fork Road at Springsville Crossing. Within the study area, it is a single-lane gravel surfaced road, roughly 8 miles in length.

Sheep Creek-Indian Creek Road (FR 042), a part of the Uinta NF's Arterial Travel Route, splits off of Rays Valley Road (FR 051), roughly eight miles northeast of U.S. Highway 6 and follows the ridge in the head of Sheep Creek Canyon to the top of Strawberry Ridge. The road then drops down Indian Canyon to Strawberry Reservoir. FR 042 generally provides access to the southern portion of the Uinta NF region of the study area and is roughly 9.5 miles long. It is a gravel road varying in width from one to two lanes.

Left Fork Road (FR 079) originates at U.S. Highway 6 near Soldier Summit, and follows the Left Fork of the White River, to the northwest. This road eventually crests Willow Creek Ridge and drops down Trail Hollow to Strawberry Reservoir. FR 079 generally provides access to the southeastern portion of the Uinta NF region of the study area. It is a gravel and/or dirt surfaced road varying in width from one to two lanes and is approximately 20 miles long.

Right Fork Road (FR 081) originates at U.S. Highway 6 near Soldier Summit, and follows the Right Fork of the White River, to the northeast. This road eventually reaches the crest of Reservation Ridge, at the border of the Ashley NF. It then turns north and follows the crest of the ridge to Willow Creek Ridge, turning west on that ridge and ending at its junction with FR 079. FR 081 generally provides access to the extreme southeastern portion of the Uinta NF region of the study area. It is a single-lane unsurfaced road that is approximately 23 miles long.

FR 135, a low standard, high clearance pickup and 4-wheel drive route, follows the top of Strawberry Ridge from FR 132 for approximately 11 miles and accesses the north end of the study area. It is a single-lane unsurfaced road. The portion between the head of Mud Creek and its junction with FR 029 has been closed and is no longer usable. It also accesses Strawberry Ridge south of FR 029 but dead-ends above Indian Spring due to closure efforts. It provides access or linkage to a number of secondary roads within the study area including FR 110, FR 150, FR 134, and FR 124. Other important roads that are accessed or linked by FR 135 include FR 042 and FR 029, which are described above.

Forest Roads 084, 245, and 124 access the extreme northern portion of the study area from U.S. Highway 40 north of Strawberry Reservoir. FR 084 follows Trout Creek to the north of Highway 40 (roughly 2 miles within the study area), FR 245 parallels FR 084 to the west (roughly 5 miles within the study area), and FR 124 ascends Strawberry Ridge to the

southwest, terminating at FR 135 (it is roughly 3 miles long). All of these roads are single laned and unsurfaced.

Westside Road (FR 131), which is a part of the Uinta NF's Arterial Travel Route, is an important route that provides access to numerous primary and secondary roads in the eastern portion of the Uinta NF. It extends roughly 15 miles south from U.S. Highway 40 around the western shoreline of Strawberry Reservoir. It is an all weather, well maintained, paved two-lane road. Important primary roads that are accessed or linked by Westside Road include Forest Roads 029, 042, 079, and 109, each of which are described separately in this section. It also provides access or linkage to a number of secondary roads within the study area including Forest Roads 134, 307, 150, 120, 079, 110, 111, and 148.

Forest Roads 109 and 090 provide access to the southern portion of the Uinta NF and are accessed by the Left Fork Road (FR 079), described above. Both of these roads are single-laned and unsurfaced. FR 109 is roughly 3 miles long, FR 090 is roughly 10 miles long.

It is expected that the roads listed above will generally remain unchanged, but due to time and management of nature resources, the transportation system may change which may include the road closures and/or obliteration, road surfacing, and road numbers.

Ashley NF Region

Access to the Ashley NF is provided by U.S. Highway 40, which parallels the border of the Forest, roughly 10 miles to the north. From Highway 40, various county roads run south through the Uintah and Ouray Indian Reservation to the Ashley NF. In general, county roads that access the Ashley NF from Highway 40 run parallel to the major drainages that flow out of the Forest to the Duchesne and Strawberry Rivers. In addition, U.S. Highway 191 crosses the middle Ashley NF, providing access to a few secondary roads within the Forest.

Timber Canyon Road (FR 149) is an arterial access route into the northwestern portion of the Ashley NF. The road's origin is in the Strawberry River Valley, near Starvation Reservoir, which is accessed from U.S. Highway 40. The road runs southwest from the Strawberry River Valley as a county road for 18 miles until it enters the Ashley NF. After entering the Forest, the road climbs 10 miles and terminates at Reservation Ridge, at FR

147, which is described below. Timber Canyon Road is a single-lane dirt road, with a design speed of 15 mph. Secondary Forest Service roads that are accessed by Timber Canyon Road include FR 176, FR 361, FR 090, FR 172, and FR 168. These secondary roads are all primitive and unsurfaced.

Horse Ridge Road (FR 179) is a collector route that provides access to the narrow, southwestern portion of the Ashley NF. It runs south from Timber Canyon Road, near the Strawberry River, through the Uintah and Ouray Indian Reservation 15 miles to the Ashley NF, where it follows Horse Ridge for 4.6 miles and terminates at Reservation Ridge at FR 147. It is a single-lane unsurfaced road, that was designed for low speed automobile use. Secondary Forest Service roads that are accessed by Horse Ridge Road include FR 091, FR 097, and FR 090. These secondary roads are all primitive and unsurfaced.

U.S. Highway 191 provides access to various secondary roads, including Forest Roads 153, 324, and 111. FR 147, an important road that follows Reservation Ridge (and is described below), is accessed from Highway 191.

Reservation Ridge Road (FR 147) is an important arterial route that runs along the western and southern perimeter of the Ashley NF along Reservation Ridge. It extends roughly 18.4 miles from the northwestern corner of the Forest, south and east to its junction with U.S. Highway 191. It is generally an improved dirt road for most of its length and was designed for automobile use for speeds of up to 30 mph. FR 147 is an important arterial route in the western portion of the Ashley NF, linking numerous roads. Important arterial and collector roads that are accessed or linked by FR 147 include FR 149, FR 179, and U.S. Highway 191, each of which are described separately in this section. It also provides access or linkage to a number of secondary roads within the study area including Forest Roads 180, 200, 301, 033, 148, 320, 068, 069, 070, 071, 073, 074, 081, 082, 084, 098, 323, 326, 100, 327, and 101, all of which are relatively primitive unsurfaced roads.

Lake Canyon Road (FR 175) is a local access route for the north-central portion of the Ashley NF. It runs south from Timber Canyon Road, near Starvation Reservoir, through the Uintah and Ouray Indian Reservation to the Ashley NF, where it follows the Right Fork of Lake Canyon. It is a single-lane improved dirt road, roughly 4.7 miles in length, and was designed for low speed automobile use. Secondary Forest Service roads that are accessed

by Lake Canyon Road include FR 329, which follows Bear Gulch, and FR 328, which follows the Left Fork of Lake Canyon. These local roads are also primitive and unsurfaced.

Right Fork Indian Canyon Road (FR 330) is a local route that also provides access to the north-central portion of the Ashley NF. It runs southwest from U.S. Highway 191, entering the Forest to the west and follows the Right Fork of Indian Canyon. This local road is roughly 5 miles in length and is a single-lane unsurfaced road, designed for low speed use by trucks.

Cottonwood Ridge (FR 331) and Wild Horse Ridge (FR 491) Roads are accessed from Sowers Canyon Road (described below). They runs southwest along Cottonwood and Wild Horse Ridges respectively, both in the Uintah and Ouray Indian Reservation and in the Ashley NF, eventually merging within the Forest. Both roads are single-lane and unsurfaced, designed for low speed automobile use.

Sowers Canyon area

Sowers Canyon Road (FR 152) is an important collector route in the eastern portion of the Ashley NF. It originates at Antelope Canyon Road as a county road within the Uintah and Ouray Indian Reservation. It then runs southwest, following Sowers Creek into the Ashley NF. The road eventually ends near the mouth of Deathtrap Canyon, roughly 15.6 miles southwest of the Forest boundary. Sowers Canyon Road is an improved dirt road, designed for automobile use with speeds of up to 30 mph. Secondary Forest Service roads that are accessed by Sowers Canyon Road include Wire Fence Canyon Road, which follows Wire Fence Canyon roughly three miles to its terminus. Wire Fence Canyon Road is a single-lane unsurfaced road.

Nutters Ridge Road (FR 333) is an important collector route for the Sowers Canyon area. It extends southwest from Sowers Canyon Road in the Uintah and Ouray Indian Reservation, eventually climbing the ridge between Wire Fence Canyon and Nutters Canyon in the Ashley NF. Nutters Ridge Road proceeds 9 miles and terminates at Anthro Ridge, where it joins FR 163 (described below). Nutters Ridge Road is an improved dirt road, designed for low speed automobile use.

Antelope Canyon Road (FR 154) is an important collector road in eastern Ashley NF and provides access to numerous other roads leading into the Forest. It originates at U.S. Highway 40 roughly 9 miles east of Duchesne, extending south through the Uintah and Ouray Indian Reservation and entering the Ashley NF near its northeast corner. Within the Forest, it follows the Left Fork of Antelope Creek roughly 10 miles. The road eventually exits the Forest near its southeast corner, descending to Wells Draw. Antelope Canyon Road is an improved dirt road, designed for low speed automobile use. Secondary Forest Service roads that are accessed by Antelope Canyon Road include FR 191, which follows the Right Fork of Antelope Canyon, Road 201, which follows Alkali Canyon, and FR 336/163, which is described below.

Right Fork Antelope Ridge Road (FR 335) is a local access route into the Sowers Canyon area. It originates at Antelope Canyon Road within the Uintah and Ouray Indian Reservation, extending southwest along the ridge overlooking the east side of Nutters Canyon. The road proceeds roughly 16.6 miles, eventually terminating at Anthro Ridge, where it joins FR 163. FR 335 is a single-lane dirt road, designed for low speed automobile use.

Gilsonite Ridge Road (FR 337) is a local route that begins as a county road that parallels Antelope Canyon Road. It runs roughly 5.5 miles and accesses the extreme eastern portion of the Ashley NF. It is a single-lane unsurfaced road, designed for low speed automobile use. Secondary Forest Service roads that are accessed by FR 337 include FR 202 and FR 338, which follow Gilsonite Draw out of the eastern end of the Forest.

Chokecherry Road (FR 336)/Anthro Mountain Road (FR 163) accesses the southeastern corner of the Ashley NF. It originates at Antelope Canyon Road, climbing up Chokecherry Canyon to the southwest and ascending to Anthro Ridge. It is a single-lane unsurfaced road, designed for low speed automobile and RV use. FR 336/163 is an important road in the eastern portion of the Ashley NF because it links numerous other roads. Important primary roads that are accessed or linked by FR 336/163 include FR 154, FR 335, and FR 333, which are all described above. Secondary Forest Service roads that are accessed by FR 336/163 include FR 167, FR 161, and FR 332, which follows the west side of Wire Fence Canyon.

3.12 SOCIOECONOMICS

3.12.1 General Description

To address all areas of the Uinta and Ashley NFs which are the subject of this oil and gas leasing EIS, the socioeconomics study area could be quite broad. However, a review of various background documents suggests that only the counties of Duchesne and Uintah, and more particularly the towns of Duchesne, Roosevelt, and Vernal are likely to experience notable impacts. Therefore, this baseline section will be confined to that study area. The counties to the south and west (Carbon, Wasatch, and Utah) are more focused on coal development, urban and commercial growth, and agriculture and are not included in the study area. The anticipated development of the Sowers Canyon area, with up to 30 development wells, further suggests a focus on the Duchesne area. The few proposed exploration wells (for undetermined locations elsewhere in the Uinta and Ashley NFs) do not promote the inclusion of the other counties in the baseline analysis.

A few additional comments regarding the setting for the proposed development and the nature of the study area will prove useful to this baseline discussion. The study area might more specifically be confined to the southern half of Duchesne County and the central one-third of Uintah County, including the populated area. The town of Duchesne serves as the northeastern gateway to this portion of the Ashley NF and, as noted above, will be the primary focus of this baseline discussion. It is projected that the Roosevelt/Vernal area, to the east (about 40 to 60 miles from Sowers Canyon) will provide some additional employees, services, and supplies to oil and gas development, especially in the Sowers Canyon area in Duchesne County.

As noted in the Transportation section (Section 3.11), access to the area is limited primarily to three major federal highways, and a number of county and forest roads. Therefore, socioeconomic effects will be primarily directed to the northeast along U.S. Highway 191, north of that portion of the Ashley NF in which the Sowers Canyon area is located. Minor socioeconomic effects could be felt to the south, along the U.S. Highway 6 segment between the Helper/Price area and Spanish Fork to the west. However, since this area is projected to be only negligibly affected, it will not be addressed in the baseline discussion. At present, U.S. Highway 191 is the only paved highway to cross this portion of the Ashley NF and the rough terrain on the south side of the Forest. An arterial route has been

proposed through the Uinta NF from the Strawberry Reservoir vicinity down to U.S. Highway 6 at the mouth of Sheep Creek. An environmental impact statement was prepared on this project in 1990 and alternative routes range from 55 to 84 miles in length. However, since this route has not been completed, and since only a few scattered exploration wells are proposed under the RFDS, the socioeconomic impacts to this area are likewise expected to be negligible. The primary entrance to the western portion of the study area is by way of U.S. Highway 40 from Heber City to Duchesne. Other entrances are from the east from Vernal via U.S. Highway 40 to Duchesne, and from the south via Helper and Price northeast on U.S. Highway 191 toward Duchesne. U.S. Highway 6, between Spanish Fork and the Helper/Price Area, provides access to the southwestern portion of the Uinta NF study area.

3.12.2 Forest Management Plan Direction

No particular management plan direction for either Forest is given specifically for socioeconomic issues. Issues such as recreation, land use and ownership, and related matters will directly affect the social and economic well-being and lifestyles of local residents and Forest visitors, and will be considered as the baseline section is developed.

3.12.3 Issues

The socioeconomic baseline discussion will address the following issue identified from public scoping and Forest Service management concerns (see Section 1.8):

Issue 1: The socioeconomic effects of oil and gas leasing and subsequent activities.

Specific concerns regarding socioeconomic include population characteristics, employment and income, housing, local government services and fiscal condition for the study area for the West Uinta Basin EIS, and provide brief comments on the social setting. These specific areas are described below.

3.12.4 Sensitive Resource Components

3.12.4.1 Population

Table 3.12-1 shows Utah population estimates by county and city in the study area. Note that Duchesne County has generally remained at about the same population level in 1992 as in 1980, with a significant bump in the mid-1980s as oil and gas production rose and then fell in the late 1980s. Total population as of July 1, 1992 was estimated at 12,900, with little overall change experienced between 1980-1992. Duchesne County has about 0.7 percent of total Utah population. In Uintah County, the same trend is generally shown, although a slight increase between 1980 and 1992, of about 1.1 percent (with a 2.6 percent change 1991-1992) has been experienced. Population has ranged during 1980 to 1992 from about 20,700, to the current estimate of 23,700. Uintah County has about 1.3 percent of Utah's population (State of Utah Economic Coordinating Committee 1993).

In the cities of interest, Duchesne has experienced similar trends to that of the county, with a decrease in population from 1980 to 1990, from 1,677 to 1,308 persons. In the city of Roosevelt, in Duchesne County, a slight increase has been experienced: from about 3,800 in 1980 to 3,915 in 1990 (U.S. Department of Commerce 1990a).

Vernal, in Uintah County, lost population from 1980 to 1990, with a 7.48 percent decrease from 7,181 to 6,644 persons. (Utah Office of Planning and Budget 1991a; cited in Wasatch-Cache and Ashley NF 1992 [USFS 1992j]). The decrease is primarily due to declines in oil and gas exploration and production.

Slipsheet for Table 3.12-1

The above figures are in contrast to what has historically been a boom-and-bust cycle in Duchesne and Uintah Counties. During the period 1970 to 1980, Duchesne County's population increased substantially (by 5,280 persons, or 71 percent) with the development of the Altamont and Bluebell oil fields. This figure is compared to a net increase of only 220 people between 1960 and 1970 and, as previously noted in Table 3.12-1, a slight decrease (0.3 percent) from 1980 to 1990.

Uintah County similarly boomed between 1960 and 1980, due to large construction projects like Flaming Gorge Dam, Central Utah Project water projects, start-up of the White River Shale Oil projects, the DG&T Power Plant, and oil exploration (Uintah Basin Association of Governments 1993). Again, as shown by Table 3.12-1, modest growth was experienced in the county in 1980 to 1990, with a spurt between 1980 and 1985, then a decline, and then a recent spurt in 1991 to 1992 due to tight gas sands drilling activity.

Tables 3.12-2, and 3.12-3 show age, sex, and social characteristics of selected population segments in the study area (State of Utah Economic Coordinating Committee 1993; Ute Tribe Public Relations/Audio-Visual Department 1992; Uintah Basin Association of Governments 1993; U.S. Department of Commerce 1990a and 1990b). The following items are of note as one reviews the three tables:

- Males and females are about equal, with females in greater number in Uintah County.
- American Indian, Eskimo or Aleuts (here, Uintah and Ouray Ute Indian Tribe) comprise about 5 percent of Duchesne County residents (predominantly in the Roosevelt area); and 11 percent in Uintah County (Ballard/Ouray area).
- Hispanics comprise about 3 percent of Duchesne County's population; and about the same minority in Uintah County.
- The age/sex structure is comparable to the rest of Utah, which has a lower median age than all states in the U.S., and a sizeable percent of the population under age 18. Duchesne County has a median age of 25.0 years, with 43.0 percent under age 18. For Uintah County the figures are 23.2

years and 43.4 percent. Both counties have only 6 to 9 percent of population age 65 and over.

Outside of the towns, much of the remainder of the study area in this vicinity is very sparsely populated. The Uintah and Ouray Indian Reservation here generally extends in an east-west band south of the town of Duchesne, along the northern border of the south unit of the Ashley NF.

Population trends for all of the counties and cities in the study area are not available in detail. However, State of Utah, Duchesne County, and Uintah County indicators may be instructive. Duchesne County is predicted to grow to about 13,300 to 15,000 people by year 2000 (Uintah Basin Association of Governments 1993; Duchesne County 1991a); and to about 17,000 by the year 2020. Uintah County is projected to have about 24,300 persons by the year 2000; and 32,600 persons by the year 2020 (Uintah Basin Association of Governments 1993). For the state, the

Slipsheet for Table 3.12-2

Slipsheet for Table 3.12-3

1992 estimate of 1,820,000 persons is predicted to increase by 1.6 percent per year, to about 2,774,000 persons by the year 2020 (State of Utah Economic Coordinating Committee 1993). By the year 2000, mining and energy-related employment in the state is predicted to grow only 1.0 percent per year, to about 10,200 persons, giving some indication of local trends in the two towns of interest (Duchesne and Vernal). However, these data disagree slightly with other employment estimates (see below).

3.12.4.2 Employment and Income

The following discussion is a summary of information from several federal, state and local publications (U.S. Department of Commerce 1990b and 1990c; State of Utah Division of Energy 1991; Uintah Basin Association of Governments 1993).

The employment and income picture in Duchesne and Uintah Counties has been dominated by oil and gas production, along with the industries and commercial enterprises which service this activity. Crude oil production continues to fall in the State of Utah, with 1993 figures showing only 22.4 million barrels, an 11 percent decrease from the 25.2 million barrels in 1991. Among Utah counties, Duchesne County moved into second place in 1992 with 5.9 million barrels. Uintah County was the fourth leading producer with 3.4 million barrels. Regarding natural gas production, expanded pipeline capacity planned for the Uinta Basin by Questar Corporation and Colorado Interstate Gas Company will provide additional access to California, Midwest, and East Coast markets. The Kern River pipeline, opened in 1992, is already providing Utah gas producers with some access to California markets. As a result, natural gas well completions have increased from 92 in 1991 to a projected 134 in 1992. Most of the drilling activity is focused on the tight-sand formations in the Uinta Basin.

Overall, energy industry employment continues to decline for primary energy-producing sectors; oil, natural gas, coal, and uranium (State of Utah Economic Coordinating Committee 1993). These trends have occurred since the high point of about 20,700 workers statewide in 1981. In 1992, total energy employment in Utah was about 13,300 persons, of which petroleum production, petroleum distribution, and natural gas distribution accounted for nearly 6,000 workers.

Utah crude oil production by county in 1990 shows Duchesne County in third place, with 673 wells and just over 7 million barrels of production. Uintah County ranks fourth, with 426 wells and slightly over 4 million barrels in production.

Regarding natural gas production by county in 1990, Uintah County ranks third, with 436 wells and a gross production of over 28 billion cubic feet. Duchesne County is fourth; however, here only seven wells produce over 19 billion cubic feet. Of the 15 largest natural gas fields in the state, the Natural Buttes, Bluebell, and Red Wash fields are in Uintah County; and the Altamont and Monument Butte fields are in Duchesne County (State of Utah Department of Natural Resources 1991).

Income from energy production is not disaggregated by county and town. In Utah in 1992, however, employment directly attributable to energy production totalled 4,708 jobs (again in slight disagreement with previously given estimates), paying total wages of about \$130,000,000 (or about \$27,612 per job). These figures represent less than 1 percent of total employment for non-agricultural jobs in the state (State of Utah Economic Coordinating Committee 1993). This wage figure compares to approximately \$15,200 per capita personal income in Utah statewide, and an average of \$19,700 for the United States. In general, jobs in the energy sector do pay well in relation to other sectors. Hourly wages may range from \$27.82 per hour for rig crew, up to \$38.49 per hour for oil and gas extraction personnel (U.S. Department of Commerce 1991; cited in U.S. Forest Service 1993, Wasatch-Cache DEIS). Uintah County shows 507 "mining" jobs in 1990 (including oil and gas extraction and non-metallic minerals), while Duchesne County has 221 (U.S. Department of Commerce 1990d).

The employment mix in Uintah and Duchesne counties is characterized in a slightly different light, however, by the Uintah Basin Association of Governments (1993). In a summary report compiled from various sources, it is stated that total employment by industry in the area is dominated by government (24.2 percent in 1990 in Uintah County); trade (22.1 percent); followed by mining (17.3 percent). Government is even more dominant in Duchesne County, at 33.0 percent, with trade at 21.7 percent and mining at 12.2 percent. Personal income is also dominated by government and trade in each county.

Poverty levels in the two counties are higher than the norm for the State of Utah (11.4 percent) and the U.S. (13.1 percent). In 1989, both counties' poverty levels were,

coincidentally, at 18.7 percent. The weighted average annual income threshold for a family of four was \$12,674. The American Indian, Eskimo or Aleuts category has distinctly higher poverty rates, at 31.1 percent in Duchesne County and 51.2 percent in Uintah County, both rates on the Reservation (State of Utah Economic Coordinating Committee 1993; U.S. Department of Commerce 1990e).

The perceptions of Uintah and Ouray Ute Indian Tribe members regarding employment and income is likely different than reflected in the above statistics; the assertion that the Utes were stripped of their lands (and resources), culture, and identity is evident in a publication of the Tribe (Ute Tribe Public Relations/Audio-Visual Department 1992). Operations budgets for the U.S. Bureau of Indian Affairs to conduct Reservation activities, and trust accounts for individual tribal members, have offset this lack of income from local resources to some extent in the "non-Indian" sense. Local Indian enterprises mentioned are snack shops and gas stations, cattle ranching, irrigated agriculture, and wood cutting. During 1992, the total tribal and allocated oil and gas production was approximately 1.7 million barrels of oil and 3.36 mcf of gas. Data on the number of Native Americans employed in the oil and gas industry, are unavailable at this time.

The loss of historic and current Indian "income" from their shrinking land and water resource base in this study area is further chronicled in other publications (O'Neil 1971; Clemmer and Stewart 1986). Of original Uintah and Ouray reservation lands, over 520,000 acres were taken for homesteading under the Dawes Act, and over 970,000 acres were taken and added to Uinta NF. Distant markets and centers of distribution, and the limited resource base, have caused the economic base for the Tribe to rely heavily on subsistence farming, minuscule cash cropping with animal husbandry, traditional hunting and collecting, income from oil and gas production, and government assistance.

3.12.4.3 Housing

Housing in Duchesne County is dominated by single-family, owner-occupied units, as in much of Utah and the United States (U.S. Department of Commerce 1990b; 1990c). About 83 percent are owner-occupied, with the remainder renter-occupied. Value of owner-occupied housing units averaged about \$49,000 for whites, and \$39,000 for Native Americans. About two-thirds of the owner-occupied units are fixed structures, with the remainder mobile homes or trailers. Mean value of mobile homes is about \$25,000, with no discrepancy for white-owned or Native American-owned homes. Native Americans are shown in 1990 as owning 51 homes and 20 trailers in Duchesne County, and renting another 70 units; among the 664 residents of the county classified as Native American (or about 4.2 persons per household).

Duchesne County building permit statistics for 1991 and 1992 show recent valuation data (Duchesne County 1993). The 17 and 15 single-family residence permits issued, respectively, show average value per residence declining from 1991 (\$80,000) to 1992 (\$55,800). During the same period, permits for cabins remained steady at 17/year, business construction went up from 1 (at \$27,000) to 2 (total \$248,000), mobile homes increased substantially from 27 to 70 (average value steady at about \$10,000), and total assessed valuation overall climbed 28%, from \$2.7 million to \$3.5 million.

The housing situation in Uintah County has similar characteristics for the greater number of persons. Of 6,008 units, it is noted that 4,647 (77 percent) are owner-occupied. Value here averages a bit higher than Duchesne County, at \$51,000 for white-owned houses, and much less (\$30,000) for the average Indian-owned house. Trailer values are in the \$20,000-\$24,000 range. In Uintah County, only about 81 percent of the owner-occupied homes are fixed structures. Average rental prices (as in Duchesne County) are in the \$150-\$350/month range.

Trends in housing in Vernal are of interest, and are instructive about housing in the Uinta Basin in general. Recall that Vernal lost about 7.5 percent of its population 1980-1990, and yet housing units increased 18.2 percent, from 2,406 to 2,845 units. Speculation with oil and gas development likely fueled this growth. However, about 8 percent of "owner-occupied" (sic) units were vacant in 1990, and the rental property vacancy rate was

21 percent. Vernal averaged 2.88 persons per household in 1990 (USFS 1992j, Socioeconomics Background Report, North Slope Oil and Gas Leasing EIS).

3.12.4.4 Local Government Facilities, Services, and Fiscal Conditions

Facilities and Services

Duchesne and Vernal are the county seats for their respective counties in the study area. Public services across the study area include the expected range of schools, police protection, fire protection and emergency services, and parks and recreation facilities. The following summary is taken from several sources (Wasatch-Cache and Ashley National Forest [USFS 1992j]; Duchesne County Area Chamber of Commerce 1993; Vernal Area Chamber of Commerce 1993).

Regarding schools, Duchesne County has 5 elementary, 1 middle, 1 junior high, 1 elementary/secondary, and 3 high schools, for a total of 11 schools of the 13 schools in the District (Duchesne School District 1991b). Total enrollment was 4,300 students in 1991. The Duchesne District is the largest employer in the County (see Section 3.12.4 regarding government employment), with approximately 400 full-time equivalent employees. Vocational and higher education is provided by the District, the Education Center (college courses at Roosevelt, as an extension of Utah State, Logan), and the Uinta Basin Applied Technology Center (vocational training in Roosevelt). The Vernal area, in Uintah County, has 6 elementary, 1 junior high, 1 middle, and 2 high schools, among the 10 total schools in the area (Vernal Area Chamber of Commerce 1993). Utah State University Extension here offers 2-year Associate degrees, as well as Bachelor and Masters degree programs. The Uinta Basin Applied Technology Centers offers business and trade technology training.

The social and cultural profile of Vernal also includes four radio stations, four banks and lending institutions, dance schools, over 60 clubs and organizations, and a senior citizens center with recreation and transportation facilities (Vernal Area Chamber of Commerce 1993). Regarding health care, a rehabilitation center for alcohol and drug abuse is present locally. The police department has 14 full-time officers, while the fire department has 25 volunteers. Tourism is claimed to be a \$50 million annual industry. Vernal and Roosevelt each have local airports, and Vernal has a Delta Airline connection, while national and international flights are directed to Salt Lake City. Vernal hosts a weekly newspaper, 41

churches (including 28 LDS and 12 Protestant), a 39-bed nursing home with licensed acute care, and a local hospital. Recreational facilities available in the Vernal area include movie theaters and a community theater, bowling, skating, water slides, and miniature golf; a public pool; 15 baseball and softball fields; an 18-hole golf course and 10 public tennis courts; and a local athletic club. Vernal was listed 48th among the top 100 best small towns in America in a recent publication. These are towns, according to the author of the publication, where "the traditional values of family, community, faith, hard work, and patriotism remain strong...." The criteria included local government spending on education, available health care, crime rates, per-capita income, and cultural opportunities (Salt Lake Tribune 1993).

The town of Duchesne, as a county seat, also contains several social and cultural attractions. Major employers, as noted previously, include the School District, the county hospital (about 150 average employees), the IGA Supercenter (about 75 employees average), and Stewart Enterprises, Inc. (again, about 75 employees average). Duchesne has a 42-bed local hospital, with 10 active medical staff and 5 courtesy staff. Both Duchesne and Roosevelt have industrial parks ranging from about 50 to 150 acres. The two cities also have local airports, with approximately 6,000-foot runways of asphalt, and the usual local navigation and communications aids. The police and emergency services in each town include volunteer fire departments, with the County Sheriff's department servicing Duchesne, and an 8 member full-time police force in Roosevelt.

The economic statistics regarding recreation may be of interest in both jurisdictions. Duchesne's gross taxable room rent was over \$1 million, for visitors in 1982. It has since declined to about \$360,000 in 1990, with about 24,000 visitors. This compares to only 22,000 visitors in 1982, which suggests that room rates have considerably lowered since that time, or that more persons are camping or not spending a great deal on nightly room rentals (Duchesne County 1991a). Yet, Duchesne continues to promote tourism in their area, with a color brochure on Duchesne County and a number of other items in their package for visitors and prospective residents (Duchesne Area Chamber of Commerce 1993b). In the Vernal area, the Dinosaurland Calendar of Events for 1993 to 1994 shows an extensive series of attractions, nearly every 2 weeks, from February through December. The Vernal Chamber of Commerce (1993) also actively promotes their areas to visitors and prospective residents alike. Notably, "Dinosaurland" is highlighted by an extensive multi-

page, color brochure, touting Flaming Gorge National Recreation Area, Dinosaur National Monument, Green River raft trips, and a number of local attractions.

Local Fiscal Conditions and Revenues from Existing Oil and Gas Activities

Both counties levy taxes on oil and gas activities; on (a) the value of real property pertinent to such operations (state-assessed value, but taxed by the county) and on (b) the value of underground rights (minerals severance tax). The latter is based on the value of the proceeds from the sale of gas and oil production during the previous year production period, less federal, state, and Indian royalties, and windfall profit tax, if applicable. The tax is collected by the State of Utah, but a portion of the collection is returned to counties and communities through redistribution from the general fund under a grant program. Regarding severance taxes, the gross value of oil and gas production less exemptions was taxed at a rate of 4.0 percent in Utah prior to January 1, 1992, when a graduated rate scale was used. The State of Utah also has an oil conservation tax, which is levied on proceeds from sales. Utah also receives a split of all royalties, bonus bids, and other fees collected for use of federally-administered lands in the state, under the provisions of the Mineral Leasing Act of 1920. For leased federal lands, the royalty payment is 12.5 percent of the gross income of gas and oil production (Wasatch-Cache and Ashley National Forest [USFS 1992j]; citing other studies).

Revenues for Duchesne and Uintah Counties for fiscal and calendar year 1991 are shown on Tables 3.12-4 and 3.12-5. Oil and gas production activities play a large role in county economic growth and development. Federal mineral revenues from oil and gas production activities in 1992, for example, in each county are as follows:

Federal Mineral Revenues Disbursements By County, 1992

<u>Product</u>	<u>Amount Paid Duchesne to County</u>	<u>Amount Paid Uintah County</u>
Gas	87,542.72	2,144,336.91
Rent	93,982.20	352,785.66
Oil	518,600.46	2,538,566.01

<u>Product</u>	<u>Amount Paid Duchesne to County</u>	<u>Amount Paid Uintah County</u>
Mineral Royalty	22,124.84	404,877.01
Gas Plant Production	2,026.25	305.60
Bonus and 1st Year Rents	-24,720.25	252,912.25
Gilsonite	_____	<u>10,686.76</u>
Total	699,466.22	5,704,470.20

Slipsheet for Table 3.12-4
and
Table 3.12-5

These amounts are typically reported under the “ Taxes and PILT” line items on annual revenue statements such as those shown on Tables 3.12-4 and 3.12-5, but cannot be easily segregated. Further, not all these accounts are actually “ paid” to the county, according to local officials (see sources referenced for Tables 3.12-4 and 3.12-5).

3.12.4.5 Social Setting

A number of social categories, or groups of people, living near the Ashley and Uinta NF comprise the social and cultural baseline for planned oil and gas development. These groups are not mutually exclusive, since one person may belong to several groups. They are, however, categories readily useful for analysis of later social and economic effects. The following discussions are adapted from the Draft Environmental Impact Statement, Ashley National Forest, Land and Resource Management Plan (USFS 1985a) as adapted for the proposed oil and gas activity, primarily on this portion of the Ashley NF. Each group and its expected orientation is discussed below; these groups will then be further assessed in the impact section regarding the various alternatives.

- **Native Americans.** This group comprises the prehistoric and historic inhabitants of the area, some of whom have been displaced to Reservation lands, and others of whom live off the Reservation. A subset of this group is very interested in maintenance of their traditional hunting and gathering lifestyle, in those lands which provide access for that lifestyle. They also may be interested in spiritual use of traditional cultural properties in this vicinity in the Ashley NF (see Cultural Resources Baseline Section 3.10).
- **Younger Newcomers.** This group has recently moved to the area, and is generally most interested in those activities which limit resource use in the project vicinity. They have moved to this area to have the natural setting maintained for the most part, and would prefer less commodity development in terms of roads and resource extraction.
- **Ranchers/Farmers.** This group generally desires to maintain its traditional lifestyle, but in recent decades has been faced with financial pressure in terms of high taxes, overhead costs, and unstable prices for livestock and crops. This group is usually under pressure to sell to non-traditional or

absentee owners, who want these ranches and farms for use as a tax shelter, recreation, or retirement home. Ranchers and farmers are generally interested in commodity production, but those activities which affect their ability to produce crops or livestock may be seen as detrimental. In this sense, activities which promote such production could slow real estate transactions regarding ranches.

- **Business People.** Business people generally realize that population increases, resulting in commercial and industrial activity, depend largely on increasing resource extraction or commodity production in the area. Therefore, they are generally in favor of such production, but may be differentially affected, depending on their dependence on amenity or commodity outputs from the Forests. For example, a business person selling recreation equipment may be less inclined to favor commodity development than one who is selling tools and equipment for oil and gas operations.
- **Oil and Gas Workers/Miners.** This subset views resources from a consumptive approach rather than from an environmental protection viewpoint. Yet, they express a general concern for maintaining the quality of the environment, and compliance with laws and regulations which govern their extraction activities. They are primarily interested in the freedom to pursue their profession, and yet many live in this area for its recreational attractions. They are generally most dependent on recoverable resources rather than renewable resources, such as timber.
- **Government Workers/Educators.** This group generally favors maximum protection to the natural setting in the Forests. This segment is rather stable and would change little, unless major population changes occur. This group is likely to retain its views regardless of any management direction adopted by the Forests.
- **Retirees.** This group also generally favors retaining the Forests in their natural setting, without further disturbance. These persons have usually purchased property in the area for a certain lifestyle, and to disrupt this

lifestyle with additional development activities generally causes retiree opposition.

- **Regional Population.** The population of a region (e.g., for the Uinta Basin, in general, or the Salt Lake City region) is generally more interested in the amenity values of the Forests rather than resource development. However, the Uinta Basin groups are likely in favor of oil and gas development, since much of their livelihood depends on it. People in the Salt Lake City vicinity, who would be more interested in use of the National Forests for recreation, would likely favor less development activity here.
- **National.** Again, national groups are likely more interested in the recreational amenities of the Forests, rather than their development for oil and gas production.