ENVIRONMENTAL ASSESSMENT
BEAR CANYON MINE
CO-OP MINING COMPANY
MINING PLAN MODIFICATION
EMERY COUNTY, UTAH

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CHAPTER 1
PURPOSE AND NEED

1.1 PROJECT DESCRIPTION

Co-Op Mining Company (Co-Op) submitted an application for modification of their Bear Canyon Mine permit to the Utah Division of Oil, Gas and Mining (UDOGM) on July 21, 2005. The proposed mining plan modification involves adding approximately 7,591.29 acres (portions of 4 leases) to the existing permit, of which approximately 3,837.13 acres are on National Forest System (NFS) lands administered by the Manti-La Sal National Forest in Emery County, Utah. The remaining 3,754.16 acres are fee lands. The mining plan modification area is described as follows (Map 1, General Location Map, Appendix A):

T. 16 S., R. 7 E.,
- Sec. 1 – Lots 1-2, S2NE, SE
- Sec. 10 – N2, N2SW, SESW, SE
- Sec. 11 – All
- Sec. 12 – All
- Sec. 13 – E2, E2W2
- Sec. 14 – E2NW

T. 16 S., R. 8 E.,
- Sec. 6 – Lots 11-14, E2SW, W2SE, SESE
- Sec. 7 – All
- Sec. 8 – W2E2, W2
- Sec. 16 – All
- Sec. 17 – All
- Sec. 18 – All
- Sec. 19 – Lot 1, NE, NENW, N2SE
- Sec. 20 – N2, N2SW, NESE
- Sec. 21 – N2, N2SW, SESW, SE

The coal reserves in the proposed modification area would be accessed from the existing underground mine workings in the Bear Canyon Mine. The coal within the proposed mining plan modification area is currently leased by the mine. The production of the mine would go from approximately 0.5 million tons/year to approximately 2.5 million tons/year. The number of employees would increase from 55 to approximately 240. No roads or surface facilities would be constructed on National Forest System lands for this

project; however, the proposed action might lead to other future mining activities such as a mine portal in Cedar Canyon (off Forest), a ventilation shaft or portal, and possible coal exploration drilling to more accurately define coal quantity and quality ahead of mining. Any of these future activities proposed on National Forest System lands would be evaluated in a National Environmental Policy Act (NEPA) analysis and permitted by the appropriate agency.

1.2 PROPOSED ACTION

The proposed action is for UDOGM to modify the mining and reclamation plan to add approximately 7,591.29 acres of Federal Coal Leases U-024316 (issued 5/1/1958), U-61049 (issued 11/1/1949), U-46484 (issued 5/1/1958), and U-61048 (issued 2/8/1923). The Office of Surface Mining Reclamation and Enforcement (OSM) proposes to send the mining plan modification to the Assistant Secretary of the Interior, Land and Minerals Management, for approval. The Forest Service proposed action is to consent to the permit additions, subject to all lease terms, conditions, and stipulations contained in the leases, and identify any additional stipulations needed to address surface effects in the mining plan modification area consistent with Forest Plan direction.

1.3 PURPOSE AND NEED

OSM has determined that this permit change constitutes a mining plan modification (30 CFR Part 746) under the Surface Mining Control and Reclamation Act 0f 1977, requiring the approval of the Assistant Secretary of the Interior, Land and Minerals Management. As a cooperating agency, OSM will use this Environmental Assessment (EA) as the NEPA analysis for their decision. The consent of the Forest Service, the surface management agency, is required for the Federal portions of the area. Forest Service consent authority is provided by the Federal Coal Leasing Amendments Act of 1975 that amended the Mineral Leasing Act of 1920. The FS decision to consent or not consent to the mining plan modification requires a NEPA analysis, which will be based on this EA also.

The purpose of this mining plan modification is to allow the lessee to recover the potentially available coal reserves in the area, with mitigations needed to protect non-coal resources. The consent by the Forest Service must be consistent with the rights granted by the lease to explore for and develop the coal reserves. This action would enable Bear Canyon Mine to recover coal reserves on their leases. It is also in keeping with the Forest Service mission in providing the opportunity to recover leasable minerals on National Forest System lands (Mineral Leasing Act of 1920, as amended) consistent with requirements for managing other resources.

1.4 SCOPE OF THIS ENVIRONMENTAL ANALYSIS

1.4.1 Scoping Process

Project scoping was accomplished by mailing letters to 34 addressees on June 6, 2006. The proposal was modified by Co-Op to mine 3 coal seams rather than 1, so letters were sent to 35 addressees (the original 34 plus one new addressee) on July 27, 2006, explaining the change in the proposal. Comments were requested from other Federal agencies, State, county, and local agencies within Utah, Indian tribes, environmental groups, and interested individuals. Additionally, a Legal Notice of Proposed Action was published in the *Sun Advocate* and *Emery County Progress* newspapers on March 28, 2006 in which comments were also requested. The project has been listed in the Forest Service Quarterly Schedule of Proposed Actions. Six responses were received from the public. From these responses and the internal scoping, the Interdisciplinary Team identified potential issues that are identified in Section 1.4.3.

The following are the public responses that were received:

1) Utah Environmental Congress (UEC, 2 letters).
2) Castle Valley Special Services District (CVSSD).
3) United States Fish and Wildlife Service (USFWS).
4) North Emery Water Users Special Services District (NEWUSSD, 2 letters).
5) The Paiute Tribe.
6) The Hopi Tribe (2 letters).

Responses to these letters are in the project record.

1.4.2 Relevant Planning Documents and Analyses

1) The Land and Resource Management Plan (LRMP) for the Manti-La Sal National Forest on page III-4 states that the Forest Management
Goals for Minerals and Geology are to:

> a. Provide for the interpretation of surface and subsurface geologic conditions and processes such as landsliding.
>
> b. Manage geologic resources, common variety minerals, ground water, and underground spaces (surficial deposits, bedrocks, structures, and processes) to meet resource needs and minimize adverse effects.
>
> c. Provide appropriate opportunities for and manage activities related to locating, leasing, exploration, development, and production of mineral and energy resources.
>
> d. Ensure that adequate reclamation of disturbed areas is accomplished.

Chapter III of the LRMP prescribes Forest-Wide and Management Unit Direction for the mining plan modification area. The Forest Plan Management Units Map (Map 2,

Appendix A) shows those Management Units that are applicable to the permit modification area.

a. Forest-Wide Direction for Leasable Minerals Management Activity is discussed on Page III-35 of the LRMP:

General Direction 01- Negative recommendations, denials, or consent for leasing, permitting, or licensing will be based on site-specific environmental assessments using appropriate standards and guidelines. Stipulations for these actions should minimize and/or mitigate effects or conflicts with other resource uses and should return disturbed lands to conditions compatible with emphasis on the management unit or adjacent management unit.

b. The General Direction for Minerals Management in each Management Unit found within the permit modification area is also found in Chapter III of the LRMP.

1. Management Prescription: Key Big-Game Winter Range (LRMP, Page III-58). Management emphasis is on providing winter forage and cover for big-game species in areas that must be available and unencumbered for wildlife use each year during the critical winter period.

Management Activity: Minerals (LRMP Page III-59).

General Direction 01 – Modify, delay, or deny mineral leasing, exploration, and/or surface occupancy, where applicable, if it causes unacceptable stress on big game or unmitigated damage to their habitat.

2. Management Prescription: General Big-Game Winter Range (LRMP, Page III-61). Management emphasis is on providing general big-game winter range in areas wildlife traditionally use.

Management Activity: Minerals (LRMP Page III-61).

General Direction 01 – Modify, delay, or deny mineral leasing, exploration, and or surface occupancy, where applicable, if they cause unacceptable stress on big game or unmitigated damage to their habitat.

3. Management Prescription: Range (LRMP, Page III-64). Management emphasis is on production of forage and cover for domestic livestock and wildlife.

Management Activity: Minerals (LRMP Page III-66).

General Direction 01 – Provide appropriate mitigation measures to assure continued livestock access and use.

General Direction 02 – Those authorized to conduct developments will be required to replace losses through appropriate mitigations, where a site-specific development adversely affects long-term production or management.

4. Management Prescription: Timber (LRMP, Page III-67). Emphasis is on management for the production and use of wood-fiber for a variety of wood products.

Management activity for minerals is not discussed within this Management Unit. Therefore, Forest-wide direction applies.

5. Management Prescription: Riparian (LRMP, Page III-69). Emphasis is on management of riparian areas, and all the component ecosystems. (Note: This management unit is not mapped in the Forest Plan, due to map scale.)

Management Activity: Riparian, Flood Plain, and Wetlands (Page III-71).

General Direction 01 – Prior to implementation of project activities, delineate and evaluate riparian areas and/or wetlands that may be impacted.

Standards and Guidelines (b) – Where site-specific development adversely affects long-term productivity or management, those authorized to conduct development will be required to replace loss through appropriate mitigation.

Management Activity: Minerals (Page III-72).

General Direction 01 – Avoid and mitigate detrimental disturbance to the riparian area by mineral activities. Initiate timely and effective rehabilitation of disturbed sites.

General Direction 02 – Where possible, locate mineral activities outside the riparian unit.

General Direction 03 – Restore channel changes to hydraulic geometry standards for each stream type.

2) This analysis tiers to the following environmental documents:

a. Environmental Assessment for the Readjustment of Federal Coal Lease U-46484, 1987.

b. Environmental Assessment for the Readjustment of Federal Coal Lease U-024316, 1987.

c. Environmental Assessment for the Readjustment of Federal Coal Lease U-61049, 1989.

d. Environmental Assessment for the Readjustment of Federal Coal Lease U-61048, 1992.

e. Final Environmental Impact Statement, Manti-La Sal National Forest, 1986.

1.4.3 Issues Evaluated in Detail

1.4.3.1 Subsidence

Subsidence itself is not a resource or issue. However, subsidence can have effects on resources so it is evaluated in detail so that the effects may be evaluated and disclosed. Full-extraction coal mining, whether by longwall or room-and-pillar methods, causes surface subsidence as the mined-out area collapses behind the workings. Subsidence may result in the failure of the Castlegate escarpment. Escarpment failure would impact resources on the escarpment and the associated rockfalls could impact the area below the escarpments, resulting in effects to visual quality of the plateau and escarpments, raptor nesting habitat on the escarpments, vegetation below the escarpment, and wildlife use of the area. The impacts to these resources will be evaluated in more detail in Sec. 3.3 through 3.6. Potential subsidence impacts to surface and ground water will be addressed in the hydrology section.

Evaluation Criteria:

- Consistency with Visual Quality Objectives.
- Number of raptor nests that could be impacted.
- Length of escarpment (linear feet and percentage of total escarpment) that could be failed.

1.4.3.2 Hydrology

In the semi-arid climate of east-central Utah, water resources are important to the other resources on the forest, and are also used off the forest. Subsidence can affect the flow path of groundwater, which can affect how it reaches surface water features such as springs and streams.

Evaluation criteria:

- Number of springs with the potential to be affected, by water quantity or quality.
- Stream segments (linear feet) on National Forest System lands with the potential to be affected.
- Stream segments (linear feet) of other land ownership possibly affected.

1.4.3.3 Wildlife

One aspect of forest management is to maintain ecosystems suitable for terrestrial and aquatic wildlife. Mining-induced subsidence can impact wildlife habitat by causing escarpment failure and disrupting water resources, which could affect Management Indicator Species (MIS), Macroinvertebrates, Migratory Bird Species, Threatened, Endangered and Sensitive Plant and Animal Species and their habitat.

Evaluation Criteria:

- Impacts to threatened or endangered species.
- Impacts to sensitive or MIS species, or migratory birds.

1.4.3.4 Vegetation and Range

Much of the proposed mining plan modification area is managed as rangeland, for the production of forage for wildlife and livestock. Subsidence and escarpment failure could impact vegetation through impacts to groundwater and surface impacts. Surface disturbance could also allow noxious weed species to enter and spread through the area. Subsidence may impact range facilities such as fences, ponds, and springs.

Evaluation criteria:

- Subsidence impacts to vegetation.
- Protection from noxious weed invasion.
- Protection from damage to range improvements.

1.4.3.5 Cultural Resources

Forest actions must be in compliance with the Natural Historic Preservation Act of 1980, which requires identifying, documenting, and preserving historic and cultural resources. Both historic and prehistoric resources have been identified near the proposed mining plan modification area, some of which are eligible for the National Register of Historic Places. Mining-induced subsidence could cause damage to prehistoric sites that are common on the escarpments. They could also impact cultural resources in other areas, but it is less likely.

Evaluation Criteria:

- In compliance with Federal antiquities laws.

- Are unidentified sites subject to subsidence impacts.

1.4.3.6 Socioeconomics

Expanded coal production could create both positive and negative impacts. Increased coal production can help meet national energy needs, provide royalties to Federal, state, and local governments, and increase employment opportunities. This could also lead to increased demands on schools, housing, and transportation facilities.

Evaluation Criteria:

- Tons of coal
- Royalties
- New jobs
- Ability of local communities to meet demands on infrastructure.

1.4.4 Issues Considered but Not Further Evaluated

1.4.4.1 Paleontological Resources

The dominant fossil-producing unit on the Forest is the North Horn Formation. Fossils are usually exposed in the eroding "bad lands" type areas, which are not present in the study area. Subsidence related impacts to paleontological resources are not expected. Forest Service Special Stipulation #5 in the coal leases describes measures for the protection of paleontological resources.

1.4.4.2 Roadless Area

The proposed project would not extend into any Inventoried Roadless Area (IRA). The closest IRAs to the proposed project are the Gentry Mountain IRA and the East Mountain IRA. The Gentry Mountain IRA is located to the north of the proposed project area. The closest point between the Gentry Mountain IRA and the proposed project area is in Sections 3 & 4, T16S R7E, approximately ½ mile from the northwest corner of the proposed project area. The East Mountain IRA is across Highway 31 (on the west side of the highway, away from the proposed project area).

1.5 APPLICABLE LEGAL AND REGULATORY REQUIREMENTS AND COORDINATION

Decisions must conform to the overall guidance of the Manti-La Sal National Forest Plan (1986), as amended, and its Final Environmental Impact Statement (FEIS), 1986. This environmental analysis tiers to the Forest Plan FEIS. This mining plan modification will be processed under the authority of the Mineral Leasing Act of 1920. Approving the mining plan modification would authorize the lessee to mine the Federal coal, but would not authorize surface disturbing activities.

The Surface Mining Reclamation and Control Act of 1977 (SMCRA) gives the Department of the Interior, Office of Surface Mining (OSM) primary responsibility to administer programs that regulate surface coal mining operations and the surface effects of underground coal mining operations. In January 1981, pursuant to Section 503 of SMCRA, the Utah Division of Oil, Gas and Mining (DOGM) developed, and the Secretary of the Interior approved, a permanent program authorizing Utah DOGM to regulate surface coal mining operations and surface effects of underground mining on non-Federal lands within the state of Utah. In March 1987, under Section 523(c) of SMCRA, Utah DOGM entered into a cooperative agreement with the Secretary of the Interior authorizing Utah DOGM to regulate surface coal mining operations and surface effects of underground mining on Federal lands within the State.

Under the cooperative agreement, Federal coal lease holders in Utah must submit permit application packages (PAP's) to OSM and Utah DOGM for proposed mining and reclamation operations on Federal lands in the State. Utah DOGM reviews the PAP to ensure that the permit application complies with the permitting requirements and that the coal mining operation will meet the performance standards of the approved permanent program. If it does comply, Utah DOGM issues the applicant a permit to conduct coal mining operations. OSM, the Bureau of Land Management (BLM), the Forest Service, and other Federal agencies, review the PAP to ensure that it complies with the terms of the coal lease, the Mineral Leasing Act of 1920 (MLA), NEPA, and other Federal laws and their attendant regulations. OSM recommends approval, approval with conditions, or disapproval of the MLA mining plan to the Assistant Secretary, Land and Minerals Management. Utah DOGM enforces the performance standards and permit requirements during the mine's operation and has primary authority in environmental emergencies. OSM retains oversight responsibility for this enforcement. BLM and the Forest Service have authority in those emergency situations where Utah DOGM or OSM inspectors cannot act before environmental harm or damage occurs.

1.5 DECISIONS THAT MUST BE MADE

Because this permit revision involves a mining plan modification, it must be approved by the Assistant Secretary of the Interior, Land and Minerals Management (30 CFR 746.18(a)). The Forest Supervisor of the Manti-La Sal National Forest must determine what stipulations are needed to protect non-mineral resources. Forest Service consent authority is provided by the Federal Coal Leasing Amendments Act of 1975 that amended the Mineral Leasing Act of 1920.

The Forest Supervisor would also consent to any approval of the associated permit revision by Utah Division of Oil, Gas and Mining, which would involve including this permit change in the Mining and Reclamation Plan. The FS consent, and terms and conditions, will be documented in a decision document. OSM submits the decision document to the Assistant Secretary. DOGM must approve the permit change under the

provisions of the Utah Coal Regulatory program. The Bureau of Land Management is responsible for maximum economic recovery under 43 CFR 3480.0-5.

CHAPTER 2
DESCRIPTION OF ALTERNATIVES

2.1 INTRODUCTION

This chapter presents the alternatives considered for implementation, and a comparative summary table of the alternatives considered for implementation responding to the identified issues. A no action alternative and two action alternatives are considered in detail.

Table 2-1, List of Alternatives

Alternative 1 – No Action **Alternative 2 – Consent to the Mining Plan Modification as Proposed** **Alternative 3 – Consent to the Mining Plan Modification with Supplemental FS Mitigations**

2.2 HISTORY AND PROCESS USED TO FORMULATE THE ALTERNATIVES

Alternative development is driven by public comments and input from Forest Service personnel. Comments were sought by various means including newspapers, the Forest Service's *Schedule of Proposed Actions*, and by letters to State and County governments and other interested parties.

Letters requesting comments were sent to interested parties (see Sec. 1.4.1). Six letters were received in response to the Forest's public involvement efforts. The contents of each letter were reviewed and issues identified that could help refine the analysis, project design, and development of alternative actions.

2.3 ALTERNATIVE DESIGN, EVALUATION, AND SELECTION CRITERIA

The alternatives must address the issues that have been identified. Action alternatives must be consistent with the rights granted to the lessee under the existing federal coal leases, as conditioned by the lease terms and stipulations contained therein. In addition, any occupancy and development of the lease must be consistent with all applicable, non-discretionary laws and regulations.

2.4 DESCRIPTION OF PROPOSED ALTERNATIVES

Alternative 1 – No Action

Alternative 1 addresses the need to provide a "No Action" alternative (40 CFR 1502.14). The Forest Service would not consent to the mining plan modification. Subsequently, Alternative 1 would not allow for mining within the modification area, and therefore not provide coal reserves for the mine. No mitigation measures or monitoring would be required as part of this alternative.

Alternative 2 – Consent to the Mining Plan Modification as Proposed

This alternative represents Co-Op's proposal to increase the Bear Canyon Mine's permit boundary to provide coal reserves for the mine so that current production levels can be increased. The area would be added to the permit area for mining through the Bear Canyon Mine. The additional acreage would be subject to those lease terms and conditions (stipulations) contained in existing federal coal leases (Appendix C).

Alternative 3 – Consent to the Proposed Mining Plan Modification with Supplemental Forest Service Stipulations

This alternative is similar to Alternative 2 with application of additional mitigation measures (Appendix D).

2.5 PAST, PRESENT, AND REASONABLY FORSEEABLE FUTURE ACTIONS

Council on Environmental Quality (CEQ) regulations (40 CFR 1508.7) define cumulative impact as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal of non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

Past, present, and reasonably foreseeable future actions in the project area have been developed in support of this EA. The cumulative effects for each resource category are addressed under each alternative in Chapter 3. Estimates of residual, current, or anticipated effects are discussed. The sum of the effects, in addition to the anticipated direct and indirect effects of the proposed action, will form the basis for the cumulative effects analysis.

2.6 COMPARISON SUMMARY OF ALTERNATIVES

Table 2-2, Comparison of Alternatives, displays the components of each alternative and

the physical changes to the environment likely to occur from the project for each alternative. These changes are not in themselves identified as issues, but would cause changes to resources and the socioeconomic setting and, therefore, form the basis for the identified issues.

Table 2-2 Comparison of Alternatives

Issue: Subsidence/Escarpment Failure	Alternative 1	Alternative 2	Alternative 3
1.Alternative meets Visual Quality Objectives?	Yes	Yes	Yes
2.Number of raptor nests that may be impacted.	0	6	6
3.Length of escarpment (linear feet and percent of total) that could be failed.	0	11,700 25%	11,700 25%

Issue: Surface and Ground Water, Riparian Areas	Alternative 1	Alternative 2	Alternative 3
1. Number of springs possibly affected	None	None	Same as Alternative 2.
2. Stream segments (linear ft.) on NFS lands possibly affected. a. Perennial b. Intermittent	 0 0	 2,500 0	 Same as Alternative 2.
3. Stream segments (linear ft.) on non-NFS lands possibly affected. a. Perennial b. Intermittent	 0 0	 1,500 2,000	 Same as Alternative 2.

Issue: Wildlife	Alternative 1	Alternative 2	Alternative 3
1. Impacts to threatened or endangered species.	No	No	No
2. Impacts to sensitive, MIS, and migratory bird species.	No	Possible slight increase in golden eagle highway mortality. Some nest losses also possible.	Same as Alternative 2.

Issue: Vegetation and Range	Alternative 1	Alternative 2	Alternative 3
1. Subsidence impacts to vegetation.	No	Mitigated	Mitigated

2. Noxious weed invasion.	No	Mitigated	Mitigated
3. Subsidence damage to range improvements.	No	Mitigated	Mitigated

Issue: Cultural Resources	Alternative 1	Alternative 2	Alternative 3
1. In compliance with Federal antiquities laws.	Yes	No	Yes
2. Are unidentified sites subject to subsidence impacts.	No	Yes	Yes, but lower probability

Issue: Socio-economics	Alternative 1	Alternative 2	Alternative 3
1.Tons of coal mined.	0	25 million	25 million
2. Royalties paid.	$ 0	$ 38 million	$ 38 million
3. Number of jobs created: Mining jobs Direct effect jobs	 0 0	 185 1,018	 185 1,018
4. Ability of communities to meet demands on infrastructure.	N/A	Yes	Yes

CHAPTER 3
AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 INTRODUCTION

This chapter describes the affected environment and environmental consequences, by resource, with emphasis on the identified issues.

The proposed mining plan modification area is located on the south end of Gentry Mountain in Emery County, Utah. The Forest Plan identifies the Management Prescription (key map and pages III-58 to III-69) for the proposed project area as falling within Key Winter Range (KWR), General Winter Range (GWR), Range (RNG), Timber (TBR), and Riparian (RPN) management units (Map 2, Forest Plan Management Units, Appendix A). The Forest Plan direction for minerals activities within each of these management units is discussed in Section 1.4.3. The proposed mining plan modification satisfies the requirements for management unit direction through the incorporation of the standard stipulations in the existing leases, and additional measures as discussed in the alternatives.

3.2 TOPOGRAPHY, GEOLOGY, AND SUBSIDENCE

This section does not address a specific issue, but provides information necessary to understand the resource issues discussed later. An understanding of the topography and geology is necessary to evaluate the hydrology of the area. Subsidence can have effects on all resources. It is evaluated in detail so that the effects may be evaluated and disclosed. Full-extraction coal mining, whether by longwall or room-and-pillar methods, causes surface subsidence as the mined-out area collapses behind the workings. Subsidence may result in the failure of the Castlegate escarpment, resulting in effects to visual resources, raptor nesting habitat, vegetation, and wildlife. Potential subsidence impacts to surface and ground water will be addressed in the hydrology section.

3.2.1 Affected Environment

The project area is located in the Wasatch Plateau, the westernmost of the high plateaus of the Colorado Plateau Physiographic Province. Because the Wasatch Plateau exhibits morphological characteristics of both the Colorado Plateau and the Basin and Range Physiographic Provinces, it is considered to lie within a transition zone between the two. The Wasatch Plateau generally consists of gently dipping layers of sedimentary rock that were uplifted during formation of the San Rafael Swell and the Wasatch Monocline. The Plateau rises several thousand feet above Castle Valley to the east and Sanpete Valley to the west. The eastern margin of the Plateau is characterized by abrupt erosional escarpments, with the topography characterized by narrow, deeply incised canyon walls. The topography on the western margin is more gentle, being controlled by the westerly dip of the Wasatch Monocline, a single-limbed fold. Rock layers to the east of the crest or major drainage divide of the Plateau generally dip gently to the west (3-5 degrees). West of the divide the rock layers dip steeply to the west along the monocline and plunge beneath Sanpete Valley.

Subsidence includes both vertical and horizontal deformations of the ground surface due to mining. All areas within the mining plan modification area containing mineable thicknesses of coal could be directly affected by subsidence from the proposed mining.

3.2.1.1 Topography

The topography within the mining plan modification area is varied. The top of Gentry Mountain is relatively flat to slightly rolling with elevations of approximately 8,800 to 9,600 feet above sea level. Small ephemeral, intermittent, and perennial drainages drain the plateau, feeding canyons incising the plateau.

Canyons typically dissect the plateau surface, commonly in a pattern dictated by the geologic structure. Generally, the canyon walls are steep and canyon bottoms are relatively narrow, formed as a result of regional uplift and stream downcutting through the horizontally bedded strata. Colluvial toe slopes are common, as are localized areas of rockfall.

Horizontal bedding planes, natural jointing, and erosion provide for local topographic variation in a landscape dominated by the exposure of the cliff-forming Starpoint Sandstone and Castlegate Sandstone. A series of cliffs and ledges typically comprise the canyon slopes, overlain in spots by rockfall and talus slopes. The talus and soil formation mediates the topography by minimizing the cliff/ledge contrasts. Spalling of the sandstone cliffs also contributes to a varied topography.

3.2.1.2 Geology

Exposed formations in the project area (Figure 1, Stratigraphic Section, and Map 3, Appendix A) range from the mid-Cretaceous Mancos shale to the Tertiary Flagstaff Limestone Formation. They are presented below in stratigraphic order, from oldest to youngest:

Mancos shale (Cretaceous) – This formation is the oldest exposed unit in the project area and is found on the lower slopes on the east side of the project area. Only the uppermost member of this formation, the Masuk shale, is not concealed in the subsurface. It consists of light to medium gray marine mudstones. It intertongues with the overlying Star Point sandstone.

Star Point sandstone (Cretaceous) - This member is exposed in the project area, forming the prominent cliffs to the east. It is a marine shoreface deposit formed by accumulation of beach sands of the Cretaceous seaway. The sandstone consists of three massive sandstone units, (oldest to youngest): the Panther, Storrs, and Spring Canyon members. These sandstones intertongue with the overlying Blackhawk Formation and the underlying Mancos shale. The three units consist of fine to medium grained, massive, buff to brown colored sandstone, separated by beds of shale and shaly siltstone.

Blackhawk Formation (Cretaceous) – The Blackhawk Formation is easily eroded and forms slopes in the project area. It consists of lenticular sandstone, siltstone, and claystone or shale units. Many coal seams of continental and deltaic origin are found in the Blackhawk. The thicker seams occur in the lower 200 feet of the formation. In the project area the seams of mineable thickness are the Tank Seam, the Blind Canyon Seam, and the Hiawatha Seam.

Castlegate sandstone (Cretaceous) – The Castlegate sandstone is a cliff-forming massive, fluvial sandstone and the oldest member of the Price River Formation.

Price River Formation (Cretaceous) – The Price River Formation is fluvial in origin and a slope-forming unit. It consists of well-cemented conglomerate, conglomeratic sandstone, and sandstone with some shale beds. It forms the gently sloping upper slopes of the canyons in the Wasatch Plateau, mostly indiscernible from the overlying North Horn Formation.

North Horn Formation (Cretaceous-Tertiary) – The North Horn Formation is a slope-former that is also found in the graben to the west of the project site. It consists of interbedded lacustrine limestone, sandstone, and mudstone or shale.

Flagstaff Limestone Formation (Tertiary) – The Flagstaff Limestone formation is a freshwater lacustrine deposit that forms resistant ledges where present. It contains subordinate, interbedded dark-gray shale.

Structural Features - Several north-south trending, steep angle faults are found in the northwest part of the mining plan modification area. These are associated with the Pleasant Valley Graben. The Bear Canyon Fault, the eastern margin of the graben, has an offset of approximately 220 feet. The western margin is the Pleasant Valley Fault with an offset of approximately 520 feet. The Blind Canyon and the Trail Canyon faults, with offsets of 200 and 135 feet, respectively, are within the graben. A number of smaller faults are also located within the graben. The faulting is likely a result of tensional forces that have dominated the Wasatch Plateau region since the Tertiary Period. No faults are recorded east of the Bear Canyon Fault within the project area. Major joint sets average N15°E and N85°E; a less frequently observed set (near the East Fork of Fish Creek) averages N52°E. The strata generally dip SSE to SSW at approximately 1°- 2°, with the greater dips in the northwest part of the mining plan modification area. The structural contour maps indicate some mild folding (synclinal structure) in the eastern part of the project area.

3.2.1.3 Subsidence

The Bear Canyon Mine has been operating within their permit area, adjacent and to the west of the current mining plan modification area, for many years. Their mining has been totally with room-and-pillar methods in the past. They have mined extensively in the head of Bear Canyon and in the southern portion of the ridge between Bear Canyon and Trail Canyon. There have been rockfalls and escarpment failures in both Bear and Trail Canyons. Impacts are most noticeable on the west side of Bear Canyon where subsidence was focused along a fault.

The top of Gentry Mountain is relatively flat. Subsidence impacts in similar areas on Gentry Mountain and East Mountain due to longwall mining have been minimal. The most noticeable impacts are occasional tension fractures, up to about 6 inches wide, around the panel margins. Larger surface cracks were usually tension fractures associated with topographic features such as ridges and the margins of the plateau. Occasionally subsidence is focused along a fault, due to the lack of stress transfer across a fault.

The southern and eastern margins of Gentry Mountain are steep escarpments incised by numerous canyons. The Castlegate sandstone, the most prominent of the cliff-forming units, crops out along most of the escarpment. The three mineable coal seams in the area, the Tank, Blind Canyon, and Hiawatha seams, are approximately 550, 800, and 825 feet, respectively, below the top of the Castlegate sandstone. Co-Op proposes to conduct full-

extraction mining under approximately 4.6 (linear) miles of Castlegate sandstone escarpment. Maleki (2006) identified approximately 1.5 miles of escarpment with low, moderate, or high potential for escarpment failure.

3.2.1.3.1 Visuals

Characteristic Landscape

Gentry Mountain is a long, high elevation plateau, extending north-south on the eastern margin of the Wasatch Plateau. In the mining plan modification area, elevations range from approximately 7,000' at the base in Huntington Canyon to over 9,600' along the top. The ridge top is mostly covered with patches of aspen, spruce, and fir, with large open areas of grass and sagebrush. The escarpments have little vegetation due to the steep slopes. The lower elevation areas are dominated by pinyon pine, juniper, and mahogany, with more riparian species such as cottonwoods and willows.

Visual Quality Objective

The Visual Quality Objective (VQO), (Manti-La Sal NF Forest Plan, Visual Quality Objective Map, 1986), is Partial Retention or Modification of landscape character (Map 5, Appendix A). Under the Partial Retention VQO, management approved activities need to remain visually subordinate to the existing characteristic landscape. These activities may introduce new or different form, line, color, or texture. Under the Modification VQO, management approved activities may dominate the characteristic landscape but must, at the same time, use naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middleground. Subsidence would generally fall within this allowable range of visual changes.

It is often difficult to identify subsidence-induced failure due to vegetative growth, weathering, and natural erosive processes. The only readily visible subsidence effects in the Bear Canyon Mine permit area are along a fault on the west side of Bear Canyon. Subsidence tends to be focused along faults in this type of situation due to the lack of stress transfer across a fault. In general, the average person would probably not notice a difference between natural and subsidence-related escarpment failure.

The view of the escarpments from Highway 31, a scenic byway, is an important consideration (Heber Williams, 2006). One aspect of the visual analysis is the amount of seen area and the duration of time of the seen area. Only a few segments of the proposed Castlegate escarpment failure area can be seen from any roadway. (The section of escarpment approximately 2,000 feet long on the south end of Wild Horse Ridge is easily visible from Highway 31. It has already been room-and-pillar mined and will probably have no more impacts. Although it was rated with a low to moderate potential for failure by Maleki [2006], there were no escarpment failures in this section and none are expected in the future.) Because of the proximity to passersby, these locations generally present the most visual concerns. However, the locations that can be seen from the roadway are up canyons (1/2 to 1 mile) and, at highway speed, can only be seen for a few seconds. If

there is escarpment failure, it would likely not be noticed by passersby because of the time of exposure, angle of the road to the canyon (almost perpendicular), roadside vegetation, roadside landforms, and distance from the road.

3.2.1.3.2 Raptors

The escarpments are important nesting areas for raptors. The coal companies are required (as a part of their DOGM permit) to monitor raptor nests annually, which is normally done by contracting a helicopter with Utah Division of Wildlife Resources personnel conducting the survey. Four raptor nest locations are within the areas of proposed escarpment failure. (Note: Raptor nest locations are shown on Plate 5-3A of the Mining Plan. The locations are kept confidential to protect the raptors.) Four golden eagle nest are located on escarpment areas that have potential to fail due to mining in the Bear Canyon Mine (numbers 901, 920, 921, and 925). During the Spring 2006 survey 2 nests were inactive (numbers 920 and 921), one was not found (number 925), and one was not surveyed (number 901). The nest that was not found was probably an old nest that had not been tended for several years and no longer exists. The nest that was not surveyed was probably not surveyed due to computer database problems. Because of the database problems, they did not have the information in the navigation system to find the nest during the flight. It was classified as inactive in the 2000 through 2004 surveys.

Three nest sites in the Left Fork of Fish Creek (numbers 913, 914, and 1400) are downslope of a large section of escarpment which is proposed for failure. Nests 913 and 914 were inactive during the 2006 survey. Nest number 1400 was not found and presumed to no longer exist. These sites are in the Starpoint sandstone. Rockfalls from the Castlegate sandstone escarpment may travel far enough downslope to damage these nests. A breeding pair of golden eagles normally has several nest sites, so they could use an alternate nest if necessary.

3.2.1.3.3 Vegetation

A Forest Service sensitive plant, the Canyon Sweetvetch (*Hedysarum occidentale* var. *canone*), is present along the lower slopes of the escarpment in the Bear Canyon area. A portion of a *Hedysarum* population was impacted in Newberry Canyon by an escarpment failure due to subsidence in the Cottonwood Mine. Monitoring of the site has shown that the population has recovered and that *Hedysarum* does well on disturbed sites. Another Forest Service sensitive plant, the Link Trail Columbine (*Aquilegia flavescens* var. *rubicunda*), is in the Left and Right Forks of Fish Creek and the Left Fork of Cedar Creek. These sensitive plants are addressed in more detail in Sec. 3.5, Vegetation and Range.

3.2.1.3.4 Wildlife

Two of the canyons that incise the plateau in the area, Fish Creek and Chris Otteson Hollow, are elk migration routes from Gentry Mountain to the lower winter range areas. The rubble may cause wildlife to go around escarpment failure areas in Fish Creek.

There is no escarpment that would be failed in Chris Otteson Hollow, so there would be no impact to elk migration.

3.2.2 Environmental Consequences and Direct and Indirect Effects

In longwall mining and in room-and-pillar mining with pillar recovery, nearly full extraction of the coal resource may be accomplished. When these types of mining are conducted, stress is relieved in the immediate strata surrounding the extracted coal. As a result, collapse of the roof and heaving of the floor occurs. As roof material collapses and the floor heaves, the excavation fills with broken material (gob). In response to the collapse of the immediate roof, overlying strata bend and break under their weight until the strata are supported by the broken material and the inherent stiffness of the strata. The deformation of the overlying strata propagates upward, resulting in the surface expression termed "the subsidence basin". In time, compaction of the gob diminishes until the strata overlying the gob reaches equilibrium. Strata deformation can extend upward into the overburden for a distance of 30 to 60 times the thickness of the coal removed (Peng, 1992). Standard conservative mining practice suggests that vertical distances between the coal seam and overlying streams be kept at 60 times the mining height.

Proposed longwall mining in the mining plan modification area will result in some degree of vertical subsidence and horizontal surface strain (the percentage of extension or compression at the ground surface), both during the course of mining (transient behavior), and after mining has been completed (permanent alteration). Environmental consequences from mining-induced subsidence can include lowered surface elevations, tension cracks, escarpment failure, alteration of stream flows, and stream gradient changes. The degree of subsidence and environmental consequences of subsidence at specific sites are controlled by both the sequence of mining and the final mining geometry.

Subsidence predictions were made for the proposed mining plan using a numerical model calibrated with baseline subsidence data from the Bear Canyon Mine and nearby mines on East and Trail Mountains (Maleki, 2006). The calibrated version of this model (Sec. 4.2 of Maleki, 2006) was used to make quantitative predictions of the expected subsidence. The similarities in geology and geometry between the mining plan modification area and the surrounding area justifies the use of the back-analyzed parameters for the predictive model.

Some uncertainty exists for predictions made with the model due to geologic and mining geometry variations. Precise estimations of subsidence can only be made for a specific mining geometry. Even moderate changes to that geometry can compromise the accuracy of subsidence predictions. Model predictions are based on the proposed mining plan and the assumption that future longwall mining methods will be similar to that practiced in nearby mines. Maleki (2006) has evaluated the proposed subsidence effects

in the mine plan modification area, based on the proposed mining plan, published research, and actual mining effects in the area. The following are his major points:

1. Surface subsidence, including ground lowering, fracturing, and deformation, will occur. These effects can be minimized by proper mine planning, such as laying out panels to reduce the surface impacts.
2. Subsidence in this area is expected to be about 68% of the seam height. Maximum subsidence, where both the Hiawatha and Tank seams are mined, is expected to be 10.4 feet.
3. Staggering the positions of full-extraction boundaries in multiple seam mining will avoid overlapping tensile zones. Not columnizing the longwall extraction areas in multiple seams will reduce the surface cracking at final extraction boundaries.
4. Deviation from the major joint sets (avoiding alignment of joints with mine openings) reduces the potential for subsidence-related cracking at the surface. Chances are increased for limiting the number and length of mining-induced surface fracturing at final subsidence boundaries.
5. Pillar sizes in the gateroads of 30 feet wide will reduce surface impacts by totally crushing.
6. Where subsidence is predicted, expected surface movement beyond underground boundaries will be from 460 to 750 feet (depending upon the angele-of-draw), depending on location and the number of seams mined. The angle-of-draw is predicted to be between 25 and 30 degrees based on single and two-seam mining conditions. This is higher than the 22.5 degree angle-of-draw normally used for East Mountain but lower than values reported by the British Coal Board. Changes in surface slopes are expected to be 1 percent or less.

3.2.2.1 Alternative 1 – No Action

Under the No Action Alternative, the Forest Service would not consent to the mining plan modification. Mining would continue within the currently permitted sections of the mine until the coal resource has been recovered. This mining would have no subsidence effect on the mining plan modification area.

There would be no direct or indirect effects due to this decision. There would continue to be occasional natural escarpment failures due to the relatively rapid (in geologic terms) erosion of the Wasatch Plateau. These failures are not likely to cover large areas and are a natural feature, so there would be no change to visual qualities. They could occasionally destroy a golden eagle nest but are not likely to remove all of the nests of a breeding pair at one time. Isolated escarpment failures are not likely to have noticeable impacts to native wildlife and vegetation.

3.2.2.2 Alternative 2 – Consent to the Mining Plan Modification as Proposed

Under Alternative 2, the Forest Service would consent to the mining plan modification. Mining would occur as proposed by Co-Op Mining within the modification area.

Predicted maximum subsidence is approximately 10.4 feet (Maleki, 2006), based on the proposed longwall panel locations and mining methods. The surface subsidence is permanent once fully developed, typically within 1 year of mining.

Predicted vertical subsidence will not be visually discernable anywhere within the mining plan modification area. Surface gradient change will be too gradual for casual observation. However, consequences of the subsidence (e.g., ponding or rockfalls) may be recognizable. Although up to 10.4 feet of subsidence is expected, the surface expression will be uniform with gentle slopes. Maximum dips from the no subsidence areas at the panel margins to the maximum subsidence areas within the panels will be less than 1 degree (0.8 %). Slopes of this order are visibly imperceptible. Longwall subsidence is generally a gentle process that occurs progressively and cannot usually be felt on the surface above the active workings. On Gentry Mountain itself, there will be no risk to public safety due to subsidence. Below the escarpments, there could be an increased risk to safety during active subsidence periods. Escarpment failure could also destroy golden eagle nests, which would require a "take permit" from the USFWS. Visual qualities could be reduced, but not enough to prevent meeting Forest Plan VQO's. There could also be minor impacts to wildlife migration through Fish Creek and Chris Otteson Hollow. Potential impacts to wildlife resources are discussed in more detail in Sec. 3.4.

The panels located west of the Bear Canyon Fault are projected to be mined using room-and-pillar methods. First mining, or full support mining (where elastic pillars are left behind to support the ground), is not expected to cause measurable subsidence or subsidence-related impacts during the course of mining. This applies to estimated extraction ratios less than 50 percent. Residual subsidence is possible over first-pass mining areas, but would not be expected to occur for several years and could take decades or centuries. Larger pillar widths and lower extraction ratios tend to delay residual subsidence. Subsidence over first-pass mining areas is most likely to be a fraction of that produced by equivalent-height longwall mining. Second-pass, or full extraction room-and-pillar mining (where pillars left during development are subsequently partially mined) often yield extraction ratios between 70 and 90 percent. This practice can lead to immediate roof caving similar to that produced by longwall mining and present similar potential for subsidence and escarpment failure during or soon after mining. Experience suggests that most subsidence occurs within 1 year after full extraction mining. Most of the area west of the Bear Canyon Fault will probably be subject to full-extraction mining to maximize coal recovery.

Malki (2006) broke the escarpments into segments of 300 feet in length and evaluated their potential for failure due to mining-induced subsidence. 39 segments (11,700 linear feet, or approximately 2.2 miles) have a low, moderate, or high potential for failure, out of 158 total segments. Therefore, approximately 25% of the escarpment has some level of potential for failure.

The escarpment areas have a Visual Quality Objective of either Partial Retention or Modification. None of the activities proposed in the mining plan modification would be expected to preclude meeting the VQO of Partial Retention standards (which are higher than that of Modification) in which management approved activities must remain visually subordinate to the existing landscape. Under these VQOs, activities may introduce new or different form, line, color, or texture. Escarpment failures are not likely to be noticed by passersby due to time of exposure from the highway or other roads, the angle of the subsidence to the road, roadside vegetation and landforms, and distance from the road. Casual observers are unlikely to be able to differentiate between natural rockfalls, which are common in the area, and mining-induced rockfalls.

Escarpment failures may impact the populations of the Canyon Sweetvetch and Link Trail Columbine populations, but it is unlikely to impact the population as a whole. There are other isolated populations of these plants in Huntington Canyon and other canyons along the eastern edge of the Wasatch Plateau.

Four golden eagle nests are located on the escarpment within potential failure areas, and two more are located downslope of the escarpment that could be impacted by rolling rocks. These nests could be damaged or destroyed due to escarpment failure. The operator would be required to obtain "take permits" from the USFWS before conducting mining that may impact these nests. In the Bear Canyon Mining and Reclamation Plan, the operator has committed to schedule mining under the escarpments outside the nesting period, or to screen the nests to prevent their use, to preclude taking of birds. No other impacts to wildlife or vegetation are expected.

The only perennial streams that could be affected under Alternative 2 are the Left and Right Forks of Fish Creek. Maximum subsidence of the streambed is predicted to be 10 feet. Differential subsidence along the streams would result in both increases and decreases in the channel gradient. Maximum increase in the stream inclination are predicted to be approximately 0.30 percent, or 0.30 feet of drop per 100 feet of horizontal distance. Peak decreases in gradient are predicted to be approximately 0.75 percent, or 0.75 feet per 100 feet of horizontal distance.

Cracks in stream channels may temporarily form during the passage of the longwall face, but usually close after the lonwall passes and the transient tensile strain relaxes. Effects to streams are discussed in Section 3.3. Collapse of unsupported spans during mining is possible even where permanent strains formed after mining do not threaten the stability of such features. Transient strain can be reduced by maintaining a high rate of panel retreat. The faster the retreat rate, the more uniform is the development of subsidence, thus a reduction in the magnitude of transient strain. This can help to protect surface features located toward the centers of longwall panels. Where gateroads cross stream channels, there may be permanent cracking in the stream bottom.

There would be no direct effects to the environment from this alternative. There are potential indirect effects to wildlife, vegetation, and hydrologic resources.

3.2.2.3 Alternative 3 – Consent to the Mining Plan Modification with Supplemental FS Mitigations

No change from Alternative 2.

3.2.4 Cumulative Effects

The impacts from subsidence in the general project area include escarpment failures, surface fracturing, surface lowering, and impacts to hydrologic resources.

Mining-induced subsidence impacts exist in the areas on Gentry Mountain that have been previously mined by the Bear Canyon Mine, immediately west of the proposed mining modification area. The Star Point and Hiawatha mines to the north, and the mines on East Mountain, have all created subsidence impacts in the general area. Full-extraction mining in the mining plan modification area would add to the impacts in the area. The mining plan for the new area has been designed with the latest technology (Maleki, 2006, and introduction to Sec. 3.2.2). Lease stipulations (Appendix 3) also require the operator to mitigate impacts, keeping them from being significant impacts. The impacts due to mining-induced subsidence are explained in Sec. 3.3 through 3.7 for each resource.

3.2.5 Irreversible/Irretrievable Commitment of Resources

The irreversible/irretrievable commitment of resources are explained in Sec. 3.3 through 3.7 for each resource.

3.3 HYDROLOGY

The analysis of the hydrologic resources, and potential impacts to hydrologic resources due to underground coal mining, rely heavily on data in the Cumulative Hydrologic Impact Assessment (CHIA) prepared by the Utah Division of Oil, Gas and Mining (DOGM, 2007) for Gentry Mountain. The CHIA is a summation of hydrologic data collected by several coal mines over many years and evaluates the impacts of past mining. The reader is encouraged to consult the CHIA if they want more detailed information on the hydrology related to the Bear Canyon mining plan modification.

3.3.1 Affected Environment

3.3.1.1 Ground Water

The principle aquifers in the permit modification area "are the Star Point Sandstone and the combined North Horn and Price River Formations. These aquifers are modified by north-south normal faults systems that can act as boundaries or conduits, and sometimes act simultaneously as barriers to flow across the fracture but as conduits for flow parallel to the fracture" (DOGM, 2007). The Star Point Sandstone contains 3 possible sandstone aquifers (listed from oldest to youngest), the Panther, Stoors, and Spring Canyon sandstone tongues. These units are beach sands that intertongue with the Mancos Shale, due to fluctuating sea level that caused the beaches to migrate laterally through time. Each sandstone tongue has its own potentiometric surface. The Mancos Shale is a thick aquitard that effectively blocks further downward infiltration. The mine workings overly the Star Point Sandstone and are separated from the North Horn/Price River Formations by the Blackhawk Formation. The Blackhawk is generally considered an aquitard, although groundwater may move through the formation via fractures or faults.

Information about springs is derived from company maps from their proposal identifying monitoring sites (Plate 7-4) and area geology (Plate 6-1). This was supplemented with information from the Division of Oil, Gas and Mining's Coal Water Quality database, the Division of Water Rights database, and Forest Service grazing allotment maps. There are at least 40 springs or seeps in the mining plan modification area (including both National Forest System and private lands). Approximately fifteen are in the Fish Creek subwatershed; 14 in the Trail Creek subwatershed, and 9 in the Bear Canyon subwatershed.

Recharge to the majority of the springs in the permit modification area is primarily from annual snowmelt with additional amounts from rainfall events. The amount of recharge that infiltrates the formations is variable and is highly dependent upon topographic relief. The relatively gentle topography on top of Gentry Mountain allows the greatest opportunity for precipitation to enter the formations.

Water moves downward through fractures and solution cavities in the Flagstaff Limestone or through porous layers and fractures in the North Horn until it comes in

contact with a less porous layer. The water then moves laterally along this layer until it exits at an outcrop or encounters another porous or fractured layer. Most of the springs in the permit modification area are located in the North Horn or Price River Formations. Flow paths and time of travel are unknown; however, the relatively quick response of the springs in the North Horn formation to precipitation suggests that the water moves primarily through fractures. Water issuing from formations below the North Horn is likely conveyed through fractures or faults.

Some springs are associated with faults. "Water may be conveyed along a fault until, 1) water discharges as a spring, 2) water discharges to a lower perched aquifer system, or 3) water discharges to a more extensive aquifer or ground-water system" (DOGM, 2007). In the area, "most springs having flows in excess of 10 gpm lie either: 1) directly along a fault, 2) in close proximity to a fault, or 3) appear to fall in line with the projection of an identified fault" (DOGM, 2007). Springs associated with faults may have a recharge area that extends beyond the topographic watershed.

Two springs of particular concern are Birch Spring and Big Bear Spring; both are fault related springs discharging near the Mancos Shale-Panther Tongue Sandstone contact. These springs are adjacent to, but not in the mining plan modification area. Both are developed as public drinking water sources. The water users contend that past mining has affected the water yield from these springs; this is disputed by the mining company. In 1996 the Utah Supreme Court upheld a decision by the Board of Oil, Gas and Mining that the current scientific evidence did not indicate a hydrologic connection between the Bear Canyon Mine, the mining occurring in the Blind Canyon Coal Seam at the time of the decision, and Big Bear and Birch springs. No conclusive investigations have been conducted to establish the source area(s) for these springs.

There are many hypotheses about the source areas for these springs. Water chemistry may provide some information. The chemical characteristics are similar between Birch and Big Bear springs, but Big Bear Spring has mixed waters with a modern component while Birch Spring water has no modern component. The regional potentiometric surface matches the geologic structure and dips from north to south, indicating recharge of the aquifer also comes from the north. The most likely recharge would be from a stream crossing the Panther Tongue Sandstone where it crops out in a canyon.

The following paragraphs from the CHIA (DOGM, 2007) describe potential scenarios for Birch and Big Bear springs.

> "Birch Spring issues from fractures in the Panther Tongue of the Star Point Sandstone. The most likely recharge is directly north of the spring. Fractures and faults of the Pleasant Valley Graben and the shattered zone south of Tie Fork Canyon align with Birch Spring; although these areas are several miles from the spring, they have high potential as the sources for the recharge to Birch Spring. They are topographically higher and areas of greater precipitation. There are perennial streams in these areas to the north. The Star Point Mine determined that the stream in Nuck Woodward Canyon has losing reaches that recharge the

ground water system through the Trail Canyon Fault. Losing reaches have not been gauged in Wild Cattle Hollow, directly upgradient of Birch Spring, but Wild Cattle Hollow aligns with the Trail Canyon Fault and brecciated zones that would accommodate recharge are undoubtedly present. Potentiometric information is sparse west of the Gentry Ridge Horst, but SDH-2 and Upper Tie Fork Spring confirm that at least a component of the potentiometric gradient is to the south. These faults and fractures limit east-west ground water flow, and favor flow towards Birch Spring from these northern areas."

"Big Bear Spring issues from fractures in the Panther Tongue of the Star Point Sandstone. The fractures and faults of the Bear Canyon Graben in particular, and the shattered zone south of Tie Fork Canyon align with Big Bear Spring; although these areas are several miles from Big Bear Spring, they are the most likely sources for recharge to Big Bear Spring. They are topographically higher and the area of greatest precipitation. There are perennial streams in these higher areas to the north. The Star Point Mine determined that the stream in Nuck Woodward Canyon has losing reaches that recharge the ground water system through the Trail Canyon Fault. Losing reaches have not been confirmed in streams directly upgradient of Big Bear Spring, but Wild Cattle, Gentry, and McCadden Hollows align with large faults and brecciated zones that would accommodate recharge are undoubtedly present. Information from boreholes, mines, and the Tie Fork Springs confirm that the potentiometric gradient is to the south – with perhaps an eastward component, and the potentiometric surface is higher in the Bear Canyon Graben than to the east or west. The faults and fractures limit east-west ground water flow, and favor flow towards Big Bear Spring from these northern areas.

It has also been suggested that recharge came from Bear Creek and local faults and fractures. Although recharge to the spring from the creek is not confirmed, baseflow to Bear Creek comes from the Bear Canyon Fault."

3.3.1.2 Surface Water

The mining plan modification area is in the Huntington Creek watershed and is tributary to the San Rafael River. On National Forest System lands, portions of Trail Creek, Bear Creek, and Fish Creek (Left and Right Forks) are perennial. The lower drainage of Cedar Creek (outside the Forest boundary) is also perennial.

"Perennial reaches of streams receive substantial groundwater inputs and generally flow continuously throughout the year. Their flows can vary widely from year to year and may dry up during severe droughts, although groundwater is generally near the surface" (National Research Council, 2002). A perennial stream is made up primarily of gaining or effluent segments. However, in arid environments, a stream may have losing or influent segments and still be considered perennial if the influent segment has perennial segments up and downstream of it. The importance of springs in maintaining perennial streamflow is variable and ranges from a major to a supplemental source.

The alluvial ground water that supports perennial stream segments also originates in a variable source area upstream/up-gradient of the perennial segment. Intermittent streams typically occur in these portions of the source area. "Intermittent stream reaches typically flow for several weeks or months each year when precipitation and associated groundwater inputs are relatively high. The timing of the flow and drying of intermittent streams is broadly predictable on a seasonal basis" (National Research Council, 2002). In this area the duration of flow is typically several months and is usually in response to spring snowmelt. However, many intermittent streams have riparian vegetation supported by the surface flows and shallow groundwater that is likely perennial. Based on 2006 field reconnaissance, springs are an important source of water supporting the perennial segments of Trail Creek, Bear Canyon, and the Right and Left Forks of Fish Creek.

The streams in the permit modification area originate in the relatively gentle terrain of Gentry Mountain. They then flow through the steep terrain of the mountain escarpment and foot-slopes before reaching Huntington Creek.

3.3.1.3 Riparian Areas and Wetlands

No information is available to determine how many of the springs in the permit modification area support wetlands or aquatic ecosystems.

Riparian areas are associated with the perennial stream segments and may extend into the intermittent segments.

3.3.1.4 Water Uses on National Forest System Lands

Water on National Forest System lands is used consumptively for livestock and wildlife watering. Some, but not all, springs have been developed. Forest Service claims for water rights were prepared in the 1980's as part of a general adjudication of the Huntington Creek drainage. It appears that there was direction at the time of the filings to emphasize point to point claims on streams. Since that time, and the publication of the proposed determination for Huntington Creek, the Forest Service has continued to work with the Division of Water Rights to develop an efficient and comprehensive method for documenting and claiming water uses on lands administered by the Forest Service. To that end, a subbasin claim is being developed that would assert a claim of right for all developed and undeveloped waters on National Forest System lands in the Huntington Creek watershed. Therefore, all developed and undeveloped springs in the permit modification area should be assumed to have a claim of right associated with them, irrespective of whether there is a specific filing currently in the Division of Water Rights data base.

3.3.2 Environmental Consequences and Direct and Indirect Effects

Coal mining can impact hydrologic resources by subsidence or by directly mining into water-bearing structures.

3.3.2.1 Consequences due to Subsidence

Mining may result in changes in permeability and transmissivity in rock units above, below, and within the mined rock units. Mining may depressurize ground water in a rock unit below the mined rock and lower the potentiometric surface. Mining the coal resource creates a void that can increase transmissivity and water storage in the mined region. Subsidence results in rock deformation that changes the permeability and transmissivity in the overlaying formations. Mining and mining related subsidence may intercept water from a surface-water source, aquifers, or fracture zones. Ground water may continue along its original flow path after interception or it may be redirected. Potential effects include a loss or gain in water quantity at a storage location, an increase or decrease in flow at an existing discharge point, or a newly created discharge location. (DOGM, 2007)

Full extraction mining results in subsidence. Maleki (2006) describes four zones of subsidence: the cave zone, the fracture zone, the continuous deformation zone, and the soil zone. The height of these zones is determined by the total coal extraction height and the nature of the overlying formations. The depth of overburden relative to these zones is important in predicting effects on surface features, including springs and stream channels. With an insufficient depth of overburden the fracture zone may extend to the surface; these fractures could alter subsurface or surface flow paths to springs or streams. Water may be diverted from its previous point or zone of surface discharge and may even be diverted into the mine workings. This could result in a decrease or loss of flow in springs or seeps and could affect the ecosystems associated with a spring or seep. This could also affect the flow in streams and the associated riparian areas. Water rights may be affected. In some geologic formations, the fractures may heal by a combination of sloughing of sediments into the fractures and swelling of clays; this may take several years. The deformation zone may alter flow paths but is unlikely to divert water into the mine.

3.3.2.2 Consequences due to Mining into Water-Bearing Units or Structures

The mining process can intersect water-bearing units or structures. Water encountered in the Bear Canyon Mine could originate from three possible sources: sandstone paleochannels, up-welling through the mine floor from the Star Point Sandstone, and from water bearing faults.

Sandstone paleochannels are encountered randomly during mining. They are isolated from one another and do not form a local or regional aquifer. They are also believed to be isolated from other local aquifers and are not recharge. Generally the water is dated to be several thousand years old and, when encountered, a channel drains within days to weeks in most cases.

Mining could result in draining water from the Star Point sandstone. The potentiometric surface is above the Star Point sandstone in a large part of the mining plan modification area. As the coal is mined, water could well-up through the mine floor, possibly resulting in large volumes of in-flow. This water would not reach the surface in any appreciable amounts under natural conditions. If there were a substantial shale layer between the coal seam and the Star Point sandstone that acts as an aquiclude, the up-welling probably would not occur. From an examination of the drill logs, this situation exists in the northwestern part of the mining plan modification area where only the Blind Canyon Seam would be mined because approximately 70 to 75 feet of Blackhawk Formation separates the Blind Canyon Seam from the Star Point sandstone. In other portions of the mining plan modification area, where the Hiawatha Seam would be mined, an aquiclude does not occur between the coal and the Star Point sandstone.

The volume of water welling up through the mine floor while mining in the new mining plan modification area, east of the Bear Canyon Fault, can be estimated based upon available information including slug test data performed on the Star Point Sandstone in the Bear Canyon Mine, drill hole data showing sandstone thickness and water levels, and information from experience in other mines in the area under similar conditions. There are no known faults or pronounced folding east of the Bear Canyon Fault that would tend to increase the hydraulic conductivity and secondary porosity in the Star Point Sandstone in that area. Under similar conditions in the Bear Canyon Mine and other mines in the area, past experience has shown that the Star Point Sandstone is capable of sustaining flows in the range of a few gallons per minute. In situations where there is greater hydraulic conductivity due to fracturing, initial flows from the mine floor have been recorded as high as 300 gpm, gradually diminishing as depressurization occurred. Using an average storativity value for a confined aquifer of 5 x E-4 and using an approximate thickness of 80 feet for the Spring Canyon member of the Star Point Sandstone, approximately 13,000 gallons could be yielded over time for one acre. It is not expected that initial inflows would exceed 10 gpm over the entire one acre area. As depressurization takes place, the volume would decrease.

Encountering fault related ground water could occur if or when the faults in the northwestern part of the mining plan modification area are tunneled through while accessing the coal reserves in that area. There are nine faults mapped in the permit modification area (Map 4, Appendix A). Birch Spring and Big Bear Spring (both municipal water supplies) are at least partially dependent upon this fault system. The following summary of potential impacts to Birch and Big Bear springs is from the Cumulative Hydrologic Impact Assessment (CHIA) for Gentry Mountain prepared by DOGM (2007):

> "The flow paths of ground water to Birch Spring and Big Bear Spring are not known in detail, but it is evident from the geology and topography that the source area is to the north, between the Bear Canyon Fault on the east and the Pleasant Valley Fault on the west, and that flow is dominantly through fractures. The potentiometric surface of the Spring Canyon Sandstone Member of the Star Point Sandstone is above the Blind Canyon Seam in the McCadden Hollow area, but the

flows at Big Bear and Birch springs are at the level of the Panther Sandstone Member, where the underlying Mancos Shale effectively stops any further downward infiltration. Mining operations in the Blind Canyon Seam in the McCadden Hollow area, should they occur, are not expected to intercept this deeper flow system or impact flows at Big Bear and Birch springs. Mining operations east of the bear Canyon Fault are not expected to impact Birch, Big Bear, or Tie Fork springs."

3.3.2.3 Alternative 1 – No Action

Under Alternative 1, the Forest Service would not consent to the mining plan modification. There would be no mining outside of the currently permitted area, so there would be no additional impacts to hydrologic resources. There would be no direct or indirect effects to hydrologic resources.

3.3.2.4 Alternative 2 – Consent to the Mining Plan Modification as Proposed

The leases contain Special Forest Service Stipulations that apply to hydrologic resources, including:

monitoring requirements, including the collection of baseline data;

the requirement that underground mining operations be conducted to prevent surface subsidence that would damage or alter the flow of perennial streams; and

the replacement of any surface water identified for protection that is lost or adversely affected by mining operations with water from an alternate source in sufficient quantity and quality to maintain existing riparian habitat, fishery habitat, livestock and wildlife use, or other land uses.

There are also State requirements for the replacement of water affected by subsidence.

The State of Utah has assigned classifications to the water resources in the state (Rule R317-2. Standards of Quality for Waters of the State). Each classification designates certain acceptable uses and water quality standards. The classifications for the waters in the proposed permit revision area include:

- 1C – protected for use as a raw water source for domestic water systems with prior treatment by treatment processes as required by the Utah Division of Drinking Water.
- 2B – protected for secondary-contact recreation, such as boating, wading, or similar uses.
- 3A – protected for cold-water species of game fish and other cold-water aquatic life, including the necessary aquatic organisms in their food chain.
- 4 – protected for agricultural uses, including irrigation of crops and stock watering.

In the permit modification area, the only ground-disturbing activity proposed is subsidence. No road construction, exploration drilling, or mining facility construction are proposed. Coal reserve exploration drilling may be proposed at a future date, but would be assessed in another environmental analysis with site-specific details and management requirements. No water quality effects are anticipated from this proposed action. Water quality monitoring would continue as required by the Division of Oil, Gas, and Mining. The proposed action is consistent with the Clean Water Act.

Projected effects on springs in and closely adjacent to the mining plan modification area and the riparian ecosystems associated with these springs are based on the following assumptions:

The recharge mechanism for a spring can be generally categorized as a fracture flow system, rock matrix flow system, or a combined fracture-matrix flow system.

Based on a spring's position in the stratigraphic column, the recharge mechanism can be assumed based on local knowledge of the geology.

Using Maleki's (2006) description of subsidence zones and the type of recharge, the possible effects of mining can be generalized as follows: the fracture zone can affect all three types of spring recharge; the deformation zone could affect fracture flow systems and may also affect combination systems. The likelihood of deformation zone subsidence effects on combination fracture-matrix flow system springs depends on the overburden depth or, expressed differently, the height of the deformation zone. In areas where two seam of coal are proposed for mining, the fracture zone can be assumed to extend upward approximately 650 feet. In areas where one seam would be mined, the fracture zone would extend approximately 325 feet. The deformation zone is assumed to extend from the fracture zone to the ground surface.

All of the springs are assumed to support a riparian or wetland ecosystem; size is unknown.

Projected effects on the streams in the permit modification area are based on the following assumptions:

Springs are an important source of perennial stream flow.

The quantity of water in a stream segment could be directly affected if the fracture zone extends to the stream channel bottom. The quantity of water may not be directly affected in the deformation zone, depending on the geologic formation and distance between the fracture zone. Indirect effects must consider what may have occurred upstream.

Stream pattern and/or profile could be affected depending on the stream type and the projected change in surface slopes relative to existing stream slope.

Using these assumptions, information about the springs and stream segments in the permit modification area are summarized in Table 2, Springs in the Mining Plan Modification Area and Table 3, Stream Segments in the Mining Plan Modification Area, located in Appendix E.

Using the above assumptions, the possible effects of the proposed action will be addressed by subwatershed.

Fish Creek

Left Fork of Fish Creek

Ground Water

Two seams of coal are proposed for mining in a portion of the Left Fork of Fish Creek; the height of the deformation zone would range from approximately 550 to 750 feet. In other areas of the Left Fork, one seam is proposed for mining, resulting in a deformation zone height of approximately 750 to 850 feet. The springs overlying the subsided zone in this portion of the Left Fork are in the North Horn Formation and are assumed to have a combined fracture-matrix flow recharge system. Given the height of the deformation zone, subsidence is unlikely to affect the springs or their dependent ecosystems.

Surface Water

No adverse effects on the springs supporting stream flow are expected.

In the headwaters of the Left Fork a portion of the stream channel would be subsided; deformation zone height would range from approximately 550 to 750 feet in the North Horn Formation. Loss of water from the channel or adverse changes in channel slope are unlikely.

The stream channel adjacent to the escarpment would also be subsided; deformation zone height would range from 400 to 800 feet in the Price River and Castlegate Formations. Loss of water from the channel is possible but not likely. Adverse changes in channel slope are unlikely. There is a possibility of escarpment failure, which could affect the stream channel.

Right Fork of Fish Creek

Ground Water

One seam of coal is proposed for mining in a portion of the Right Fork of Fish Creek; the height of the deformation zone would range from approximately 850 to 1250 feet. The springs overlying the subsided zone in this portion of the Right Fork are in the North Horn Formation and are assumed to have a combined fracture-matrix flow recharge system. Given the height of the deformation zone, subsidence is unlikely to affect the springs or their dependent ecosystems.

Surface Water

No adverse effects on the springs supporting stream flow are expected.

In the headwaters of the Right Fork the stream channel would be subsided; deformation zone height would range from approximately 350 to 550 feet in the North Horn Formation. Loss of water from the channel is unlikely. Adverse changes in channel slope are possible.

The stream channel adjacent to the escarpment would also be subsided; deformation zone height would range from 200 to 500 feet in the Price River and Castlegate Formations. Loss of water from the channel is possible. Adverse changes in channel slope are unlikely.

Bear Canyon

Ground Water

One seam of coal is proposed for mining in a portion of Bear Canyon; the height of the deformation zone would range from approximately 850 to 1050 feet. The springs overlying the subsided zone in this portion of Bear Canyon are in the North Horn Formation and are assumed to have a combined fracture-matrix flow recharge system. Given the height of the deformation zone, subsidence is unlikely to affect the springs or their dependent ecosystems.

Surface Water

Subsidence of Bear Creek would not occur. The coal reserves do not extend beneath Bear Creek in the lower portion of the drainage and in the upper drainage the coal reserves thin to the point that it would be unfeasible to mine.

Trail Canyon

Several geologic faults with significant vertical offset make it unfeasible to mine the coal beneath Trail Canyon or to reach the coal reserves west of Trail Creek at this time. Trail Creek would not be undermined or subsided in this proposed action. Should mining in this area be proposed at some future date, additional analysis to assess the possible impacts would be necessary.

McCadden Hollow, tributary to Trail Canyon

Ground Water

One seam of coal is proposed for mining in a portion of McCadden Hollow; the height of the deformation zone would range from approximately 850 to 1250 feet. The springs overlying the subsided zone in this portion of McCadden Hollow are in the North Horn

Formation and are assumed to have a combined fracture-matrix flow recharge system. Given the height of the deformation zone, subsidence is unlikely to affect the springs or their dependent ecosystems.

Several other springs in McCadden Hollow are separated from the proposed mining by the Blind Canyon Fault.

Surface Water

McCadden Hollow is a tributary to Trail Creek and is intermittent. The stream channel would be subsided; deformation zone height would range from approximately 650 to 950 feet in the North Horn Formation. Loss of water from the channel is unlikely. Adverse changes in channel slope are unlikely.

Cedar Creek

The east side of the proposed permit revision area extends into the Cedar Creek watershed. No mining or subsidence is proposed in this subwatershed.

Birch and Big Bear Springs

There are many hypothases about the source area for these springs. There is general agreement that these springs are also at least partially supplied by faults. In the mining plan modification area, the area likely supplying water to these springs is bounded by the Bear Canyon Fault to the east and the Pleasant Valley Fault to the west and includes portions of Sections 10, 11, 12, 13, and 14 in T 16 S, R 7 E. There are nine faults mapped in this zone.

The following quote from the CHIA (DOGM, 2007), describes the hydrogeology and expected impacts to Birch and Big Bear springs:

> "Mining in the McCadden Hollow block is not likely to interfere with the Panther Member hydrologic system and flow to Birch Spring and Big Bear Spring. To access the Blind Canyon Seam in McCadden Hollow, entries will need to cross the Bear Canyon Fault. Fractures and brecciated zones adjacent to the fault may yield some water, but the fault crossing will be above the potentiometric surface, on both sides of the fault (Bear Canyon Mine Plan, Plate 7J-2). Tunnels will need to be built down to the Blind Canyon Seam on the McCadden Hollow side of the fault. Projected mining in the McCadden Hollow block is to be done below the Spring Canyon potentiometric surface. Lower Blackhawk strata that lie between the Blind Canyon Seam and the Spring Canyon Sandstone will greatly reduce the possibility of groundwater upwelling through the mine floor. In the McCadden Hollow area, the Star Point Sandstone very likely consists of three distinct sandstone members, with separate hydrologic systems. This will isolate the Panther Member hydrologic system that supplies Birch and Big Bear springs from impacts in shallower members. Finally, if a large volume of water were to be

encountered in the McCadden block, the cost of moving the water could stop further mining."

Findings of the CHIA

The Statement of Findings (Sec. VI.) in the CHIA states:

> "No probability of material damage from anticipated coal mining operations has been found."

The following is a more detailed discussion from the Statement of Findings in the CHIA:

> "Numerous hydrologic changes have occurred over the extensive period of mining in the Gentry Mountain CIA. This is reflected by the changes observed in mine discharge rate and as noted in flow hydrographs of some springs. Most of these changes appear to have taken place in the past, many years prior to SMCRA. Water rights were issued on mine discharges in the 1870s and 1880s. Since then, the mines have changed ownership and recorded hydrologic information has been lost. Some mining related influences have been influenced. These influences have been mitigated through agreements, between the mine companies, water rights holders, and landowners. Mining in the CIA has been conducted in accordance with applicable rules and without known material damage."

3.3.2.3 Alternative 3 – Consent to the Mining Plan Modification with Supplemental FS Mitigations

No change from Alternative 2.

3.3.3 Cumulative Effects

The analysis area for possible cumulative watershed and soil effects is the subwatersheds of the permit modification area – Trail Canyon, Bear Canyon, and Fish Creek. Cedar Creek is not included because a very small area of minor subsidence is proposed in the subwatershed. The activities of hydrologic interest that are likely to overlap in time and space with the proposed underground mining include livestock grazing, drilling to refine coal reserve information, and vegetation treatments by mechanical treatment or prescribed burning.

Effects of the proposed action under Alternatives 2 and 3 are possible or likely in limited areas of the cumulative effects analysis area. In the Right Fork of Fish Creek adverse changes in stream channel slope are possible in the headwaters and loss of water as the channel crosses the escarpment is possible. No mining effects are anticipated on the

springs and their dependent ecosystems or on the other drainages in the permit modification area.

Livestock grazing occurs in the headwaters of the Right Fork of Fish Creek, which is primarily privately owned. Grazing is very limited in the escarpment area and downstream due to steep slopes. Livestock grazing in areas of stream channel instability induced by subsidence may prolong but not preclude recovery; however, information about grazing management of these private lands is unavailable.

Gentry Mountain is well roaded. Any additional drilling to delineate the coal reserves would likely occur adjacent to existing roads and should not affect the stream channels or associated riparian areas. Monitoring of similar activities with Forest Service requirements suggests few short-term adverse effects and good post-project recovery (Foster, 2006, unpublished monitoring report). Forest Service requirements include use of no-activity buffer zones around springs, seeps, and stream channels; however, similar requirements may not be applied to the private lands.

Vegetation treatment for fuels management is being considered by the Forest Service in a portion of the cumulative watershed effects area. At this time no treatment units are proposed in the Right Fork of Fish Creek. It is unknown whether the private landowner is considering any type of vegetation treatment.

No adverse cumulative effects on the stream channel are anticipated; however, information about the current or future management of the private lands in the area is unavailable.

3.3.4 Irreversible/Irretrievable Commitment of Resources

Groundwater is generally considered a renewable resource, especially groundwater that occurs near surface in active groundwater systems. No irreversible or irretrievable commitment of groundwater resources that occur near-surface in active groundwater systems that support springs or seeps or supply baseflow to perennial creeks is anticipated. The interception and removal of water from deeper, inactive groundwater systems can be considered an irretrievable commitment of that resource because that water cannot be readily replaced by natural groundwater recharge mechanisms. However, these inactive groundwater systems have very little to no connection with the hydrologic system of the area.

3.4 WILDLIFE

3.4.1 Affected Environment

The analysis area for the wildlife resources covers the entire mining plan modification area and the surrounding area used by various species. The area varies by species.

3.4.1.1 Threatened and Endangered Species

Endangered species are species that have been identified, and listed in the Federal Register, by the Service as being in danger of extinction throughout all or a significant portion of its range. Threatened species are species that have been identified, and listed in the Federal Register as likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Table 3 lists wildlife species designated as threatened, endangered (T&E) or candidate (C) by the Service that could occur in Emery County, Utah; there are no proposed (P) wildlife species identified for Emery County. T&E or C species that could occur in Emery County but do not have suitable habitat, and are not likely to occur in or near the proposed project area are also identified in Table 3, but will not be considered further in this Biological Evaluation/Assessment.

Table 3-1. A list of threatened, endangered, and candidate species that may occur within the area of influence of the proposed 2006 Bear Canyon Mining Plan Modification project in Emery County, Utah.

SPECIES	SPECIES STATUS	SPECIES OCCURRENCE IN THE PERMIT AREA AND CONSIDERATION IN THIS BE/BA
Bald Eagle ***Haliaeetus leucocephalus***	**Threatened**	**Considered.** There are no habitat features in the proposed project area that would attract bald eagles to the vicinity of the proposed project; however they may occur incidentally along Huntington Canyon adjacent to the permit area.
Mexican Spotted Owl ***Strix occidentalis lucida***	**Threatened**	**Not Considered.** In Utah, the Mexican spotted owl nests in steep-walled, complex rock canyons at relatively low elevations (USDI 2001a). Canyons that provide suitable nesting habitat are generally at least 2 kilometers long and less than 2 kilometers wide. Suitable foraging habitat is generally located in mature mixed conifer forests on slopes of 40% or greater within suitable nesting canyons. There is no suitable Mexican spotted owl habitat in or near the proposed project area. Critical habitat is located in the extreme southeast part of the state (USDI FWS 2004) and would not be affected.
Western Yellow-billed Cuckoo ***Coccyus americanus occidentalis***	**Candidate**	**Not Considered.** The western yellow-billed cuckoo breeds in Utah, but migrates to South America during winter. Cuckoos are riparian obligates. Nesting habitat is classified as dense lowland cottonwood/willow riparian forest characterized by a dense sub-canopy or shrub layer. In Utah, nesting habitats are found at elevations between 2,500 to 6,000 feet. They appear to require large tracts (100 to 200 acres) of contiguous riparian nesting habitat (Parrish et al. 2002). There are not large contiguous tracts of riparian habitat in the vicinity of the proposed project, and the project area is located above 6,800 feet elevation. Therefore, the proposed project is not likely to affect the yellow-billed cuckoo.
Southwestern Willow Flycatcher ***Empidonax trailii extimus***	**Endangered**	**Not Considered.** The southwestern willow flycatcher is a riparian obligate, nesting in areas with high shrub densities interspersed with openings or meadows; they nest in cottonwood/willow habitats and structurally similar riparian vegetation such as alder and aspen. Riparian habitats in the permit area lack the high shrub densities required for this species.
Black-footed Ferret ***Mustela negripes***	**Endangered**	**Not Considered.** The black-footed ferret depends on prairie dog colonies for food and shelter. There are no prairie dog colonies (potential ferret habitat) in or near the proposed project area. The historic range of the ferret likely included parts of Emery County, but the soils, topography and vegetation in and near the proposed project would not likely support prairie dogs or ferrets.

Bonytail ***Gila elegans***	**Endangered**	**Not Considered.** Historically, the bonytail existed in warm water reaches of larger rivers in the Colorado River Basin; it is considered to be adapted to pools and eddies of mainstream rivers. It has been extirpated from most of its historic range. Currently, a small number of wild adults exist in Lake Mohave in the Lower Colorado River Basin, and there are small numbers of wild individuals in the Green River and in subbasins of the Upper Colorado River Basin (USDI 2002a). The bonytail has not been located on the Forest, and the proposed project would not adversely impact drainages where it is found. Huntington Creek runs over 20 airline miles from the project area to the San Rafael River, which then flows into the Green River.
Humpback Chub ***Gila cypha***	**Endangered**	**Not Considered.** The humpback chub is restricted to deep, swift mainstem and large tributaries in relatively inaccessible canyons of the Colorado River Basin. Adults require eddies and sheltered shorelines in streams that maintain high spring flows that flush sediments from spawning areas and form gravel deposits used for spawning. Young require low-velocity shoreline habitats. Currently, there are six known extant populations, which are located in the Upper Colorado River, Yampa River and Little Colorado River (USDI 2002b). The humpback chub has not been located on the Forest, and the proposed project would not adversely impact drainages where it is found.
Razorback sucker ***Xyrauchen texanus***	**Endangered**	**Not Considered.** Historically the razorback sucker was widely distributed in warm-water reaches of the Colorado River and its tributaries from Wyoming to Mexico. Adults require deep pools, eddies and backwaters in spring; shallow water associated with sandbars in summer; and low velocity pools and eddies in winter. Young require quiet, warm, shallow water found at tributary mouths, and in coves or shorelines in reservoirs. Currently, within the Upper Colorado River Basin this species is only found in small numbers in the middle Green River, between the confluence of the Duchesne and Yampa rivers, and in the lower reaches of those two tributaries (USDI 2002d). There are no suitable razorback sucker stream habitats on the Forest, and the proposed project would not adversely impact drainages where it is found. Huntington Creek runs over 20 airline miles from the project area to the San Rafael River, which then flows into the Green River.
Colorado pikeminnow ***Ptychocheilus lucius***	**Endangered**	**Not Considered.** The Colorado pikeminnow is endemic to the Colorado River Basin, and it historically extended from the Green River in Wyoming, to the Gulf of California; it was widespread and abundant in warm-water rivers and tributaries. It is a long-distance migrator (hundreds of kilometers to and from spawning areas). Adults require deep pool and eddie habitats in streams that have high spring flows. Currently, in Utah this species occurs in the Green River from Lodore Canyon to the confluence of the Colorado River (USDI 2002c). The Colorado pikeminnow has not been found on the Forest, and the proposed project would not adversely impact drainages where it is found.

Only the bald eagle will be carried forward for further analysis. The determination for all other species is "no effect".

Bald Eagle

Most bald eagle sightings on the Forest have been at Joes' Valley Reservoir and Huntington Canyon during late fall and early winter prior to freeze over. During the winter, bald eagles tend to concentrate wherever food is available; food availability is probably the single most important factor affecting winter eagle distribution and abundance, but availability of night roosts and diurnal perches are also fundamental elements of bald eagle winter range. Eagles are often attracted to wintering concentrations of waterfowl. In some regions, such as Utah, carrion can also be an important food source. At wintering areas, bald eagles often roost in large groups. These communal roosts are located in forested stands that provide protection from harsh weather.

Prey species commonly include fish, waterfowl, jackrabbits, and carrion; results of food-habit studies have indicated that bald eagle diets included: 56 percent fish, 28 percent birds, 14 percent mammals, and 2 percent miscellaneous sources (Stalmaster 1987). Some stretches of Huntington Creek, to the south and west of the project area, may provide foraging habitat for bald eagles. In addition, carrion from deer killed on the Huntington Highway 31 may provide additional foraging habitat.

Bald eagles spend over 90 percent of the daylight hours perching. Important perch sites generally have 3 fundamental elements: a direct view of potential food sources, located within 50 meters of water, and are located in areas isolated from human disturbance (Stalmaster 1987).

Unlike nesting and perch sites, roosting sites are not necessarily located close to water; during breeding season, nesting adults often roost in the nest or at the nest tree (Stalmaster 1987). Roost sites generally provide thermal cover, and are isolated from human disturbance. Bald eagles often roost communally during winter.

There are only a few known nesting pairs of bald eagles in Utah. There is a bald eagle nest site located approximately 20 miles from the proposed project area, and located approximately 7 miles from NFS lands. No bald eagles are known to nest on Manti La-Sal NF managed lands.

3.4.1.2 Sensitive Species

Sensitive species are species that are recognized by the Regional Forester as needing special management attention in order to prevent them from becoming threatened or endangered. Table 4 lists the Intermountain Regional Forester's list of sensitive wildlife species that could occur on the Manti Division of the Manti-La Sal National Forest (MLNF). Sensitive wildlife species that do not occur or do not have suitable habitat in or near the proposed project area, or species that would not be impacted by proposed activities within the project area, are identified in Table 4 and will not be considered further in this Biological Evaluation/Assessment.

Table 3-2. Sensitive wildlife species that could occur on the Manti Division of the MLNF, and their potential occurrence in the proposed project area.

SPECIES	SPECIES OCCURRENCE IN THE PERMIT AREA AND CONSIDERATION IN THIS BE/BA
Spotted Bat ***Euderma maculatum***	**Considered.** In Utah, the spotted bat is known to use a variety of vegetation types in Utah at elevations ranging from approximately 2,700 to 9,200 feet, including riparian, desert shrub, spruce/fir, ponderosa pine, montane forests and meadows. Spotted bats roost alone in rock crevices high up on steep cliff faces. Subsidence resulting from the mining could impact spotted bat roosting habitat. The mixed conifer forest and edge habitat in or near the permit area may provide suitable spotted bat foraging habitat.
Townsend's Big-eared Bat ***Plecotus townsendii pallescens***	**Considered.** In Utah, Townsend's big-eared bats roost and hibernate in caves and mines; they also roost (but not hibernate) in buildings (Oliver 2000). The project area does not contain caves, suitable inactive mines or unoccupied buildings, therefore it does not provide suitable roosting habitat for this species. Current mine operators have heard rumors of an old mine opening in the Fish Creek drainage, and have searched for it (M. Reynolds, pers. comm., 6/27/06). It has not been found, and if there was one, it may have collapsed. Old mine workings in the Hiawatha seam are flooded (M. Reynolds, pers. comm.. 11/14/2006) and would not provide habitat. The mixed conifer forest and edge habitat in or near the project area may provide suitable foraging habitat for the Townsend's big-eared bat.
Greater Sage Grouse ***Centrocercus urophasianus***	**Not Considered.** Sage grouse are generally found where there are large tracts of sage brush habitat with a diverse and substantial understory of native grasses and forbs or in areas where there is a mosaic of sagbrush, grasslands, aspen. Wet meadows, springs, seeps, or other green areas within sagebrush shrublands are generally needed for the early brood-rearing period. The proposed project area does have long, linear areas of mountain sagebrush at the higher elevations, but lacks large tracts of habitat and does not provide the habitat characteristics that would meet the needs of this species. No sage grouse have been observed in the permit area.
Northern Goshawk ***Accipiter gentilis***	**Considered.** Portions of the mixed conifer and aspen stands in the permit area provide suitable northern goshawk nesting and foraging habitat.
Peregrine Falcon ***Falco peregrinus***	**Considered**. Peregrine falcon's average foraging distance from the eyrie extents out to 10 miles, with 80 percent of peregrine falcon foraging occurring within a mile of the nest, and they have been known to forage up to 18 miles from their nest site

	(Spahr et al. 1991). There is a peregrine falcon eyrie located approximately 10 miles from the permit area.
Flammulated Owl ***Otis flammeollus***	**Considered.** Flammulated owls appear to be associated with mature pine or mixed conifer forests with a ponderosa pine and/or Douglas-fir component. There may be marginally suitable flammulated owl habitat in portions of the permit area.
Three-toed woodpecker ***Picoides tridactylus***	**Considered.** Three-toed woodpeckers use forests containing spruce, grand fir, ponderosa pine, tamarack, and lodgepole pine. Nests may be found in spruce, tamarack, pine, cedar, and aspen trees. There is potentially suitable three-toed woodpecker habitat in the proposed project area.
Spotted Frog ***Rana pretiosa***	**Not Considered.** Spotted frogs are most commonly found in cold, still, permanent water in such habitats as marshy edges of ponds or lakes, in algae-grown overflow pools of streams, and near flat water springs with emergent vegetation. This frog has a broad distribution throughout the previously glaciated regions of British Columbia. They also occur in the Rocky Mountains of Alberta, and have patchy distribution in the United States, from Washington to Montana and south to Nevada and Utah. In Utah, the spotted frog occurs in isolated populations, and is considered to be a relict from the last ice age. The spotted frog has not been found on the Manti – La Sal National Forest or in the permit area. The riparian habitats in the permit area do not provide suitable habitat.
Colorado Cutthroat Trout ***Oncorhynchus clarki pleuriticus***	**Not Considered.** Colorado cutthroat trout require cool, clear water in streams with well vegetated banks, which provides cover and bank stability. Deep pools and structures such as boulders and logs provide instream cover. This species is believed to have formerly been widespread in lakes, rivers, and streams in Utah, however now it is limited to isolated headwater streams and other rigorous environments where other species such as rainbow trout and Yellowstone cutthroat throat have not been introduced. The project area is located within the historic range of the species. Huntington Creek, adjacent to the project area, is ranked as a high priority cold water fishery, with self-sustaining populations of cutthroat and brown trout. Colorado cutthroat trout are not found in the permit area, and the project would not adversely impact drainages where it is found. Tie Fork Canyon, which has been identified as a cutthroat stream, is outside the permit area, and is in a separate watershed. Subsidence predicted with mining of the westernmost part of the Hiawatha seam is adjacent to that watershed, but is still in the Trail Canyon watershed.
Bonneville Cutthroat Trout ***Oncorhynchus clarki utah***	**Not Considered.** Bonneville cutthroat trout require cool, clear, well-oxygenated water and the presence of clean, well-sorted gravels with minimal fine sediments for successful spawning. They are found at high, moderate and low elevations in small head water streams in the Bonneville basin (USDI 2001b). The project area does not drain into the Bonneville basin, so there is no potential for impacts.

Spotted and Townsend's big-eared bats, northern goshawks, flammulated owls, peregrine falcons, and three-toed woodpeckers will be analyzed further. The determination for all other species is "no impact".

Spotted Bat

The spotted bat ranges from Mexico through the western states to the southern border of British Columbia; it is probably widely distributed in low numbers throughout western North America (Toone 1994). It probably occurs throughout Utah, but its distribution appears to be patchy. Habitats occupied by this bat range from low desert to montane coniferous forest. They have been found in a variety of habitat types including open ponderosa pine, desert shrub, pinyon/juniper, and open pasture and hay fields. In Utah, the spotted bat has been captured in several habitats: lowland riparian habitat (open meadows), desert shrub communities (sagebrush/rabbitbrush), ponderosa pine forest, montane grassland (grass/aspen), and montane forest and woodland (grass/spruce/aspen). This species has also been occasionally found in or on buildings in Utah towns and cities (Oliver 2000).

Spotted bats typically roost singly in crevices in steep cliff faces. Cracks and crevices in limestone or sandstone cliffs provide important roosting sites (Spahr et al. 1991), especially where rocky cliffs occur in proximity to riparian areas. Day roosts and maternal roosts are typically within small (up to 6 cm) cracks and crevices in cliff faces (Toone 1994). The relative inaccessibility of cliff roosts may insulate spotted bats from human disturbance, but the species has been observed roosting (and foraging) near campgrounds (Toone 1994). Spotted bats are thought to feed mainly on moths high above the vegetation canopy. They forage alone after dark using echolocation, which is

effective for fast flight feeding on tympanate moths (moths that can detect ultra-sonic sounds). As is common with many bats, spotted bats may forage a considerable distance (up to 6 miles) from roost sites (Toone 1994).

Roosting habitat in the Wasatch Plateau region is likely to occur in numerous cliffs along the edges of the plateau and on canyon walls that cut through the plateau. It is likely that spotted bats forage in a variety of habitats on the Plateau at elevations lower than 9,200 ft. Various surveys on the MLNF have detected spotted bats in several major canyons (and their tributaries) on the east side of the plateau, including Muddy, Ferron, Straight, Cottonwood, and Huntington Canyons (Perkins and Peterson 1997, and Sherwin et al. 1997), and they have been acoustically detected in Rilda Canyon (Sherwin et al. 1997).

Observations made during the 1997 surveys on the MLNF indicated that foraging spotted bats tolerate at least moderate human disturbance while foraging. Surveys were conducted at several sites near roads with light to moderate vehicular traffic (Crandall Canyon, Huntington Canyon, Straight Canyon), including tandem coal trucks. Spotted bats were observed foraging at low elevation sites, within 30 meters of the right-of-way (Sherwin, et al. 1997). Studies of bat roosting sites have shown bats abandoning roosts due to human disturbance (Diamond and Diamond 2004). Bat surveys in the Wild Horse Ridge area documented big brown bats, silver-haired bats and small-footed, long-legged and fringed myotis.

Townsend's Big-Eared Bat

Townsend's big-eared bats occur throughout North America, from British Columbia to southern Mexico; from California to South Dakota and western Texas and Oklahoma. They are widely distributed throughout the Intermountain Region, and they occur throughout Utah (Oliver 2000). They inhabit a wide variety of xeric and mesic habitats including: desert scrub, sagebrush, chaparral, deciduous and coniferous forests including, but not limited to pinyon/juniper, ponderosa pine, spruce/fir, redwood, mixed hardwood/conifer, and oak woodlands (Pierson et al. 1999), and their distribution is strongly correlated with the availability of caves or cave-like roosting habitat such as mines, buildings with cave-like attics, diversion tunnels or bridges (Pierson et al. 1999). They require relatively spacious, relatively cool cave-like roost sites; generally at least 30 meters in length, and at least 2 meters high with temperatures ranging from -2.0 to 13.0^{o} C (Pierson et al. 1999).

These bats are relatively sedentary, and do not migrate long distances; generally seasonal movements are less than 32 km (Pierson et al. 1999). Detections in Utah have ranged from 3,300 feet to 9,520 feet (Oliver 2000). In Utah, night roosts are found in mines and caves; day roosts and maternity roosts are found in mines, caves and buildings (Oliver 2000).

Townsend's big-eared bats are insectivorous; a lepidopteran specialist eating mostly moths (Pierson et al. 1999). They forage after dark using echolocation on the wing

(Sphar et al. 1991); a late flyer, emerging from the roost primarily after dark; well after sunset (Pierson et al. 1999).

Breeding occurs at winter sites between October and February, and parturition occurs in late spring and early summer. Each female usually gives birth to a single offspring. Females and young roost in communal nurseries, which range in size from 12 to 200 individuals. The offspring fly at three weeks and are weaned in six to eight weeks. Nurseries break up by August.

During winter, these bats roost singly or in small clusters in hibernacula from October to February. They do not migrate, but will move to different roost locations within hibernacula and may even move to different hibernacula during a winter in response to temperature changes.

Most of the bat surveys conducted on the MLNF that employed the use of mist nets or bat detectors have not revealed Townsend's big-eared bats (Perkins and Peterson 1997, and Sherwin et al. 1997). This is not unusual, as these bats are most commonly located during direct surveys of roosts (Oliver 2000).

Northern Goshawk

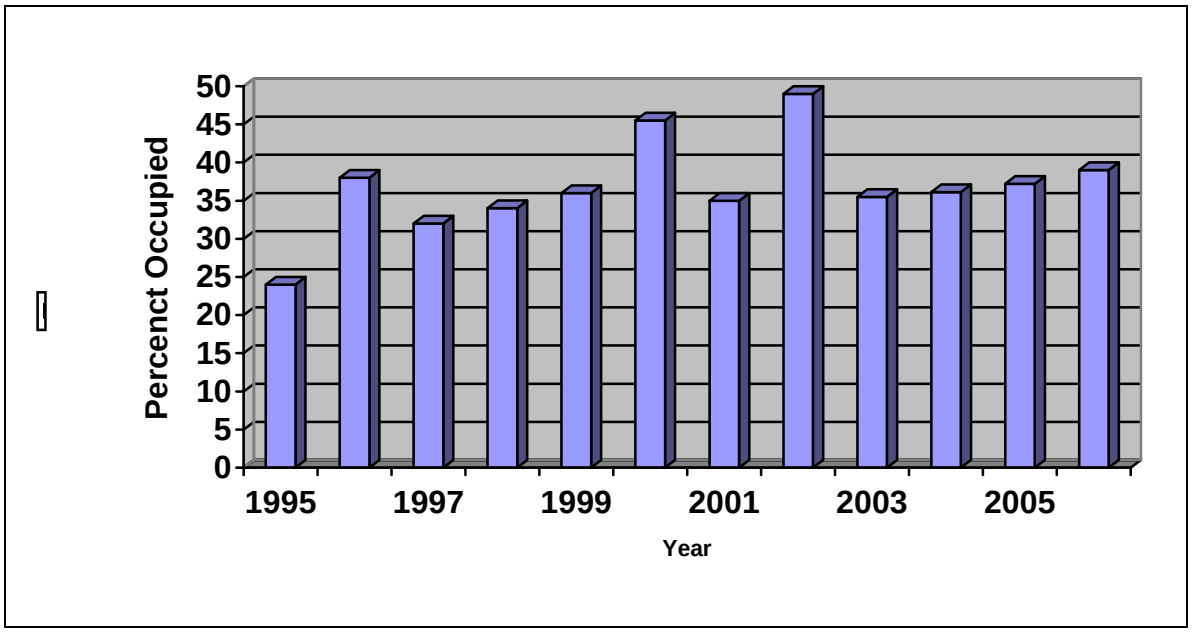
Goshawks have been found in a variety of forest ecosystems including lodgepole pine, aspen, ponderosa pine, Douglas-fir, and mixed forests throughout much of the northern hemisphere. Goshawk nest sites are usually located in dense mature forests with relatively large trees, near water, and on benches of relatively little slope (Graham et al. 1999). Closed canopies are important for protection and thermal cover, and relatively open understories are important to allow maneuverability during foraging. Data (district records) collected from the Wasatch Plateau between 1989 and 2000 show that over 80% of goshawk nests (n = 48) are in stands with a mixture of aspen and conifer species, with the remaining nest stands comprised of mixed-conifer (primarily Engelmann spruce/subalpine fir) without aspen. Sixty-five percent of all nests have been in aspen trees, with proportionally fewer in Douglas-fir and spruce. Nests are often used year after year, but nest stands usually contain a number of alternate nests. Goshawks are sensitive to human disturbance and have abandoned nests and young due to human activities that take place too close to their nest. In the 1980s an evaluation of 20-acre buffers around nest sites, indicated that these small areas were not adequately protecting nest areas; in 1992 more comprehensive management recommendations suggested that managing for 6,000 acre territories to protect nest sites and provide adequate foraging habitat was more appropriate (Graham et al. 1999). The U.S. Fish and Wildlife Service recommends that active goshawk nests be buffered with a 0.5 mile spatial buffer (USDI 2002e).

Suitable goshawk habitat is often heterogeneous, which supports a broad range of prey species; particularly those preferred by the goshawk: small mammals and birds including rabbits, squirrels, chipmunks, grouse, woodpeckers, jays and robins. Important forest components in Utah include snags, multiple canopies, and down woody debris (Graham et al. 1999).

The MLNF Land and Resources Management Plan directs that Forest Service management activities and human uses for which the Forest issues permits be restricted within a 30-acre area around active goshawk nests (USDA 1986). A circular 30-acre buffer would have a radius of approximately 645 feet. Restrictions within the 30-acre buffer around active nest sites would normally extend from March 1 through September 30. The U.S. Fish and Wildlife Service recommends that no disturbing activities take place within 0.5 mile of an active goshawk nest from March 1 through August 15 (USDI 2002e).

The goshawk population on the Manti Division of the Manti-La Sal National Forest appears to be stable. The goshawk started to become a focal species on the Manti-La Sal National Forest (MLSNF) in the late 1980s, and the number of known goshawk territories on the Forest has steadily increased since that time; therefore looking at the number of known active nests over the years would give the impression that the goshawk population on the Forest has steadily increased since the late 80s. A better indication of how the goshawk population is doing on the Forest would be the percent of monitored nests that were occupied each year, which is illustrated in Graph 1.

Graph 3-1. The percent of monitored goshawk nests that were occupied on the Manti Division of the Manti-La Sal NF from 1995 through 2006.



The goshawk population on the Forest fluctuates but has remained relatively stable since 1995. The percent of occupied goshawk nests has remained stable on the Wasatch Plateau with a slight upward trend.

There is one known territory within the project area (McCadden Hollow) and two territories in Gentry Hollow, which is to the north, and outside of the project area.

Peregrine Falcon

The peregrine falcon is cosmopolitan, ranging from coast to coast in North America. Pesticide accumulation in the mid 1900s drove the peregrine to the verge of extinction, and by 1965 fewer than 20 pairs were known west of the Great Plains. In 1990 there were 326 known pairs in the southwest region (Rodriguez 2002). The peregrine falcon was federally listed as an endangered species in 1970, and again in 1984. With the help of reintroductions and pesticide controls (primarily banning DDT, which caused eggshell thinning and drastically low reproduction), the peregrine falcon population increased sufficiently to be de-listed in 2000.

Peregrine falcon preferred nesting habitat is on cliff faces with recesses or protected shelves, although reintroduced birds regularly nest on man-made structures such as towers and high-rise buildings. A wide variety of habitats are used for foraging, including riparian woodlands, open country near rivers and marshes, coniferous and deciduous forest edges, shrublands, and prairies. They prey on a wide variety of birds including pigeons, shorebirds, waterfowl, grouse and other small to medium-sized terrestrial birds. Peregrine falcons may travel up to 18 miles from their nest site to forage for food, however a 10-mile radius around the nest is an average hunting area, and 80% of foraging occurs within a mile of the nest (Spahr et al. 1991). The nearest known peregrine falcon eyrie is located approximately 10 miles from the project area.

Flammulated Owl

Flammulated owls are generally associated with mature ponderosa pine or mixed conifer habitat that has a ponderosa pine component; possibly because of habitat structural characteristics and relative abundance of their preferred prey species (arthropods). Flammulated owls have also been found in stands of mixed conifer with a Douglas-fir component and incense cedar that mimic relatively open habitat characteristics generally associated with ponderosa pine stands.

Flammulated owls are almost exclusively insectivorous, preying primarily on lepidopteran (moth) species. Competition with bat species may be a limiting factor in some areas. Flammulated owls are obligate secondary cavity nesters relying on previously excavated cavities. Possible limitations to this species include availability of snags for nesting, or competition for nest cavities with mammalian (sciurid) competitors.

Breeding begins in May when pair formation and nest site selection take place. Young are hatched after a 21-22 day incubation period and fledged in late July. They disperse from the natal area by September. In mid-October, flammulated owls migrate to wintering grounds in Mexico and Central America.

Flammulated owls are distributed from southern British Columbia south to Veracruz, Mexico and from the Rocky Mountains to the Pacific during breeding. In winter their range is thought to extend from central Mexico to Guatemala and El Salvador (Spahr et al. 1991).

Owl surveys were done in combination with bat surveys in the Wild Horse Ridge area in 2004. Only great-horned owls were documented at that time.

Three-toed Woodpecker

Three-toed woodpeckers range across North America in northern coniferous and mixed forest types. They are found in Engelmann spruce, sub-alpine fir, Douglas-fir, grand fir, ponderosa pine, tamarack, aspen and lodgepole pine forests (Parrish et al. 2002). Although three-toed woodpeckers occasionally feed in live trees, they generally nest and forage in dead or dying trees where beetle infestations are occurring. More than 75% of their diet is wood boring insect larvae, mostly beetles, but they also eat moth larvae; approximately 65 percent of their annual diet and 99 percent of their winter diet is comprised of spruce beetles (Parrish et al. 2002). They are major predators of the spruce bark beetle, especially during epidemics. They forage on a wide variety of tree species depending on location. In Colorado, they prefer to forage on old-growth and mature trees, and in recent years in Utah, population peaks seem to follow spruce bark beetle infestations in mature spruce/fir forests. Fire or insect killed trees are major food sources, and support local increases in woodpecker numbers 3-5 years after disturbance. Snags at least 12 inches dbh (diameter at breast height) and 15 feet in height are required for the three-toad woodpecker's excavated cavities. In Utah, they nest and winter in coniferous forests, generally above 8,000 ft. elevation, and they stay on their territories year-round (Parrish et al. 2002).

Three-toed woodpecker populations generally fluctuate in an area based on the abundance of their primary prey: the bark beetle. Three-toed woodpeckers would be expected to follow the beetles as they move to new areas and are likely to occur in or near the project area.

3.4.1.3 Management Indicator Species

Management Indicator Species (MIS) are species identified at the Forest planning level that could indicate changes in Forest habitats resulting from management actions. The potential impacts to these species resulting from management actions are analyzed at the project level.

Table 5 lists wildlife species identified as Management Indicator Species (MIS) by the Manti-La Sal National Forest (MLNF) that could occur on the Manti Division of the MLNF.

Table 3-3. Management Indicator Species that could occur on the Manti Division of the Manti-La Sal National Forest.

Species Common name (*Scientific name*)	Species/Habitat Associations	Consideration of this Species
Rocky Mountain Elk *Cervus canadensis*	Elk tend to occupy the higher elevation aspen and mixed conifer habitats from spring through early fall, and move to lower elevation mixed shrub, pinyon/juniper, and sagebrush habitats for winter.	**Considered.** Elk are known to use the permit area.
Mule Deer *Odocoilus hemionus*	Mule deer use most of the habitat types surrounding the permit area. Lower elevation pinyon/juniper and sagebrush habitats provide suitable winter range. Most mule deer winter range is located at the	**Considered.** Mule deer are found in and around the proposed

	edge of National Forest system lands on BLM managed land. Deer populations in this area exhibit seasonal movement (elevational migration) in response to snow cover.	project area.
Northern Goshawk ***Accipiter gentilis***	Goshawks have been found in a variety of forest ecosystems including lodgepole pine, aspen, ponderosa pine, Douglas fir, and mixed forests throughout much of the northern hemisphere. Goshawk nest sites are usually located in dense mature forests with relatively large trees, near water, and on benches of relatively little slope (Graham et al. 1999). Closed canopies are important for protection and thermal cover, and relatively open understories are important to allow maneuverability during foraging.	**Considered.** Portions of the stands in and adjacent to the permit area provide suitable northern goshawk nesting and foraging habitat.
Golden Eagle ***Aquila chrysaetos***	Golden eagles generally inhabit mountainous or hilly terrain, but can also be found in valleys and western plains, especially during migration and winter. They generally nest on cliffs, but they also have been known to nest in trees. They hunt over open country for small mammals, snakes, birds and carrion.	**Considered.** The Utah Division of Wildlife Resources found two tended and three active Golden Eagle nests within the project area during their spring flights in 2006. There are numerous nest sites monitored yearly in the project area.
Macroinvertebrates **(**aquatic Insects**)**	Aquatic macroinvertebrates play important roles in ecosystems where they occur. Their best known role is serving as food for other organisms, especially fish, amphibians, and water birds. They are also important in other ecological processes such as the breakdown and cycling of organic matter and nutrients.	**Considered.** The proposed project could impact habitat for aquatic macroinvertebrates.

The northern goshawk is not discussed here, as they have been previously addressed as a sensitive species. See that section for more information.

Rocky Mountain Elk

Elk occurred within the mountainous regions of Utah historically. However, due to unlimited hunting, elk populations in the state diminished until 1898 when elk hunting was prohibited. Elk transplants were initiated in 1912 and are continuing today. Elk again occur within the mountainous regions of the state, and elk populations have increased dramatically over the last 20 years. They are once again considered a big game species in Utah.

Elk habitat includes semi-open forest and mountain meadows in the summer. They move to foothills, plains and valleys in winter. Rocky Mountain elk use uneven-aged, mature forest stands that include old growth characteristics, herbaceous openings, and water. Dense brush understory is used for escape and thermal cover. They are herbivorous, and feed in riparian areas, meadows, and on herbaceous and brush stages of forest habitats. They graze and browse, eating grasses, forbs, tender twigs, and leaves of shrubs and trees, fungi, some mast, and aquatic vegetation.

A number of studies have shown that elk use has declined in areas adjacent to roads. The width of the area avoided has varied from 0.25 to 1.8 miles, depending on the amount and kind of traffic, quality of road, and density of cover adjacent to the road (Thomas and Toweill 1982). An oil/gas field development study has shown that wintering elk move at least 0.5 mile from activities unless a physiographic barrier shields them from the disturbance (USDA 1992).

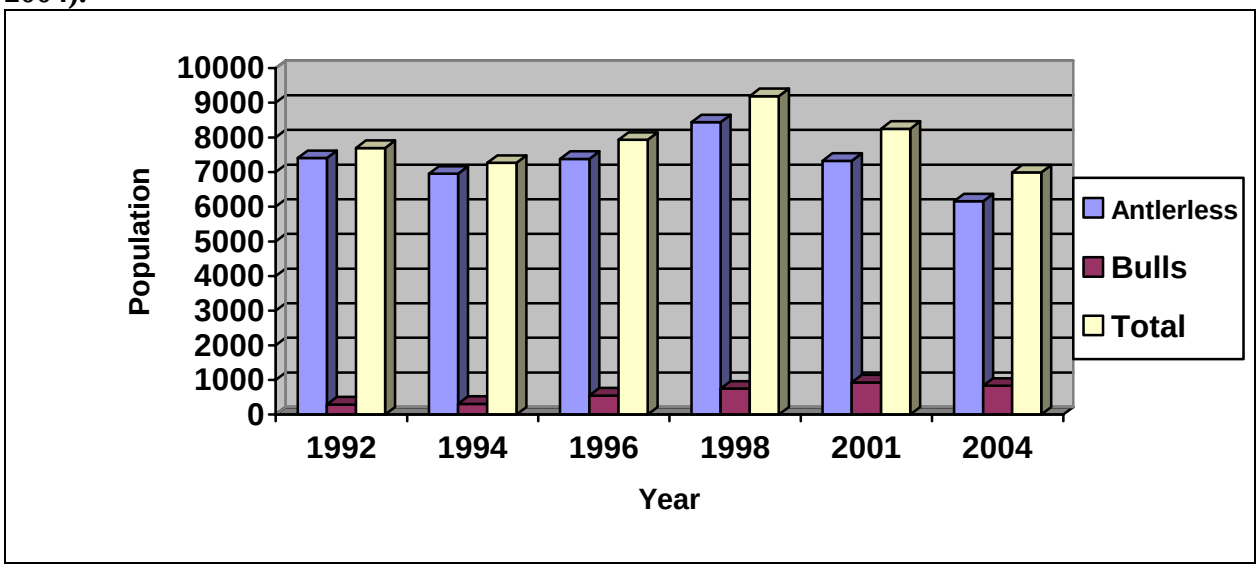
Calving takes place during late spring and early summer in areas that provide dense cover with brushy vegetation near openings, available water, and seclusion from human impacts.

On the Wasatch Plateau, elk tend to occupy the higher elevation aspen and mixed conifer habitats from spring through early fall, and then move to lower elevation mixed shrub, pinyon/juniper, and sagebrush habitats for winter range. Elk generally occupy winter range from the beginning of December through mid-April, but this varies depending on the severity of the winter. On the Plateau, parturition (calving) takes place roughly from the first part of May through early July, generally in aspen dominated habitat. Protection of winter range and calving habitat is considered a key factor in the maintenance of elk populations. It is important that higher nutritional demands during calving be met to improve the chances of calving success, cow recovery, and early calf growth. Therefore, available forage within calving habitat is especially important. Available forage within winter range is also important to increase chances of survival during this harsh season.

The project area lies within the range of the Manti elk unit 12. The southeastern part of the project area provides winter range, while the northwestern part is summer range.

The elk population (composition and size) on the Manti-La Sal NF, for the most part, depends on the number and type of tags (Bull, Cow or Spike) issued by the Utah Division of Wildlife Resources (UDWR) each year, and on weather cycles and patterns. Graph 2 illustrates the results of UDWRs Manti Elk Census from 1992 through 2004. The elk population for the Manti Elk herd in 2004 was slightly below the average population count for the 12 years of population information.

Graph 3-2. The elk population (composition and size) from 1992 through 2004 within the Manti Elk Census unit (UDWR 2004).



Mule Deer

Mule deer occur throughout the mountains and valleys of Utah. Their populations throughout Utah have historically fluctuated, periodically affected by drought and severe winter weather. Populations in Utah declined in the early to mid 1990s, but showed signs of recovery in the late 1990s. The decline was attributed to severe drought conditions from 1988 through 1992, which was followed by a severe winter in 1992-93. Other factors contributing to fluctuating mule deer populations include predators, habitat changes, and competition with elk.

Mule deer occupy several habitat types throughout the west including coniferous forests, desert shrubs, chaparral, and grassland with shrubs; they occur in early to intermediate successional stages of most forest, woodland, and brush habitats. Mule deer prefer a mosaic of various aged vegetation that provides woody cover, meadow and shrubby openings, and free water. Vegetation cover is critical for thermal regulation in winter and summer, and to provide escape cover. They browse and graze, and prefer tender new growth of various shrubs, many forbs, and a few grasses.

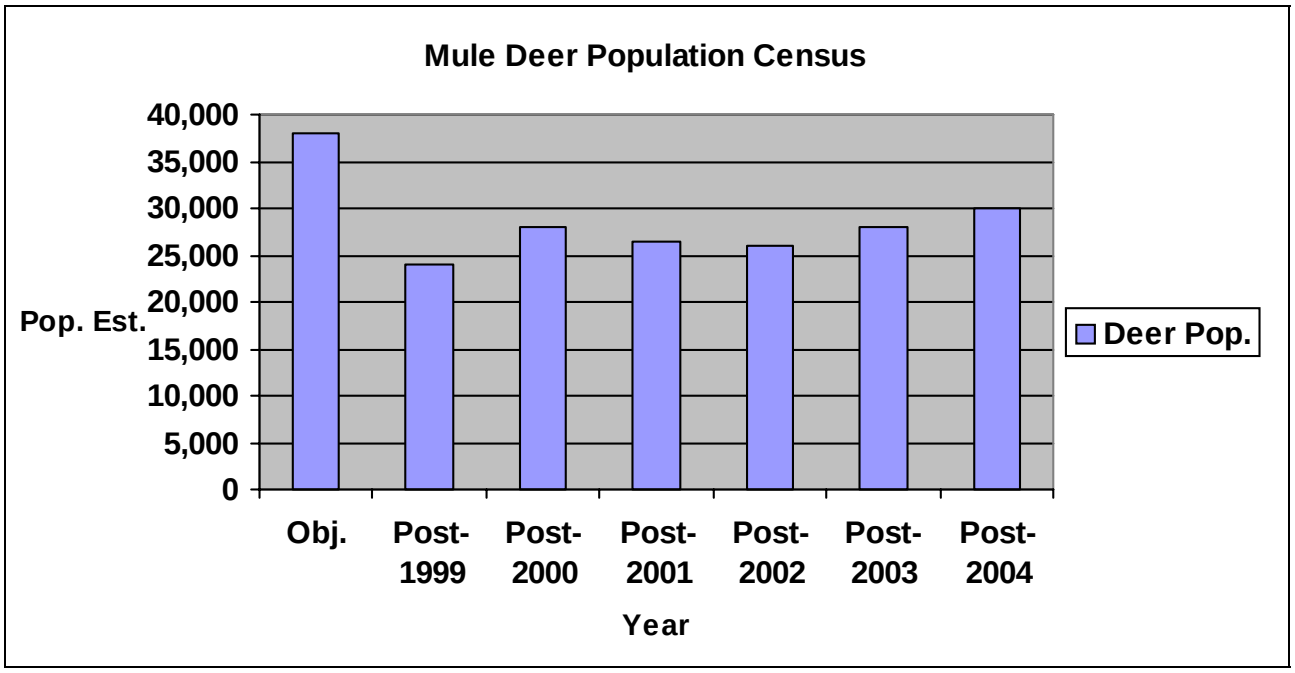
Human activity and traffic on roads are known to displace deer from the area of disturbance. The distance deer move away from disturbance areas depends on topographical features and the amount of vegetation cover in the area, but the average distance is approximately 660 feet.

Rutting season occurs in late fall through early winter. Gestation is between 195 and 212 days, and fawns are born from early April to mid-summer, with some geographic variation. Fawning peaks generally occur from late April through mid-June. Fawning occurs in moderately dense shrublands and forests, dense herbaceous stands, and high elevation riparian and mountain shrub habitats that have available water and abundant forage.

The project area lies within the range of Herd Unit 34. The southeastern part of the project area provides winter range, while the northwestern part is summer range.

Graph 3 illustrates the results of UDWRs Manti deer population estimates from 1999 through 2004. There is an upward trend in the deer population on the Manti over the 5 years of population information.

Graph 3-3. Estimate of the deer population on the Manti Division of the Manti-La Sal National Forest from 1999 through 2004.



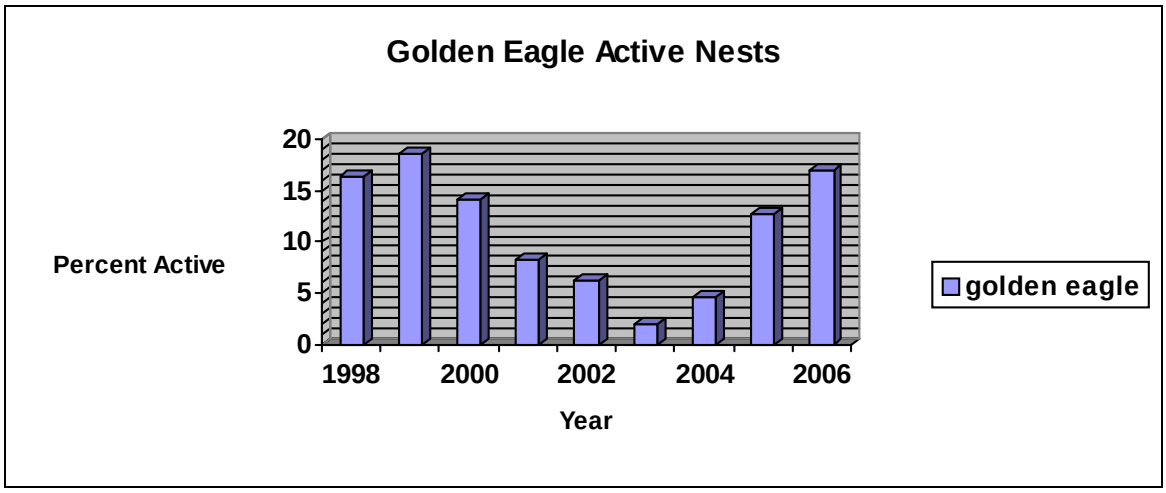
Golden Eagle

Golden eagles usually nest on cliffs overlooking large open expanses of grass-shrub or shrub steppe habitat, but tree nesting occurs in portions of their breeding range, including Utah. Nesting and brooding season generally extends from mid February to mid July. There is extensive cliff habitat along the eastern margin of the Wasatch Plateau and in canyons incising the Plateau. There are also extensive grassland and mountain brush habitats for foraging. Golden eagles primarily prey on small mammals including ground squirrels, prairie dogs, jack rabbits and cottontails.

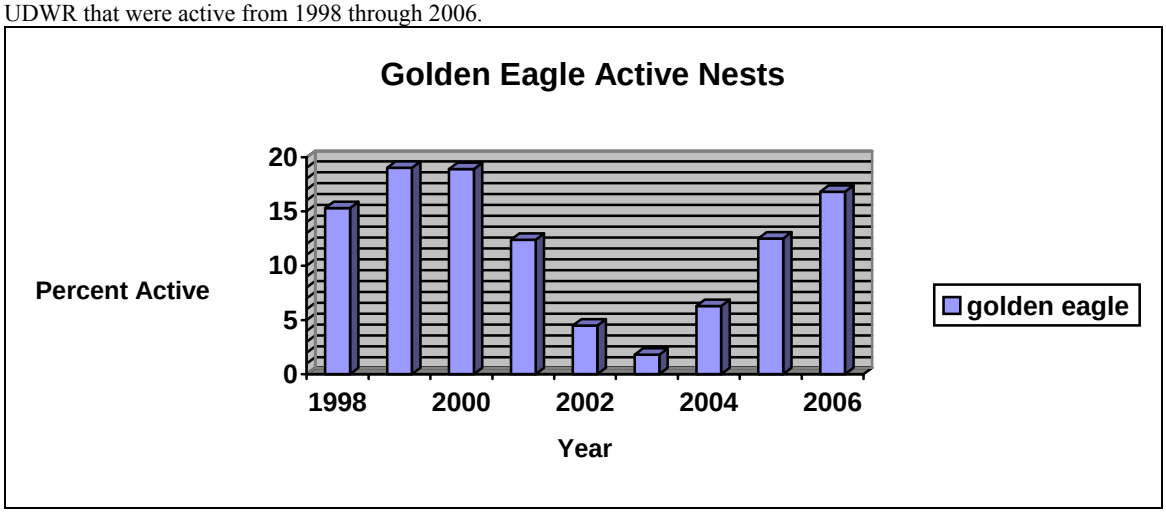
Preferred golden eagle prey habitat includes edge along high mountain brush habitat, high/mid elevation perennial forb habitat, and high elevation perennial grassland habitat. Preferred golden eagle winter habitat includes large expanses of sagebrush.

There are a number of golden eagle nest sites located on lands managed by the Manti-La Sal NF (MLSNF). The MLSNF Land and Resources Management Plan (LRMP) stipulates that golden eagle nest sites should be monitored every 5 years; however nests on the MLSNF have been monitored annually since 1998. The number of known golden eagle nests on the forest has increased over the years as new nests are found. Therefore, looking at the number of known active nests each year would not give an accurate impression of changes in the golden eagle population on the forest. A better indication of golden eagle population change on the Forest would be the percent of monitored nest sites that were active each year, which is illustrated in Graph 4.

Graph 3-4. The percent of monitored golden eagle nest sites on the Manti division of the Manti-Lasal that were active from 1998 through 2006.



Graph 3-5. The percent of monitored golden eagle nest sites on and off the Forest which were monitored by the UDWR that were active from 1998 through 2006.



The average percent of active golden eagle nests over the 7 years of surveys is approximately 11.2%. Nesting activity was well above average in 1998, 1999 and 2000, and well below average in 2002, 2003 and 2004; nesting activity was extremely low in 2003, but has rebounded somewhat in 2004. Graph 4 denotes a sine wave that could be an indication of normal golden eagle nesting activity on the MLSNF; however the variation in active golden eagle nests over the survey period has stimulated "further evaluation" by the forest.

Further evaluation of the fluctuation in nesting activity of the golden eagle population on the forest is summarized as follows:

- There has not been a dramatic change in management activity within golden eagle habitat (nesting or foraging) over the 7 year survey period that would account for the fluctuation in golden eagle nesting activity; the variation in nesting activity during the survey period is not attributed to land management activity on the forest.

- Nesting activity on the forest is believed to be linked to variation in annual precipitation and resulting fluctuation in prey base. During the years with low numbers of active golden eagle nests, prey species such as jackrabbits, cottontails, and prairie dogs also showed a decline in numbers, and drought played a significant role (Colt pers. comm. 2004).

- The percent of active golden eagle nests has been higher on the Manti-La Sal National Forest than off the forest at lower elevations. Given the fact that higher elevations have received more moisture than lower elevations, this difference in nesting activity also appears to be related to the drought and reduced prey base (Colt pers. comm. 2004).

The US Fish and Wildlife Service, in cooperation with the Utah Division of Wildlife Resources (UDWR), conducted extensive helicopter surveys in 1981 and 1982 to locate golden eagles as part of a study over a larger area, but which included the project area (Bates and Moretti, 1994). Beginning in 1986 several mining companies (including the company mining in the project area) were required to monitor territories. Monitoring is normally done by contracting a helicopter and the UDWR conducts the surveys. In 1990 the UDWR began monitoring additional territories. Rabbit populations were also monitored to determine prey base trends during 1986-91. High rabbit populations seemed to influence golden eagle nesting in two ways; more eaglets were produce in years with high rabbit populations and there was a lag effect on number of eagles that attempted to nest (Bates and Moretti, 1994).

The Coop monitoring has been done in 1981, 1982, 1986, 1987, 1990, 1991, 1996 and 1998 to 2006. There are approximately 41 golden eagle nest sites that are monitored in or near the project area (Table 9). In 2006 there were 2 tended nests, and 3 active nests (Table A-1). In 2002 and 2005 none of these were active. In 2001, 2003, and 2004 one nest site was active or tended (all at one site on BLM east of Fish Creek). In any given year, any of these sites could be occupied.

Macroinvertebrates

The 1986 Forest Plan's monitoring and evaluation program includes aquatic macro-invertebrates as a management indicator species and calls for monitoring at baseline stations or as needed for select project activities (page IV-6). Most of the baseline stations are at or near the Forest boundary. The Forest Plan was amended in 2006 to update the protocols used to collect macro-invertebrate data and to change the method used to analyze the data. The 2006 amendment did not alter the language regarding macro-invertebrate monitoring as an optional technique for selected projects. Monitoring will continue at baseline stations to characterize Forest-wide conditions; data analysis will be in cooperation with the Utah Division of Water Quality.

36 CFR 219.14(f) states that site-specific monitoring [for management indicator species] or surveying of a proposed project or activity area is not required, but may be conducted

at the discretion of the Responsible Official. The Forest Plan, as amended, is consistent with this direction.

No site-specific surveys of aquatic macro-invertebrates have been conducted and no site-specific monitoring is proposed for this project.

3.4.1.4 Migratory Birds

Federal agencies have an obligation for the conservation of migratory birds and their habitats. The Migratory Bird Treaty Act, and Executive Order 13186 ensure that environmental analyses of Federal actions required by the NEPA or other established environmental review processes evaluate the effects of actions on migratory birds, with emphasis on species of concern.

The Utah Partners in Flight Avian Conservation Strategy identifies 20 non-game migratory land birds as priority species (Parrish et. al. 2002). Ten of these species could be expected to occur on the Ferron/Price Ranger District of the Manti-La Sal National Forest. Table 6 lists these species, their habitat associations, and their consideration in the document.

Table 3-4. Neotropical migratory birds (NTMBs) listed as priority species by the Utah Partners in Flight Avian Conservation Strategy that could occur on the Manti Division of the Manti-La Sal National Forest.

Common name (*Scientific name*)	Species/Habitat Associations	Consideration of this species
Virginia's Warbler (*Vermivora virginae*)	Preferred breeding habitat includes chaparral and open stands of pinyon/juniper, ponderosa pine and scrub oak, mountain mahogany thickets or other low brushy habitats on dry mountainsides. In Utah, the primary breeding habitat is oak, and secondary breeding habitat is pinyon/juniper at elevations ranging from 4,000 to 10,000 ft. (Parrish et al. 2002).	**Not Considered.** Virginia's warblers are known to nest on the Manti La-Sal NF, and the proposed project would not affect suitable nesting habitat for this species.
Gray Vireo (*Vireo vicinior*)	Preferred breeding habitat is on arid slopes dominated by mature pinyon/juniper woodlands. This species commonly occurs in suitable habitats in Colorado, Nevada and Arizona at elevations ranging from 3,200 ft. to 6,800 ft., and they are known to nest southwest Utah north to Sevier County.	**Not Considered.** The proposed project project would not affect suitable nesting habitat for this species.
Black Rosy-Finch (*Leucosticte atrata*)	Breeds above timberline in Alpine tundra using barren, rocky or grassy areas and cliffs among glaciers or at bases of snow fields. In Utah, the largest breeding populations occur in alpine habitats in the Wasatch and Uinta Mountains. They have been known to occur at 11,000 ft. elevation.	**Not Considered.** The proposed project area does not provide suitable nesting habitat for the black rosy-finch.
Brewer's Sparrow (*Spizella breweri breweri*)	Breeding habitat is primarily shrubsteppe, but may also breed in high desert scrub (greasewood) habitats. Breeding habitats are usually dominated by big sagebrush (Parrish et al. 2002).	**Not Considered.** The proposed project area does have long, linear areas of mountain sagebrush at the higher elevations, but lacks large tracts of habitat and does not provide the habitat characteristics that would meet the needs of this species. The proposed project would not affect sagebrush habitats.
Black Swift (*Cypseloides niger*)	Black swifts nest in small colonies near and often behind waterfalls at elevations ranging from 6,000 ft. to 11,500 ft (Parrish et al. 2002). There are only 2 confirmed breeding locations in Utah: the Bridal Veil Falls area and Aspen Grove area (Parrish et al. 2002).	**Not Considered.** The proposed project area does not provide suitable nesting habitat for the black swift.

Broad-tailed Hummingbird (*Selasphorus platycercus*)	In Utah, the primary breeding habitat is lowland riparian; They have also been recorded as breeding in mountain riparian, aspen, ponderosa pine, Engelmann spruce, subalpine fir, and Douglas fir (Parrish et al. 2002). Nesting typically occurs at elevations ranging from 6,000 to 8,000 ft. near streamside habitat.	**Considered.** The project is not expected to affect upland vegetation and therefore would not affect suitable nesting habitat for this species.
Ferruginous Hawk (*Buteo regalis*)	Usually breeds in areas of flat and rolling terrain in grassland or shrub steppe habitat. Avoids high elevations, forest and narrow canyons. Occurs in grasslands, agricultural lands, sagebrush/saltbrush/ greasewood shrub lands and the periphery of pinyon/juniper habitats.	**Not Considered.** The proposed project area does not provide suitable nesting habitat for the ferruginous hawk, and the project is above the elevation range of this species.
Yellow-billed Cuckoo (*Coccyzus americanus*)	In Utah, the yellow-billed cuckoo is a rare breeder in large tracts (100-200 acres) of contiguous dense lowland riparian habitats. Over the last 10 years, there are only 3 breeding records in the state; none on the Manti Division of the Manti-La Sal NF (Parrish et al. 2002).	**Not Considered.** The proposed project is above the elevation range of this species, and there are no large tracts of dense riparian habitat in the project area.
Black-throated Gray Warbler (*Dendroica nigrescens*)	Preferred breeding habitat includes dry oak slopes, pinyon, juniper, pinyon/juniper woodlands, open mixed woods, and dry coniferous and mixed conifer habitats with brushy understories, and in chapparal. It occurs from sea level up to 5400 ft. elevation.	**Not Considered.** The proposed project is above the elevation range of the black-throated gray warbler.
Sage Sparrow (*Amphispiza belli nevadensis*)	Uncommon permanent resident in Utah; occurs up to 8,000 ft. elevation. Nests have been found in rabbitbrush, hopsage, saltbush, and big sage.	**Not Considered.** The proposed project area does have long, linear areas of mountain sagebrush at the higher elevations, but lacks large tracts of habitat and does not provide the habitat characteristics that would meet the needs of this species. The proposed project would not affect sagebrush habitats.

Broad-tailed hummingbird

In Utah, the primary breeding habitat is lowland riparian; they have also been recorded as breeding in mountain riparian, aspen, ponderosa pine, Engelmann spruce, subalpine fir, and Douglas-fir (Parrish et al, 2002). Nesting typically occurs at elevations ranging from 6,000 to 8,000 feet near streamside habitat. Streamside vegetation and vegetation around seeps and springs in the project area provide suitable nesting habitat.

3.4.2 Environmental Consequences

3.4.2.1 Alternative 1 – No Action

The Forest Service would not consent to the mining plan modification, so there would be no change from existing conditions.

3.4.2.2 Alternative 2 – Consent to the Mining Plan Modification as Proposed

Under Alternative 2, the Forest Service would consent to the mining plan modification as proposed. Mining as proposed would not impact threatened or endangered wildlife species or their habitat. There is potential for impacts to golden eagles, which are a sensitive species.

Golden eagles are impacted by coal truck traffic. A fully-loaded coal truck is not easily slowed or maneuvered to avoid deer and elk, so there is an increase in road-kills along the highways used for coal transport. Golden eagles feeding on the carrion are then exposed to the traffic. During the 2-year period from December, 2004 through November, 2006, 12 golden eagles were killed in Carbon and Emery counties by all vehicle types. The additional 2 million tons of coal produced annually from the Bear Canyon Mine would be approximately 50,000 truckloads per year, or approximately 139 trucks per day assuming hauling 7 days per week. This would be an increase of approximately 7.6% in overall truck traffic, based on a total production in the area of approximately 26.2 million tons of coal produced in 2006.

There is also potential for several golden eagle nests may be impacted by mining-induced escarpment failure. The operator has committed to either schedule mining that may impact nests to times other than the nesting period or screening the nests to precluded use. They would also obtain a "take" permit from the USFWS.

Mining-related impacts to streams could affect macroinvertebrate populations. The operator would be required to replace water in quality and quantity, so losses of macroinvertebrates would be short-term.

The only priority migratory bird species that might be affected is the broad-tailed hummingbird, which uses riparian areas for nesting

3.4.2.3 Alternative 3 – Consent to the Mining Plan Modification with Supplemental FS Mitigatations

No change from Alternative 2.

3.4.3 Direct and Indirect Effects

3.4.3.1 Alternative 1 – No Action

The Forest Service would not consent to the mining plan modification, so there would be no mining in the proposed permit expansion area, resulting in no direct effects. There would be no change from the current activities taking place in the study area, so there would be no indirect impacts to wildlife.

3.4.3.2 Alternative 2 – Consent to the Mining Plan Modification as Proposed

There would be no direct impacts to wildlife, but there could be indirect impacts.

The only threatened or endangered species with any potential to be impacted by the proposed mining plan modification is the bald eagle. Because of the distance from the project area to the nest territory is approximately 20 miles, there would be no effects to nesting bald eagles. There are no landscape characteristics in the proposed project that

would attract bald eagles to the area; the project area is not known or expected to be used by nesting, wintering or foraging bald eagles. The proposed actions would not impact bald eagle nesting, foraging or wintering habitat that may be available in Huntington Canyon. Therefore, the proposed project would not likely directly or indirectly affect the bald eagle.

Several sensitive species are found in the area.

1. If there was a failure of escarpments or rock faces that provided roosting habitat for spotted bats there could be a loss of roosting habitat. It is expected that individuals would likely be able to fly away; however if it failed during the day while a bat was roosting there could be mortality of individuals. Approximately 34% of the escarpment on NFS lands has the potential to fail (see Table 7). Further refinement of this analysis shows that only 6 cells have a high instability rating and 5 have a moderate instability rating (see Plate 5-3A of the Co-Op submittal).

2. The project area does not contain any known caves. But there may be suitable inactive mines or unoccupied buildings, therefore the project area may provide suitable roosting habitat for this species. Current mine operators have heard rumors of an old mine opening in the Fish Creek drainage, and have searched for it (M. Reynolds, pers. comm., 6/27/06). It has not been found, and if there was one, it may have collapsed. There are no plans for any of the mining to access the surface within the project area. Old mine workings in the Hiawatha seam are flooded and portals have water flowing out (M. Reynolds, pers. comm.. 11/14/2006) and would not provide suitable habitat. Once mining begins in the Hiawatha seam, water would need to be removed for safety. This would open up new areas of potential habitat, but due to the disturbance associated with mining it would not be suitable. Once operations were completed, it is assumed that the mine would begin to fill with water again, eliminating it as potential for habitat. However, there may be a short time period (a few years?) when it might provide suitable roosting habitat (after mining has stopped and before filled with water).

3. It is expected that due to the more flexible nature of the soils, the more gradual subsidence in this zone, and the lack of noticeable effects to upland vegetation in previously mined areas, that there would be no effects to upland vegetation from subsidence. With this said previous mining on the Ferron Price Ranger District has caused the loss of surface water. This loss of surface water could effect the availability of prey species within the analysis area.

   Subsidence as a result of mining could result in a loss of water in streams, seeps or ponds as well as surface water loss in the area, reducing habitat for prey species for the goshawk. However, based on review of depth of overburden, it does not appear that loss of water in perennial drainages is likely. Goshawk prey includes a wide variety of small mammals and birds, including rabbits, squirrels, chipmunks, grouse, woodpeckers, jays and robins. Therefore, the proposed project may

impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species".

4. Peregrine falcon's average foraging distance from the eyrie extends out to 10 miles, with 80 percent of peregrine falcon foraging occurring within a mile of the nest, and they have been known to forage up to 18 miles from their nest site (Spahr et al. 1991). The nearest peregrine falcon nest is located approximately 10 miles from the project area, and project activity would not occur on the surface in the project area and there would be no effects to potential foraging habitat.

   Peregrine falcons nest on cliff faces with ledges. Portions of the Castlegate sandstone escarpment may provide suitable nesting habitat. However, raptor nest surveys done within the project area have found only golden eagles, ravens, prairie falcons and red-tailed hawks using the escarpment. In Colorado, they have been found to use abandoned nests of golden eagles and ravens (CDOW 2004). In the Colorado study, they found that peregrines may be displaced by golden eagles, and golden eagles were noted as significant predators of nestlings. Due to the golden eagle nesting activity in the area, the potential for use by peregrines is lowered, even though there is suitable habitat. Loss of nests (eggs or young) is not expected.

   As discussed in the golden eagle analysis, habitat could be affected by escarpment failure, but is expected to be present again after failure.

5. It is expected that due to the more flexible nature of the soils, the more gradual subsidence, and the lack of noticeable effects to upland vegetation in previously mined areas, that there would be no effects to upland vegetation from subsidence. Potential nesting and foraging habitat would not be affected. Therefore, the proposed project would not likely appreciably directly or indirectly impact the flammulated owl or its habitat.

6. It is expected that due to the more flexible nature of the soils, the more gradual subsidence, and the lack of noticeable effects to upland vegetation in previously mined areas, that there would be no effects to upland vegetation from subsidence. There would be no above ground project-related activities, and any subsidence that could occur should not affect nesting habitat or foraging habitat (beetles). Therefore, the proposed project would not likely appreciably directly or indirectly impact the three-toed woodpecker.

The five management indicator species on the MLNF, and the potential impacts to the species due to the proposed mining plan modification, are:

1. Potential impacts to deer and elk are likely to be similar, therefore analysis of effects for these two species are lumped together. It is expected that due to the more flexible nature of the soils, the more gradual subsidence in this zone, and the lack of noticeable effects to upland vegetation in previously mined areas, that

there would be no effects to upland vegetation from subsidence. The proposed project would not remove cover or foraging habitat, and would not adversely impact other habitat characteristics for these species. Therefore potential direct impacts to deer and elk are not expected to be appreciable.

Indirect effects as a result of mining would be the effects of subsidence and potential loss of water in streams, seeps or ponds. These features are especially important during the calving and fawning and nursery periods for these species. Loss of water would reduce succulence of adjacent plants and could result in displacement out of that area. However, based on analysis of the depth of overburden, loss of perennial streams is not likely. Concerns over the Left Fork of Fish Creek have led to modification of the mine plan. The longwall panel has been narrowed down to protect the Left Fork and there is no full extraction under this reach.

Subsidence of escarpments would cause rock fall; these rock fields may affect ability to move through small localized areas, depending on the amount and location of rock. Canyons that incise the plateau (eg. Fish Creek and Chris Otteson Hollow) are migration routes from Gentry Mountain to the lower winter range areas. The rubble may cause deer or elk to go around these areas, but should not prevent use of the canyons for migration.

2. Bates and Moretti (1994) concluded that data on mining impacts caused by cliff failure were too few to draw many conclusions. However, when ample suitable habitat is nearby, there appeared to be no net loss in golden eagle production. They offered several recommendations; 1) if failure can be controlled, it should be done during the non-nesting season; and 2) physically fencing old nest locations may help prevent loss of nestlings.

   Subsidence/failure will usually occur within a few weeks of mining. Theoretically, a timing mitigation could be used to ensure that failure occurred outside of the nesting season (January 1st to August 31st). However, in reality mining of a longwall panel can't be stopped once it has started (shields can't be removed due to increasing ceiling pressures) and the ability to predict duration of mining of a longwall panel prior to starting is imprecise due to variations in coal deposits and resultant effects on mining.

   Fencing of old nest locations could prevent eagles from nesting on the old nest locations, but they could use adjacent unfenced areas that could be affected by escarpment failure. When nest locations in Newberry Canyon were fenced, the pair nested in other adjacent unfenced areas. It would be physically impossible to fence the whole length of escarpment, and eagles could still establish nests on the fencing.

   An Interagency group (The Buffer Team) will be looking at this project and site-specific risk analysis and mitigations for nests that might be lost. They will also

evaluate the use of a Colorado Department of Transportation model to determine if rubble from the Castlegate sandstone escarpment would be likely to affect nests on the lower Star Point escarpment. Because of the development of the nest-specific mitigation plans, the potential for loss of nests or young is low (see above).

3. There is one known northern goshawk population within the mine plan modification area. As described above, nothing in the proposed action should impact the goshawk population.

4. There are not expected to be effects to any perennial stream as discussed, so there would be no effects to macroinvertebrates.

Of the 20 non-game priority migratory bird species identified by the Utah Partners in Flight Avian Conservation Strategy, 11 could be expected to occur on the Ferron/Price Ranger District of the MLNF. The only species that might be impacted is the broad-tailed hummingbird, due to their use of breeding habitat types (riparian and forest) found in the mining plan modification area. Riparian shrubs would continue to provide nesting habitat, while flowering plants and insects in the riparian habitats would continue to provide foraging habitat.

3.4.3.3 Alternative 3 – Consent to the Mining Plan Modification with Supplemental FS Mitigations

No change from Alternative 2.

3.4.4 Cumulative Effects

The cumulative effects to wildlife in the vicinity of the mining plan modification area consist of the residual effects from past actions, current effects from present actions, and anticipated effects from reasonably foreseeable future actions.

Past activities in the area include coal mining (late 1800's to present), coal exploration (1990's), and small timber sales (1960's). The residual effects of the coal mining and coal exploration are limited to small areas of disturbance associated with portals and roads. The timber sale areas have been successfully regenerated and reforested.

Present actions include coal mining in the permitted area of the Bear Canyon Mine (1885 to present) and recreation. The impacts include approximately 40 acres of surface disturbance to vegetation for mine facilities and some short-term subsidence effects. Recreation impacts include dispersed camping and both legal and illegal ATV usage.

Future actions include development of the Bear Canyon Mine (2007 to 2017), and fuels reduction burning in Nuck Woodward and Tie Fork Canyons (2010 to 2014). The anticipated effects of development of the Bear Canyon Mine are the subject of this

environmental assessment. The fuels reduction burning should reduce build up in beetle-killed conifer stands.

Although the residual, current, and anticipated effects to wildlife have or could change the nature of the available habitats, the lands are in functioning condition and are meeting the land use plan goals for the area. The potential for changes in distribution and availability of water that could occur due to mining would likely have the greatest impact on wildlife due to the limited water availability in the upland areas. These losses would be expected to be short-term and would be similar to natural variation in water availability during droughts, annual variation in snowpack, and evapotranspiration.

The following cumulative effects discussions apply to individual species:

1. *Bald Eagle:* Since the proposed project would not likely directly or indirectly affect the bald eagle or its habitat, no cumulative effects would accrue to this species as a result of the Bear Canyon Mining Plan. The determination for this species is "no affect".
2. *Spotted bat:* The cumulative effects analysis area for spotted bats is the escarpments in Mill Fork, Rilda Canyon, and Deer Creek. Other mining activity to the west of the project area in the cumulative effects analysis area may impact areas of escarpment (potential roosting habitat). Potential effects would be the same as for this project; there is some risk of mortality to individuals from escarptment failure during day light hours while bats are at the roost. As escarptment failure occurs new nesting habitat is also created. The determination for the spotted bat is "may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species".
3. *Townsend's big-eared bat:* The cumulative effects analysis area is the portals and or open shafts in Mill Fork, Rilda Canyon, and Deer Creek Canyon .All of the planned mining would be accessed from portals outside of the project area. With the mining activity within the existing portals there is no known suitable habitat for Townsends's big-eared bats. The determination for the Townsend's big-eared bat is no impact.
4. *Northern Goshawk:* The proposed project may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species".
5. *Peregrine Falcon:* The cumulative effects analysis area is the escarpments in Mill Fork, Rilda,and Deer Creek Canyons. Mining activity to the west in the cumulative effects analysis area may impact areas of escarpment (potential nesting habitat). Potential effects would be the same as for this project; there is some potential for habitat alteration due to escarpment failure in these other areas. These areas are not currently occupied; and habitat suitability over the long-term would not be affected. The determination for the peregrine falcon is "may impact individuals or

habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species".

6. *Flammulated Owl:* The proposed project would not likely directly or indirectly impact the flammulated owl or its habitat; therefore, the proposed project would not add an appreciable incremental impact to cumulative impacts of other activities in the area. The determination for flammulated owls is "no impact".
7. *Three-toed Woodpecker:* Since the proposed project would not likely exert appreciable direct or indirect impacts on the three-toed woodpecker, no measurable cumulative affects would accrue to this species as a result of the Bear Canyon Mining Plan. The determination for this species is "no impact".
8. *Rocky Mountain Elk and Mule Deer:* Since the proposed project would not likely exert measurable direct or indirect affects on deer or elk, no measurable cumulative affects would accrue to these species as a result of the Bear Canyon Mining Plan.
9. *Golden Eagle:* Table 9 of the Wildlife Resources Report shows the number of potential nest locations affected by escarpment failure; all are on NFS lands and none are on adjacent private or BLM lands. BLM nest number 945 has been the most consistently used nest (Table A-1). This nest is over a mile away from any subsidence, and would not be affected.

   Other mining activity to the west of the project area (eg. Mill Fork, Rilda Canyon, Deer Creek) may impact areas of escarpment (potential nesting habitat).

   Mining would result in more vehicle traffic in Huntington Canyon. Deer move down to the lower elevations in the winter where they are vulnerable to vehicle traffic on Highway 29. Road-killed deer then attract golden eagles. According to information gathered by UDWR, the documented mortality or injury of golden eagles in the coal haul area, from 2004 to 2006 (3 seasons) was 19 golden eagles. Not all of these are due to collisions with coal haul trucks, but it does contribute to the roadkill of deer which draws golden eagles to scavenge.

   One of the potential mitigations that will be addressed by the Buffer Team is to have drivers report road-killed deer, so that they can moved a safe distance off of the highway, so that eagles don't get hit when flying off of the deer.

   The golden eagle prey base (small mammals) would not be affected by subsidence of upland or riparian habitats.

10. *Macroinvertebrates:* Because there would be no direct or indirect effects, there are no cumulative effects.

11. *Broad-tailed Hummingbird:* Because there would be no direct or indirect effects, there are no cumulative effects.

3.4.5 Irreversible/Irretrievable Commitment of Resources

Escarpment failure that destroys raptor nesting habitat would represent the only irretrievable commitment of wildlife habitat. However, as a section of escarpment fails, the newly formed escarpment could provide new nesting habitat.

3.5 VEGETATION AND RANGE

3.5.1 Affected Environment

The general vegetation types in the mining plan modification area are shown on Map 7, Appendix A.

3.5.1.1 Threatened and Endangered Plant Species

Endangered species are species that have been identified, and listed in the Federal Register, by the U.S. Fish and Wildlife Service (Service) as being in danger of extinction throughout all or a significant portion of its range. Threatened species are species that have been identified, and listed in the Federal Register as likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Table 1 lists plant species designated as threatened and endangered (T&E) by the U.S. Fish and Wildlife Service (Service) that could occur in Emery County, Utah. There are no proposed (P) or candidate (C) plant species identified for Emery County. The table also describes habitats occupied by the threatened and endangered plants, the general distribution of their habitats, and whether or not the species will be considered further in this BE/BA. Habitat descriptions and distributions were obtained from Welsh et al. (1987) and Atwood et al. (1991). T&E plant species and habitat presence in the project area was determined through field visits, existing data, elevations, microclimate, and plant community composition.

Table 1. **Federally listed plant species that could occur in Emery County, Utah and site-specific occurrence of their habitat within the project area.**

SPECIES	SPECIES STATUS	HABITAT DESCRIPTION & DISTRIBUTION IN EMERY COUNTY	HABITAT PRESENT IN PROJECT AREA?
Barneby Reed-mustard *Schoenocrambe barnebyi*	**Endangered**	***Schoenocrambe barnebyi* occurs in *Eriogonum* and ephedra communities on mixed shadscale soils of the Chinle Formation, 5600' – 5700'; South-central Emery County (off-Forest).**	**No**
Jones Cycladenia *Cycladenia humilis var. jonesii*	**Threatened**	***Cycladenia humilis var. jonesii* occurs in gypsiferous saline soils on the Chinle, Cutler, and Summerville Formations in cool desert shrub and juniper communities, 4400' – 6000'; Central Emery County (off-Forest).**	**No**
Last Chance Townsendia *Townsendia aprica*	**Threatened**	***Townsendia aprica* occurs in salt desert shrub and pinyon-juniper communities on clay or clay silt of the Arapien and Mancos Shale Formations, 5100' – 8000'; Southeastern Emery County (off-Forest).**	**No**
Maguire Daisy *Erigeron maguirei*	**Threatened**	***Erigeron maguirei* occurs in cool, moist wash bottoms and dry partially shaded slopes of eroded sandstone cliffs. Wingate, Chinle, and Navajo Sandstone Formations in pinyon-juniper, mountain shrub, ponderosa pine, and Douglas-fir communities. Endemic to San Raphael Swell (off**	**No**

		Forest).	
San Raphael Cactus ***Pediocactus despainii***	**Endangered**	***Pediocactus despainii* occurs open pinyon-juniper community on limestone gravels, 6000' – 6200'; Endemic to central Emery County (off Forest).**	**No**
Wright Fishhook Cactus ***Sclerocactus wrightiae***	**Endangered**	***Sclerocactus wrightiae* occurs in salt desert shrub and juniper communities on Mancos Shale, 7800' – 6200'; Southeastern Emery County (off Forest).**	**No**

None of these plant species are likely or expected to be present in or adjacent to the project area. The determination for all of these plant species is "no effect". They will not be analyzed further.

3.5.1.2 Sensitive Plant Species

Sensitive species are species that are recognized by the Regional Forester as needing special management attention in order to prevent them from becoming threatened or endangered.

Table 2 lists sensitive plant species on the Intermountain Regional Forester's sensitive species list that could occur on the Manti Division of the Manti La-Sal National Forest (MLNF). The table also describes habitats occupied by these sensitive plants, the general distribution of these habitats, and whether or not those habitats are found within the project areas. Habitat descriptions were obtained from Welsh et al. (1987) and Spahr et al. (1991). Sensitive plant species and habitat presence in the project area was determined through field visits, existing data review, elevations, microclimate, and plant community composition.

Table 2. **Sensitive plants that could occur on the Manti Division of the Manti-La Sal National Forest (MLNF), and site-specific occurrence of their habitat within the project area.**

SPECIES	HABITAT DESCRIPTION, SPECIES OCCURRENCE IN THE PROJECT AREA AND CONSIDERATION IN THIS BE/BA
Link Trail Columbine ***Aquilegia flavescens rubicunda***	**Considered.** ***Aquilegia flavescens rubicunda*** occurs in spring seeps and perennial wet sites on east side of Wasatch Plateau. The proposed project will not directly disturb any seeps or perennial wetlands, but subsidence upstream could affect stream flow. This species was found below the proposed project area; on federally-managed lands and has also been found across the highway in Huntington Canyon.
Creutzfeldt-flower ***Cryptantha creutzfeldtii***	**Not Considered.** ***Cryptantha creutzfeldtii*** occurs in shallow, rocky, heavy clay soils; open Mancos shale slopes. It is endemic to central Utah in Carbon and Emery Counties at 5,000 to 6,500 ft. elevation. It has not been found in or adjacent to the project area. This species is not found within the project area, there would be no potential for effects to this species.
Carrington Daisy ***Erigeron carringtoniae***	**Not Considered.** ***Erigeron carringtoniae*** occurs in limestone outcrops and escarpments in subalpine vegetation type. It occurs on wind blown ridge tops and snowdrift sites at high elevations of the Wasatch Plateau (9,000 to 11,000 feet). This project does not get into subalpine habitats and this species is not likely to be present.
Canyon Sweetvetch ***Hedysarum occidentale var. canone***	**Considered.** ***Hedysarum occidentale var. canone*** is usually found on sites that have a high water table, near springs or stream beds; riparian sites within the Pinyon/Juniper vegetation type generally between 5,500 to 7,000 ft. elevation. River birch and squaw brush are the most commonly associated species. It is endemic to Duchesne, Emery and Carbon Counties. The proposed project will not directly disturb any seeps or perennial wetlands, but subsidence upstream could affect

	stream flows.
Arizona Willow ***Salix arizonica***	**Not Considered.** ***Salix arizonica*** occurs in high elevation (8,550 to 11,200 ft.) unshaded to partly shaded, wet meadows and streamsides (AWITT 1995); it is often found in sedge meadows and wet drainage ways in subalpine coniferous forests. There is only one known population found on the Forest, in Dry Wash of Muddy Creek drainage. The project area does not get up into subalpine coniferous forest (Douglas-fir and aspen/mixed conifer) and this species is not likely to be present.
Musinea groundsel ***Senecio musiniensis***	**Not Considered.** ***Senecio musiniensis*** occurs on limestone barrens and talus slopes of the southern Wasatch Plateau. There is no Flagstaff limestone in the project area (Maleki 2006). It has not been found in or adjacent to the project area. As this species is associated with upland habitats, there would be no potential for effects to this species.
Maguire Campion ***Silene petersonii***	**Not Considered.** ***Silene petersonii*** occurs at high elevations (10,000 to 11,800 ft.) on open calcareous and igneous soils derived from Flagstaff Limestone, which is not found in the project area. It has not been found in or adjacent to the project area. As this species is associated with high elevations, there would be no potential for effects to this species.

Canyon Sweetvetch

These plants are usually found on sites with a high water table, near streams or along stream beds, often in the pinyon-juniper type. River birch and squaw bush are plants most commonly associated with this species. Populations have been located from Horse Canyon, southeast of East Carbon City and around Castle Valley to Straight Canyon west of Orangeville, Utah. Populations have been found on National Forest, Bureau of Land Management (BLM), state and private lands. Populations range from a few plants to over 1,000, generally at elevations of 5,500 to 7,000 feet.

This plant has been found in Bear Creek Canyon. Surveys in 1997 found several populations in the drainage and adjacent slopes. These surveys found that the plants were concentrated near the drainage bottoms, but they were also common on the slopes above the drainages (Collins 1997). They have also been documented adjacent to the project area in Huntington Canyon, Rilda Canyon and Cedar Creek (UNHP 2006).

Link Trail Columbine

These plants are usually found near springs, seeps and perennial wet sites. Populations have been found in Link Canyon, Huntington Canyon, Muddy Creek, Box Canyon, Straight Canyon and Joes' Valley. This plant has also been documented outside of the lease boundary, to the west, across Huntington Canyon (UNHP 2006). Surveys in Bear Creek Canyon in 1997 found Link Trail columbine in the lower canyon as well as the Right Fork of Bear Creek (Collins 1997). Field surveys (6/27/06) on the Left and Right Forks of Fish Creek found what was believed to be this species present along both reaches (most of the survey reaches were on BLM and state lands below the Forest boundary).

3.5.1.2 Range

The Gentry Mountain allotment provides forage for 1440 head of cattle with a June 27 to September 30 grazing season. Fifteen livestock permittees, mostly from Huntington, Utah, graze their cattle within the permitted area. Approximately 400 head enter the allotment through Huntington Canyon (west side of allotment), while the majority enter

through Mohrland (east side of Gentry Mountain). The Chris Otteson Hollow Trail is used for trailing smaller numbers of cattle onto the allotment. Those that use Huntington Canyon graze up side canyons and along Huntington Creek to Pole Canyon where the cattle are moved to the top of Gentry Mountain. Steep side slopes in the canyon keep cattle in the bottoms and rarely do they get to the top of East Mountain.

The livestock permittees have built fences, ponds, and troughs, and developed springs, to support the livestock use on the allotment. Subsidence could impact these facilities and alter the flow in springs and seeps.

3.5.2 Environmental Consequences and Direct and Indirect Effects

3.5.2.1 Alternative 1 – No Action

Under this alternative, lands in the mining plan modification area would continue to be managed as directed by the Forest Management Plan and the Gentry Mountain Cattle and Horse Allotment Management Plan, with emphasis on increasing forage, maintaining wildlife habitat, and implementing approved range improvements. There would be no change to the vegetation or the sensitive plant species in the area. Musk thistle would continue to be a problem. The allotment would be managed for livestock with a rest rotation deferred system with the development of range improvement projects. No alteration of water supplies or the distribution of water by mining-induced subsidence would occur on the analysis area. Surface structures such as fences, troughs, pipelines, or other range improvements would not be subject to mining-induced damage. Trailing routes would not be blocked.

There would be no direct or indirect effects to vegetation and range under this alternative.

3.5.2.2 Alternative 2 – Consent to the Mining Plan Modification as Proposed

The overall lowering of the land surface due to subsidence would not affect the overall health and distribution of the terrestrial plant communities present. Fracturing could divert water from saturated areas at springs and along streams that support wetlands and riparian habitats and provide water for livestock. Sections 3.2 and 3.3 (Topography, Geology, and Subsidence and Hydrology) indicate that impacts to groundwater would be minor and occur temporarily. Based on observations of other areas mined on the Forest, natural and mining-induced features causing groundwater diversions usually fill and seal quickly with sediments, although some surface cracking has persisted and is being repaired as required by Lease Stipulation #13. Impacts to wetlands and riparian areas, should they occur, would likely be short-term and temporary.

The only known populations of Link Trail columbine or canyon sweetvetch that could be affected by the proposed action are the populations in Fish Creek and Bear Creek Canyon. Indirect effects could be from loss of riparian habitats due to subsidence, or

localized loss of plants due to escarpment failure up-slope. The escarpments are all over 1,000 feet from these drainage bottoms. Falling rocks could affect individual plants, but subsurface root systems and residual seeds in the soil would allow re-establishment of plants.

The greatest potential for effects to these species would be from loss of riparian habitats due to subsidence. Water loss due to subsidence is not expected in Fish Creek or Bear Creek (see "Subsidence effects on riparian habitats" section) or any of the perennial drainages. There are scattered groups of these plants in lower Huntington Canyon and along the eastern edge of the Wasatch Plateau, so it is unlikely that impacts to these populations would cause the listing of either species.

No new surface disturbances are proposed in this mining plan modification, so there should be no new infestations of musk thistle or other noxious weeds due to mining. If surface disturbing activities are proposed in the future, they would be evaluated in a new analysis and appropriate stipulations used.

There is some potential to impact grazing facilities, such as springs and ponds. Forest Service Stipulation #14 requires the operator to protect, restore, or replace existing Forest Service owned or permitted surface improvement to provide for the continuance of current land uses.

There is a potential for subsidence to impact surface and groundwater flows. Forest Service Stipulation #21 requires the Lessee to replace any surface or developed groundwater sources, in quantity and quality, that may be lost or adversely affected by mining operations to maintain existing habitat and land uses.

Under Alternative 2, there would be no direct effects to vegetation and range. There could be minor indirect impacts to vegetation, but none that would lead to the listing of a species or contribute to the spread of any invasive species. Any impacts to range facilities would be repaired by the operator (Stipulation #17).

3.5.2.3 Alternative 3 - Approval of the Mining Plan Modification with Supplemental FS Mitigations

No change from Alternative 2.

3.5.3 Cumulative Effects

The cumulative effects to vegetation and range resources in the vicinity of the mining plan modification area consist of the residual effects from past actions, current effects from present actions, and anticipated effects from reasonably foreseeable future actions.

Past actions include coal mining (late 1800's to present), coal exploration (1990's), and small timber sales (1960's). The residual effects of the coal mining and coal exploration are limited to small areas of disturbance associated with portals and roads. The timber sale areas have been successfully regenerated and reforested.

Present actions include coal mining in the permitted area of the Bear Canyon Mine (1885 to present), grazing, and recreation. The impacts include approximately 40 acres of surface disturbance to vegetation for mine facilities and some short-term subsidence effects. All grazing is under a permit process, and maintenance of riparian vegetation is a part of that process. Monitoring has found that plants growing on ground that is grazed show no impacts from browsing or trampling (Manti LaSal sensitive plant information). Recreation impacts include dispersed camping and both legal and illegal ATV usage, which can impact vegetation and disperse noxious weeds. Recreation could also impact sensitive plant species scattered along Huntington Creek.

Coal mining will probably continue on Gentry Mountain for at least 20 more years. The most likely impacts are expected to be minor and temporary impacts to water resources. Recreation usage will probably increase, with impacts to vegetation and noxious weeds. A fuels reduction project (controlled fire usage) in Nuck Woodward and Tie Fork Canyons (2010 to 2014) should reduce fuels build up in beetle-killed conifer stands. Beetle-kill has affected large areas of conifer throughout the Wasatch Plateau.

Future coal mining might require a new mine portal in Cedar Canyon (off Forest), a ventilation shaft or portal, and coal exploration drilling. These activities could impact vegetation until they are reclaimed and vegetation is re-established. Reclamation standards also require the operator to eliminate any noxious weeds before the reclamation bond is released.

3.5.4 Irreversible/Irretrievable Commitment of Resources

If water resources were impacted, the water unavailable for use by vegetation and livestock until the loss is mitigated would be irretrievably lost.

3.6 CULTURAL RESOURCES

3.6.1 Affected Environment

Several cultural resource inventories and surveys have been conducted near the mining plan modification area within the past 30 years. Past surveys have identified 14 prehistoric sites within a mile of the project area. The majority of these were on or near the escarpments.

In May 2006 a Class I Literature and Records Search was conducted to identify any known historic properties that were recorded through previous cultural resource projects in the area and to identify the potential for encountering prehistoric and historic sites within the project boundary. Several prehistoric and historic sites from those earlier surveys were determined to be eligible for listing in the National Register of Historic Properties (NRHP). None are within the proposed mining plan modification area.

In addition to the May 2006 Class I Literature and Records Search, a Class II Sample Survey was conducted in September 2006. The survey covered approximately 1,662 acres in the areas determined to have the highest potential of containing cultural resources (dominantly the escarpments), based cultural resources found during past surveys in the area. No prehistoric sites were found or documented within the mining plan modification area. Five tools and two flakes were discovered as isolated finds, indicating the presence of Native American peoples. The escarpments did not show evidence of habitation or use, possibly a result of isolation due to the steep and rugged terrain along the drainages in the area. The remains of one historic sawmill were documented, but determined not to be eligible for listing in the NRHP.

A scoping letter that briefly described the project and a project area map were sent to the tribal governments of the Hopi, Paiute, Ute Mountain Ute, White Mesa Ute, Ute (Fort Duchesne), and Navajo Tribes beginning in June 2006. None of the tribes responded to the initial scoping documents. All of the tribes listed above were sent copies of the cultural resources inventory report associated with the project on December 8, 2006. This communication also included a request for information regarding any potential sacred sites, traditional cultural properties, and plants or other natural resources the tribes might have concerns with. The Paiute and Hopi Tribes responded.

The Paiute Tribe stated that they had no objections to the project and that they were not aware of any archaeological resources in or near the proposed mining plan modification area. No traditional cultural properties or sacred sites were identified in the analysis area through these consultation efforts. A list of culturally significant plants provided by the Paiute Tribe was submitted to the Forest for review.

The Hopi Tribe stated that they cannot concur with a Forest Service determination of "No Adverse Effect to Historic Properties", because only 1,662 acres of the 7,591 acres in the mining plan modification area were surveyed. Also, previous surveys found cultural resource sites near the mining plan modification area. The Hopi's believe that

the additional stipulations to protect cultural resources are "migitation after the fact", but also acknowledge that there is little potential for Hopi-related sites in the area. The Hopi Tribe (Terry Morgart, personal communication) stated they will not contest the determination, but will state their concerns to the Utah State Historic Preservation Officer (SHPO).

The Utah State Historic Preservation Officer has concurred with the Forest Service determination, with the additional requirement that stipulations (Appendix D) be added to protect cultural resources that may exist in the areas that have not been surveyed.

3.6.2 Environmental Consequences and Direct and Indirect Effects

The environmental consequences of coal mining on cultural resources would be due to mining-induced subsidence. Subsidence effects would be most likely in the escarpment areas, which could fail due to subsidence. The area above the escarpments is relatively flat, and subsidence would generally not be noticeable, with the exception of occasional tension fractures (see Section 3.2). The escarpment areas within the mining plan modification area were surveyed in 2006 and no sites were found. The general lowering of the surface on the top of Gentry Mountain would cause any cultural sites to be lowered slightly in elevation, but it is unlikely they would be damaged.

3.6.2.1 Alternative 1 – No Action

The Forest Service would not consent to the mining plan modification, so mining would not affect any known or unknown sites within the area. However, other impacts may occur to cultural resources from recreational and livestock activities, along with site vandalism. The sites located within the currently permitted area of the Bear Canyon Mine could be impacted by mining-induced subsidence. Escarpment areas would be subject to some natural escarpment failure.

The Forest Service would not consent to the mining plan modification, so there would be no mining in the proposed permit expansion area, resulting in no direct effects. There would be no change from the current activities taking place in the study area, so there would be no indirect effects to cultural resources.

3.6.2.2 Alternative 2 – Consent to the Mining Plan Modification as Proposed

Mining of the mining plan modification area, as proposed by the operator, would not impact known cultural resources. No cultural sites were found during the survey of the escarpments, the most likely areas to be impacted by mining-induced subsidence. Forest Stipulation #5 in the leases requires that operations be stopped if cultural resources are found during mining. If additional surface disturbance was proposed in the future, a new environmental analysis, including cultural resource evaluation, would be required.

Consent to the mining plan modification as proposed, and with the standard Forest Service lease stipulations, would not have the concurrence of the Utah SHPO. Therefore, this alternative would not be in compliance with various Federal laws covering cultural resources.

The culturally sensitive plants listed by the Paiute Tribe that occur in the project area would not be negatively affected by the proposed action.

There would be no direct effects to cultural resources due to consenting to the mining plan modification, but there could be indirect effects to cultural resources due to subsidence-related impacts. If cultural resources are discovered during operations under the lease, the lessee is required to notify the Forest Service and to fund inventory, reporting, and mitigation measures for the resource (Standard Forest Service Coal Lease Stipulation #1). However, there is no requirement for the Lessee to survey for cultural resources after an area is subsided, so they might never be reported. This alternative does not have SHPO concurrence.

3.6.2.3 Alternative 3 – Consent to the Mining Plan Modification with Supplemental FS Mitigations

Under Alternative 3, the Forest Service would consent to the mining plan modification with the standard lease stipulations (Appendix C) and supplemental stipulations (Appendix D) to protect cultural resources that may exist in areas that would be undermined but were not surveyed. The use of these stipulations is a condition of the SHPO concurrence. The stipulations cover monitoring of subsidence, discoveries in the area of potential effect, and funding of additional work.

There would be no direct effects to cultural resources due to consenting to the mining plan modification. Using the supplemental stipulations (Appendix D), there would also be no indirect effects to cultural resources.

3.6.3 Cumulative Effects

Past actions concerning cultural resources in the general area include cultural resource surveys that have identified prehistoric and historic sites, some of which are considered eligible for the National Register of Historic Places. Adverse activities include unauthorized excavations and vandalism of archaeological sites. Direct adverse impacts could include subsidence, tension cracks, and escarpment failure that could potentially destroy or damage identified and unidentified sites.

3.6.4 Irreversible/Irretrievable Commitment of Resources

Damage to sites could result in the irreversible commitment of and the irretrievable commitment of cultural resources. The proposed project could result in the irreversible

alteration or destruction of cultural resource sites that are considered ineligible for the NRHP. Cultural resource sites that have not been identified, and therefore are unevaluated for eligibility for the NRHP could be impacted.

3.2.7 SOCIOECONOMICS

3.2.7.1 Affected Environment

In Utah, coal provides over 94% of the base energy used to generate the electricity used in the State (U.S. Electricity Net Generation by Energy Source, 2004 (Preliminary); EIA, *Electric Power Monthly*). All of this coal comes from western domestic sources, providing stability for this valued energy source.

The socioeconomic area includes almost exclusively Emery and Carbon counties and primarily the towns of Huntington, Castle Dale, and Price. Coal has been produced from the Bear Canyon Mine for over 100 years. The company's property holdings now include most of the remaining coal reserves on Gentry Mountain.

The Bear Canyon Mine is currently producing approximately 530,000 tons of coal per year by room-and-pillar mining. Remaining coal reserves would sustain mining at the current rate for about 5 years.

The coal mining industry provides a most important employment base for Emery and Carbon counties. Coal mine employment income averages $4,785/month and $5,829/month for Emery and Carbon counties respectively. This compares to county averages of $ 3,086/month and $2,500/month for Emery and Carbon counties respectively. (Utah Division of Workforce Services, *Carbon County Demographic and Economic Profile* and *Emery County Demographic and Economic Profile*). The Bear Canyon Mine currently has 55 employees, with 302 direct effect jobs.

The Bear Canyon Mine currently pays $850,000 in royalties per year on coal with a market value of $10.6 million. Total royalties from the present to the end of the life of the mine would be approximately $4.2 million.

The coal energy produced is used almost exclusively for electrical power generation for citizens of Utah, Nevada, Idaho, and California. The current coal production of 530,000 tons/year could produce enough electricity for approximately 110,200 households.

3.2.7.2 Environmental Consequences and Direct and Indirect Effects

If the mining plan modification is approved, Co-Op would start mining with a longwall system and increase production to approximately 2.5 million tons per year. The Federal coal reserves mined would be sold into the market place at a projected $20/ton. If the mine plan modification is approved, there would be enough coal to sustain longwall mining for approximately 10 years.

To raise production with longwall mining, they would require 240 employees (an increase of 185 employees), resulting in 1,320 new direct effect jobs. (Governor's Office of Planning and Budget, July 2001, *Utah State and Local Government Fiscal Impact*

Model Working Paper Series: 2001-1 Multipliers for Utah, and based on the Federal Coal Reserves in the leases.)

This influx of employees would result in growth in the housing and service industries and increase the requirements for education, health, and other services. Past fluctuations in population have been a challenge for residents of the areas. For example, for Carbon County:

> Carbon County was one of the few counties in the state that did not enjoy a positive bump in employment in 2004…
>
> …it is also important to realize that Carbon County has many assets that can be used to create employment and a better quality of life for its residents. For example, the College of Eastern Utah, the excellent medical facilities, and improving transportation corridors are all pluses for the county.
>
> The economic turmoil of the 1960s and 1970s prepared the county, in a negative sense, for the bust of the early 1980s. Nearly 25,000 people called Carbon County home in 1982. By decade's end that number would be slashed by roughly 5,000, as the population in the county sank to 20,000. Net out migration, prompted by the faltering local economy, continued until well into the 1990s. In recent years, the population has stabilized somewhat, though net out migration continues. Indeed, in the decade between 1990 and 2000, Carbon's population grew by only 1 percent, the slowest rate of growth in the state. (Utah Division of Workforce Services, updated 2005, *Carbon County Demographic and Economic Profile* and *Emery County Demographic and Economic Profile*).

The potential additional employment of Alternatives 2 and 3 would help the socioeconomics of the area but only bring it back up about 25% of the way to where it was in the 1980s. The needed infrastructure exists for this level of additional growth.

If the mining plan modification is approved, Co-Op Mining would pay approximately $3.8 million per year in royalties on coal with a market value of approximately $48 million. Total royalties from the present to the end of the life of the mine would be approximately $38 million. The mine would produce from both Federal Leases and fee holdings and would probably produce from both in any one year. However, the overall sum of the market values and royalties remain the same. These are Federal coal royalties and one-half of the royalties received are returned to the State of Utah.

Increasing production to 2.5 million tons/year could produce enough electricity for approximately 519,800 households.

3.2.7.2.1 Alternative 1 – No Action

The Forest Service would not consent to the mining plan modification, so there would be no mining in the mining plan modification area. There would be no change from the current activities taking place in the study area, so there would be no change in socioeconomics.

Coal production would remain at approximately 530,000 tons/year for the remaining 5 years of the life of the mine. Total royalties for the remaining mine life would be approximately $4.2 million on coal with a market value of approximately $53 million.

Employment for the mine (55 employees) and in Carbon and Emery counties would remain unchanged.

Electrical production from the coal from the Bear Canyon Mine would remain at the level to supply the needs of approximately 110,200 household.

There would be no direct effects to socioeconomics under Alternative 1. Indirect effects would be the loss of jobs, royalties, and coal available for electrical production in about 5 years, after the remaining mineable coal has been removed from the currently permitted area.

3.2.7.2.2 Alternative 2 – Consent to the Mining Plan Modification as Proposed

Coal production would be increased to approximately 2.5 million tons/year, with a market value of approximately $48 million/year. Royalties would be approximately $3.8 million per year. The life of the mine would be extended to approximately 10 years. The coal produced could be used to generate enough electricity to supply approximately 519,800 households.

Mine employment would increase by approximately 185 jobs, with an increase in approximately 1,018 direct effect jobs. This would result in an increased demand for housing and public services. The infrastructure currently exists for this level of growth.

Under Alternative 2, there would be no direct effects. Indirect effects would be an increase in coal production, increased employment, and increased royalties to the Federal, state, and local governments.

3.2.7.2.3 Alternative 3 – Consent to the Mining Plan Modification with Supplemental FS Mitigations

No change from Alternative 2.

3.2.7.3 Cumulative Effects

The cumulative effects to socioeconomics in the vicinity of the mining plan modification area consist of the residual effects from past actions, current effects from present actions, and anticipated effects from reasonably foreseeable future actions.

Coal mining has been an important part of the economy in Carbon and Emery counties since the late 1800's. Mining has provided some of the highest-paying jobs in the area. Royalties from the coal have been important to the counties. By local economy would benefit from the additional jobs and royalties if the mining plan modification is approved. The consumer would also benefit from reasonably priced electrical power.

Allowing Co-Op to expand their Bear Canyon Mine would likely lead to an application some time in the future for additional coal leases to the north of their current mine.

3.2.7.4 Irreversible/Irretrievable Commitment of Resources

The mining and use of the coal, a non-renewable resource, would be irretrievably and irreversibly lost to future use.

CHAPTER 4
LIST OF PREPARERS

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CHAPTER 5
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CHAPTER 6
GLOSSARY

Affected Environment: Surface resources (including social and economic elements) within or adjacent to a geographic area that could potentially be affected by proposed activities. The environment of the area that would be affected by the alternatives under consideration.

Allotment: See Range Allotment.

Alluvial Material: Material transported and deposited by running water in riverbeds, lakes, alluvial fans and valleys. Includes clay, silt, sand, gravel, and mud.

Alternative: A combination of management prescriptions applied in specific amounts and locations to achieve a desired management emphasis as expressed in goals and objectives. One of several policies, plans, or projects proposed for decision making. One alternative need not substitute for another in all respects.

Analysis Area: A delineated area of land subject to analysis.

Animal Unit Month (AUM): The amount of forage necessary to sustain one cow and one calf or its equivalent for one month.

Aquatic Ecosystem: All organisms in a water-based community plus the associated environmental factors.

Aquatic Wildlife or Species: Animal species that inhabit and/or depend on the aquatic ecosystems for their life processes.

Aquifer: A layer of geologic material that contains water.

Big Game Winter Range: The area available to and used by big game through the winter season.

Big Game: Larger species of hoofed, protected, wildlife that are hunted such as elk, deer, and moose.

Biological Assessment (BA): A document that discloses potential effects to Threatened, Endangered, and Candidate plant and animal species and consistency with the Endangered Species Act relative to a proposed action.

Biological Diversity: The diversity or numbers of species that collectively represent the living plants and animals within a local, regional, or continental landscape.

Biological Evaluation (BE): A document that discloses effects to Forest Service Sensitive plant and animal species relative to a proposed action.

Browse: That part of the current leaf and twig growth of shrubs, wood vines, and trees available for animal consumption.

Bureau of Land Management (BLM): The U.S. Department of the Interior agency responsible for managing most Federal government subsurface minerals. It has surface-management responsibility for Federal lands designated under the Federal Land Policy and Management Act of 1976.

CEQ: See Council on Environmental Quality.

Contrast: The effect of a striking difference in the form, line, color, or texture of an area being viewed.

Council on Environmental Quality: An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews Federal programs for their affect on the environment, conducts environmental studies and advises the President on environmental matters.

Cultural Resources Inventory: A survey of existing conditions and data.

Cultural Resources: Those fragile and nonrenewable remains of human activity, occupation, or endeavor reflected in districts, sites, structures, buildings, objects, artifacts, ruins, works or art, architecture, and natural features that were or importance in human events.

Cumulative Impact: The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time.

Developed Recreation Sites: Relatively small, distinctly defined areas where facilities are provided for concentrated public use (i.e., campgrounds, picnic areas, and swimming areas).

Developed Recreation: Recreation that occurs a man-made developments such as campgrounds, picnic grounds, resorts, ski areas, trailheads, etc.

Dispersed Recreation: That portion of outdoor recreation use that occurs outside of developed sites in the unroaded and roaded Forest environment (i.e., hunting, backpacking, and camping).

Displacement: As applied to wildlife, forced shifts in the patterns of wildlife use either in location or timing of use.

Distance Zone: The divisions of a landscape being viewed. Three zones are used to describe a landscape: foreground, middleground, background.

Diversity: (1) The relative abundance of wildlife species, plant species, communities, habitats, or habitat features per unit of area; or (2) The distribution and abundance of different plant and animal communities and species within the area covered by a Land Resource Management Plan (36 CFR Part 219.3).

Duration: The length of time the management activity and its impacts will be taking place.

Ecosystem: All organisms in a community plus the associated environmental factors.

Effects (also see Impacts):

Direct Effects - Caused by the action and occur at the same time and place.
Indirect Effects - Caused by the action later in time or farther removed in distance but still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related affects on air and water and other natural systems, including ecosystems.

Endangered Species: See Threatened and Endangered species.

Environmental Analysis: An analysis of alternative actions and their predictable short and long- term environmental effects that include physical, biological, economic, social, and environmental design factors and their interactions.

Environmental Assessment (EA): A formal public document prepared to analyze the impacts on the environment of the proposed project or action and released for comment and review. An EIS must meet the requirements of NEPA, CEQ guidelines, and directives of the agency responsible for the proposed project or action. It includes a brief discussion of the need for the proposal, alternatives considered, environmental impact of the proposed action and alternatives, and a list of agencies and individuals consulted. Prepared by the responsible Federal agency consistent with 40 CFR 1508.9.

Erosion: (1) The wearing away of the land surface by running water, wind, ice, or other geological agents including such processes as gravitational creep; or (2) Detachment and movement of soil or rock fragments by water, wind, ice, or gravity.

Exotic: Foreign, not native

Fauna: Species of the animal kingdom.

Federal Land Policy and Management Act of 1976 (FLPMA): Public Law 94-579 signed by the President on Management October 21, 1976. Established public land policy; to establish guidelines for its administration; to protect for the management, protection, development, and enhancement of the public lands; and for other purposes.

Federal Lands: Lands owned by the United States, without references to how the lands were acquired or what Federal agency administers the land, including surface estate, mineral estate and coal estate, but excluding lands held by the United States in trust for Indians, Aleuts or Eskimos.

Floodplain: The lowland and relatively flat area adjoining inland waters including, at a minimum, that area subject to a one percent or greater chance of flooding in any given year.

Flora: Plants

Forage: All browse and herbaceous foods that are available to grazing/browsing animals. Also, food source areas for goshawks.

Forest Service (FS): The agency of the United States Department of Agriculture responsible for managing National Forests and Grasslands under the Multiple Use and Sustained Yield Act of 1960.

Fossil: The remains or traces of an organism or assemblage of organisms that have been preserved by natural processes in the earth's crust exclusive of organisms that have been buried since the beginning of historical time.

Game Species: Any species of wildlife or fish for which seasons and bag limits have been prescribed and that are normally harvested by hunters, trappers, and fishermen under State or Federal laws, codes, and regulations.

Gradient: The slope (rise/run) of a surface or stream profile.

Habitat Type: An aggregation of all land areas potentially capable of producing similar plant communities at climax.

Habitat: A specific set of physical conditions that surround a single species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and living space.

Human Environment: The factors that include, but are not limited to, biological, physical, social, economic, cultural, and aesthetic factors that interrelate to form the environment.

Impact (See Effects): The effect, influence, alteration, or imprint caused by an action.

Indicator Species: A species of animal or plant whose presence is a fairly certain indications of a particular set of environmental conditions. Indicator species serve to show the effects of development actions on the environment.

Indirect Effects: Secondary effects that occur in locations other than the initial action or significantly later in time.

Inventoried Roadless Area: Area identified in a set of inventoried roadless area maps, contained in Forest Roadless Area Conservation, Final Environmental Impact Statement, Volume 2, dated November 2000, which are held at National headquarters office of the Forest Service or any subsequent update or revision of those maps.

Invertebrate: An animal lacking a spinal column.

IRA: Inventoried Roadless Area.

Irretrievable: A term that applies to the loss of production, harvest, or use of natural resources. For example, some or all of the timber production from an area is lost irretrievably while an area is serving as a winter sports site. The production lost is irretrievable, but the action is not irreversible. If the use changes, it is possible to resume timber production.

Irreversible: A term that describes the loss of future options. Applies primarily to the effects of use of nonrenewable resources, such as minerals or cultural resources, or to those factors, such as soil productivity that are renewable only over long periods of time.

Leaseable Minerals: Minerals acquired only by lease and generally include oil, gas, coal, oil shale, sodium, potassium, phosphate, native asphalt, solid and semi-solid bitumen, and deposits of sulfur.

Lease Stipulations: Additional specific terms and conditions that change the manner in which an operation may be conducted on a lease or modify the lease rights granted.

Lease: A Federal lease, issued under the oil and gas leasing provisions of the mineral leasing laws, which grants the exclusive right to explore for and produce oil and gas from the lease area.

Macroinvertebrates. Aquatic insects.

Management Indicator Species (MIS). Management Indicator Species (MIS) are a select group of wildlife species that can indicate change in habitat resulting from activities on the Forest. MIS species for the Manti-La Sal National Forest are elk, Mule deer, macroinvertebrates, Goshawk, Golden eagle and Abert squirrel (FLRMP). With the exception of Abert Squirrels these species utilize the habitats found within the project area.

Mineral Leasing Laws: The Mineral Leasing Act of 1920, as amended (30 U.S.C. 181 et seq.), and the Mineral Leasing Act for Acquired Lands of 1947, as amended (30 U.S.C. 351-359).

MIS: Management Indicator Species.

Mitigation: Includes:

(a) Avoiding the impact altogether by not taking a certain action or parts of an action.
(b) Minimizing impacts by limiting the degree of magnitude of the action and its implementation.
(c) Rectifying the impact of repairing, rehabilitating, or restoring the affected environment.
(d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
(e) Compensating for the impact by replacing or providing substitute resources or environments.

Multiple-use: Management of the surface and subsurface resources so that they are jointly used in the manner that will best meet the present and future needs of the public without permanent impairment of the productivity of the land or the quality of the environment.

National Environmental Policy Act of 1969 (NEPA): Public Law 91-190. Established environmental policy for the nation. Among other items, NEPA requires Federal agencies to consider environmental values in decision-making processes.

National Forest Management Act (NFMA): A law passed in 1976 as amendments to the Forest and Rangeland Renewable Resources Planning Act that requires the preparation of Regional and Forest plans and the preparation of regulations to guide that development.

National Forest System: All National Forest Systems lands reserved or withdrawn from the public domain of the United States; all National Forest System lands acquired through purchase, exchange, donation, or other means the National Grasslands and land use projects administered under Title III of the Bankhead-Jones Farm Tenant Act (7 U.S.C. 1010 et seq.); and other lands, waters, or interests therein which are administered by the U.S.D.A. Forest Service or are designated for administration through the U.S.D.A. Forest Service as a part of the system (16 U.S.C. 1609).

National Register of Historic Places (NRHP): A listing of architectural, historical, archaeological, and cultural sites of local, state, or national significance established by the Historic Preservation Act of 1966.

Negligible Effect or Impact: An effect or outcome that it very small in magnitude or importance and is inconsequential.

NEPA: See National Environmental Policy Act of 1969.

No Action Alternative: No action or activity would take place. Another definition is where ongoing programs described within the existing Land Management Plan continue. No decision would be made and no leases would be offered.

Nongame Species: Species of animals that are not managed as a sport hunting/fishing resource.

Noxious Weeds: Rapidly spreading plants that cause a variety of major ecological impacts to both agriculture and wild lands.

Off-Highway Vehicle (OHV): Any motorized vehicle designed for or capable of cross-country travel on or immediately over land, water, snow, ice, marsh, swampland or other natural terrain. It includes, but is not limited to, four-wheel drive or low-pressure-tire vehicles, motorcycles and related two-wheel vehicles, amphibious machines, ground-effect or air-cushion vehicles.

Operator: A lessee, exploration licensee or one conducting operations on a lease under the authority of the lessee.

Overstory: The portion of a plant community consisting of the taller plants on the site; the forest or woodland canopy.

PAOT (People at one Time): Unit of measure for recreation representing the number of people using a facility simultaneously or at the same time.

Prehistoric Site: Archaeological sites associated with American Indians and usually occurring before contact with Europeans.

Prevention of Significant Deterioration (PSD): A classification established to preserve, protect, and enhance the air quality in National Wilderness Preservation System areas in existence prior to August 1977 and other areas of National significance while ensuring economic growth can occur in a manner consistent with the preservation of existing clean air resources. Specific emission limitations and other measures, by class, are detailed in the Clean Air Act (42 U.S.C. 1875, et seq.).

Project Area: The area to be disturbed by the proposed project and adjacent lands that could be affected.

Range Allotment: A designated area of land available for livestock grazing upon which a specified number and kind of livestock may be grazed under an allotment management plan. It is the basic land unit used to facilitate management of the range resource on National Forest System lands administered by the U.S.D.A. Forest Service.

Rare Plants: A plant species, or subspecies, that is limited to a restricted geographic range or one that occurs sparsely over a wider area.

Reasonably Foreseeable Development Scenario (RFDS): The prediction of the most likely future actions in the project area that would likely result from the proposed action.

Reclamation: Returning disturbed lands to a form and productivity that will be ecologically balanced and in conformity with a predetermined land management plan.

Record of Decision (ROD): A document separate from, but associated with, an environmental impact statement that publicly and officially discloses the responsible official's decision on the proposed action.

Recreation Opportunity Spectrum (ROS): Land delineations that identify a variety of recreation experience opportunities in seven classes along a continuum from primitive to urban. Each class is defined in terms of natural resource settings, activities and experience opportunities. The six classes are: Urban, Rural, Roaded, Natural, Semiprimitive Motorized, Semiprimitive Nonmotorized, and Primitive.

Recreation Visitor Day (RVD): A unit of measure for recreation use. It represents one day of use by one person.

Reserves: Recoverable Oil and Gas deposits.

Responsible Official: Official of the Forest Service and/or Bureau of Land Management authorized to make the decisions required under the proposed action.
Restore: To bring back landscape to a former or original condition or appearance.

Revegetation: The reestablishment and development of self-sustaining plant cover. On disturbed sites, this normally requires human assistance such as seed bed preparation, reseeding, and mulching.

Riparian Ecosystem: A transition between the aquatic ecosystem and the adjacent terrestrial ecosystem; identified by soil characteristics or distinctive vegetation communities that require free or unbound water.

Riparian: Riparian areas consist of terrestrial and aquatic ecosystems, those lands in a position to directly influence water quality and water resources, whether or not free water is available. This would include all lands in the active flood channel and lands immediately upslope of stream banks. These areas may be associated with lakes, reservoirs, estuaries, potholes, marshes, streams, bogs,, wet meadows, and intermittent or permanent streams where free and unbound water is available.

Roaded, Natural (RN): A recreation opportunity classification term describing a land area that has been predominately a natural appearing environment with moderate evidence of sights and sounds of humans. Concentration of users is moderate to low. Roads of better than primitive class are usually with 0.5 mile. A broad range of motorized and nonmotorized activity opportunities are available. Management activities, including timber harvest, are present and harmonize with the natural environment.

Roadless: Refers to the absence of roads that have been constructed and maintained by mechanical means to ensure regular and continuous use.

Scoping Process: An early and open public participation process for determining particular issues to be addressed in an environmental document and for identifying the significant issues related to a proposed action.

Sensitive Species: Those plant and animal species identified by a Regional Forester for which population viability is a concern as evidenced by: (a) significant current or predicted downward trends in population numbers or density or (b) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

Small Game: Birds and small mammals normally hunted or trapped.

Stipulation: A provision that modifies a standard lease right and is attached to and made a part of the lease.

Surface Management Agency: The Federal agency with jurisdiction over the surface of federally owned lands containing coal deposits, and, in the case of private surface over Federal coal, the Bureau of Land Management, except in areas designated as National Grasslands, where it means the Forest Service.

TEPS: Threatened, Endangered and Sensitive Species.

Threatened And Endangered Species: Definitions: Federal codes are defined as follows:

Endangered (E): Any species that is in danger of extinction throughout all or a significant portion of its range other than a species of the Class Insecta determined by the Secretary to constitute a pest whose protection under the ESA would present an overwhelming and overriding risk to man.

Threatened (T): Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Candidate Species (C): Status review taxa for which the USFWS currently has on file substantial information on biological vulnerability and threat(s) to support the appropriateness of proposing to list the taxa as an endangered or threatened species.

Forest Service Sensitive: Those plant and animal species identified by a Regional Forester for which population viability is a concern as evidenced by: (a) significant current or predicted downward trends in population numbers or density or (b) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

Vertebrate: An animal having a spinal column.

Visual Quality Objectives (VQO): Based upon variety class, sensitivity level, and distance zone determinations. Each objective describes a different level of acceptable alteration based on aesthetic importance. The degree of alteration is based on contrast with the surrounding landscape.

Preservation: In general, human activities are not detectable to the visitor.

Retention: Human activities are not evident to the casual Forest visitor.

Partial Retention: Human activities may be evident, but must remain subordinate to the characteristic landscape.
Modification: Human activity may dominate the characteristic landscape, but must, at the same time, use naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in middleground or background.

Maximum Modification: Human activity may dominate the characteristic landscape but should appear as a natural occurrence when viewed as background.

Visual Resource: The composite of basic terrain, geologic features, water features, vegetative patterns, and land use effects that typify a land unit and influence the visual appeal of the unit.

Wetlands: Lands where saturation with water is the primary factor determining the nature of soil development and the kinds of animal and plant communities living under or on it surface.

APPENDIX A
MAPS

Map 1	General Location
Map 2	Forest Plan Management Units
Map 3	Geology
Map 4	Subsidence
Map 5	Visual Quality Objectives
Map 6	Surface and Ground Water Resources
Map 7	Vegetation

APPENDIX B
PAST, PRESENT, AND REASONABLY FORSEEABLE FUTURE ACTIONS

Past Actions	Implementation Dates (Begin and End)	Residual Effects
I. Minerals		
Coal Mining.		
Cyprus-Plateau Star Point Mine is located approximately 1 ½ miles north (nearest point within permit areas) of the proposed mine modification areas. Mining and related subsidence are complete and the mine surface facilities are being reclaimed.	1970-present	Mining induced subsidence has occurred in Castle Valley Ridge area and is considered to be substantially complete. Subsidence, vegetation, and hydrologic monitoring has shown that effects in this area have been negligible. There are no surface facilities the Castle Valley Ridge area. Portal facilities are located on private lands on the east side of Gentry Mountain, about 10 miles southwest of Price. Reclamation of these facilities started in 2000 and is continuing to the present.
Hiawatha Mine.		
Mohrland Mine.		
Bear Canyon Mine. The area was mined sporadically between 1885 and 1906. During the period of 1931 to 1957 it was operated by Freed Coal and Coke. There were various owners between 1957 and 1980, when it was obtained by C.O.P. Development. They obtained the Wild Horse Ridge area in 1990 and the Mohrland area in 1996.	1885 - present	Approx. 40.46 acres of surface disturbance for the mine facilities. Areas of escarpment failure due to past mining operations.
Tip Top Mine. On the south slope of Crandall Canyon (SE 1/4 NE 1/4, Sec 5, T 16 S, R 7 E, SLM). The Crandall Canyon Road (FDR 50248), now on the Transportation System, was most likely originally constructed for the	1939-1956	Very small mine. Naturally revegetated. Disturbed area not evident. No residual effects.

mine and coal exploration. The Road is now a Forest Development Road from the SR 31 intersection to just above the Crandall Canyon Mine. The old road that continued up the canyon from the mine (now Forest Development Trail 390) was most likely originally build as a coal exploration/drilling road.		
Crandall Canyon Mine. In Crandall Canyon (S 1/2 NW 1/4, Sec 5, T 16 S, R 7 E, SLM) - The mine was constructed in 1980 and is still an active mine. The mine has disturbed approximately 5.4 acres, not including the Crandall Canyon Road. The Crandall Canyon Road was widened to two lanes and asphalt paved to accommodate coal haul traffic.	1980 – Present	The mine operates 24 hours a day, every day at differing intensities depending on production shifts. 13.6 acres are permitted for disturbance; however, only 9.9 acres have actually been disturbed: 8.2 acres on Genwal fee and 5.4 acres of vegetation/habitat has been removed for operations on the Forest. The physical activity and operations/haul traffic on the Crandall Canyon and Huntington Canyon roads impacts other resources and uses. Approximately 3,900 acres of NFS, State, and private lands included in mining plan modification area. Subsidence of mined lands has occurred. No subsidence of Crandall Creek is permitted.
Crandall Canyon Mine, Modification of Federal Coal Lease UTU-68082. 120 acres were added to the lease. No roads or surface facilities. Underground access is through the Genwal Mine.	2005	Surface subsidence. Some escarpment failure of the Castlegate Sandstone. No loss of wildlife habitat. Some disruption of surface and ground water flow paths may occur.
Crandall Canyon Mine, South Crandall Lease. 880 acres were added to the Crandall Canyon Mine. Access is through a portal on the south side of Crandall Canyon on fee property. No additional surface facilities were constructed. A water replacement agreement between Genwal, PacifiCorp, and water users has been completed to assure an uninterrupted supply of water in the event that there is any diminution in water quality or quantity at Little Bear Spring.	2005	Surface subsidence will occur. Some escarpment failure of the Castlegate Sandstone is possible. Loss of wildlife habitat is not expected. Some disruption of surface and ground water flow paths may occur.
Old Leamaster Mine. In Mill Fork Canyon (NE 1/4 SE 1/4 SW 1/4, Sec 16, T 16 S, R 7 E, SLM). The original Mill Fork Road, now a Forest Development Road (FDR 50245), was probably constructed prior to 1943 for access to the mine and for coal exploration. The Forest Development Trail that extends several miles up the canyon, beyond the Forest Development Road (171, 391); and Trails 086 and 394 on the north slope of the canyon, were most likely originally constructed prior to 1943 as coal exploration roads. The road and trails are maintained on the Forest Transportation System.	1943 – 1964	The old mine was reopened in 1976 as the Huntington Canyon #4 Mine (see below). Most of the original disturbed area was re-disturbed and expanded for the new surface facilities.
Huntington Canyon #4 Mine. SW 1/4SW 1/4, Sec 16, T 16 S, R 7 E, SLM. The mine was reconstructed at the Old Leamaster Mine in 1976 with a total surface disturbance of approximately	1976 - 1985	The area was reclaimed in 1985. Final bond release was made in 1998. There are no residual effects.

12.5 acres (almost all on pvt. inholdings). A 25KV powerline was constructed from the Huntington Canyon Power Plant in Huntington Canyon over the south Huntington Canyon slope to Mill Fork Canyon. Surface disturbance was minimized by helicopter installation and was designed to minimize impacts to raptors. The powerline remains today under a special-use permit and was extended in 1986 to provide service to the Crandall Canyon Mine. The mine was reclaimed in 1985 (recontoured to approximate original contour) and determined to be successful in 1995. Remnants of the highwalls are still visible. In 1985, the Mill Fork Road was reduced from two lanns to a single-lane (with turnouts). The second lane was recontoured and has been successifully revegetated. The permit area of 1,320 acres (pvt. and NFS lands) were only partially mined. No visible signs of subsidence.		
Deer Creek Mine, Deer Creek Canyon. Portal facilities. The facilities have disturbed 20 acres. A paved Emery County road runs up Deer Creek Canyon from the intersection with Hwy. 31 to the mine, a distance of approximately 3 miles. Road width averages 20 feet. Most of the drainages in the vicinity of the mine are culverted.	1946 - Present	
Deer Creek Mine, Rilda Canyon Fan Portal. The breakout pad and access road (from forks to breakout) have disturbed approximately 2 acres. Underground mining has subsided extensive areas on East Mountain and the south slope/escarpment of Rilda Canyon and the Left Fork of Rilda Canyon. One small rock fall (probably induced by subsidence) on the Castlegate Sandstone cliff along the south slope of Rilda Canyon has been observed in the NE corner of Sec. 33. The Rilda Canyon Road, from the intersection with Hwy. 31 to the forks, was widened to two lanes, improved, and graveled by Emery County in 1995 and 1996 (See Transportation Section).	1995 - Present	The breakout pad removed approx. 2 acres of overstory riparian vegetation and non-riparian understory vegetation. Approximately 200 feet of the Left Fork creek channel is culverted. Fan noise and limited activity at the pad would affect wildlife until they become accustomed to the disturbance. Subsidence has caused one small failure that damaged some trees and vegetation as described above. This is the only evidence of subsidence on the ground surface and no impacts have been discovered by monitoring.
Deer Creek Mine. Rilda Canyon Portal Facilities for Mill Fork Tract Access. Approximately 14 acres of new surface disturbance occurred, including a fan portal, access portal, parking lot, and storage areas. The gravel road from Huntington Canyon to the portal facilities will be paved. A new spring development is planned upstream from the portal facilities at the Right Fork of Rilda Canyon.	2005	Big game winter range was impacted.
Coal Exploration.		
Getty Minerals constructed a temporary	1981-1986	The roads and pads were recontoured and

exploration access road from the Nuck-Woodward road to the south along Castle Valley Ridge (5.5 miles) to drill four coal exploration holes on the ridge. The road and drill pads were recontoured and revegetated in 1983.		successfully revegetated. There is no erosion occurring currently and the only residual effects are visual. There is a slight intermittent bench at short segments along the road. The old road was recontoured as a trail (Castle Valley Trail System) in 1992.
The Bureau of Land Management reopened the road described above in 1985 to drill two additional coal exploration holes on the ridge. The road and pads were recontoured and seeded in 1985 and 1986. Reclamation and revegetation efforts were determined to be fully successful in 1988.	1985-1988	Same as above
Genwal has drilled 3 coal exploration borings from the surface and 12 from within Crandall Canyon Mine.	All prior to mid-1990's.	All have been reclaimed and the reclamation bonds have been released. There are no residual effects.
Exploration holes have been drilled north of the present Bear Canyon Mine lease boundary.	1990-2000	The drill sites and access roads were reclaimed. No residual effects.
Gas Exploration/Production.		
Prima Oil and Gas Company (acquired by Petro-Canada in 2004) drilled a gas exploration well in Section 22, T14S, R7E on Castle Valley Ridge during the summer of 2004. Economically recoverable gas reserves were not discovered.	2004-2006	The well site and access road were recontoured and revegetated in 2006. Reclamation efforts continue to be monitored.
Prima Oil & Gas Company proposed to drill a gas exploration well just to the south of the intersection of Big East Road (NFSR 50244) and Flat Canyon Road (NFSR 50145) in T16S R6E, SE ¼, Sec 23.	2002	The proposal was dropped. No effects.
Fortuna Oil Company has proposed to drill a gas exploration well in T16S R6E, Sec 36 (SITLA owned land). Access to the well site would be provided by Forest System roads.	2002	The proposal was dropped. No effects.

II. Recreation		
Huntington Canyon Restoration Project. Improvement of over 60 sites and closure and rehabilitation of over 50 sites located along the U31 Highway corridor.	1998-99	Improved access, containment of motorized use, designation of campsites, and streamside restoration activities have all combined to improve soil, water, and vegetative components along the Huntington Canyon corridor.
The Castle Valley Ridge Trail System (CVRTS) includes 24 miles of non-motorized trails open to hiking, horseback riding, and mountain biking. The 9 mile long Castle Valley Ridge Trail serves as the backbone to the system. When combined with 11 miles of interconnecting Forest roads	1992	Increased use with trail improvement activities and publication of a trail system brochure.

(primarily the Nuck Woodward Road), a 35-mile trail system opportunity is available to the public.		

III. Range/Vegetation		
Livestock Grazing has been a historical use of this area. Grazing by sheep and or cattle started with settlement of the area.	1850 – present	Turn of the century grazing greatly impacted rangelands at that time. Implementation of improved livestock management practices has resulted in improved upland and riparian conditions. Agriculture remains a basic industry in the area.
Rangeland improvements included installation of water troughs, to improve livestock distribution, and drift fences to better control cattle.	Early 1900's	Water troughs made water more available from small springs and seeps. Short fences kept cattle from drifting too far up canyons.
Initiation of improved grazing systems.	1950's and 60's	More formal management prescriptions were established based on evolving scientific information.
Noxious Weeds - Noxious weeds have been introduced due to surface disturbing activities and have become established: musk thistle and whitetop,	unknown	Noxious weed species outcompete native species and change species composition..

IV. Timber		
Historic sawmill sites	1850-1950	Area has been re-established and it is difficult to see evidence of past harvesting activities.
Small sales of minor amounts, including post and pole sales.	1960s	Landings and skidroads have been restored and re-established.

V. Surface Structures		
Power Lines.		
Utah Power 345 KV line. Crosses the southwest corner of the Mill Fork Tract (Energy West Mining Co.) in Section 22, T16S, R6E.	1977-Present	Access roads have been reclaimed. Powerline is visually prominent.
Genwal Mine 25 KV line. Carries electricity from Mill Fork Canyon over Mill Fork Ridge and down into Crandall Canyon to power the Genwal Mine.	1989-Present	Access roads have been reclaimed. Powerline is visually prominent.
Radio Transmitter Towers. There is a building and associated radio transmitter towers in Section 8, T15 S, R 8 E on the east side of	Unknown - present	The facility is located on private inholdings within the Forest Boundary Forest Road 249 runs past the towers.

Gentry Mountain.		

VI. Transportation		
Forest roads have been developed for grazing, recreation, timber operations, and mineral exploration	1870-present	Removal of vegetation and establishment of disturbed roadway. Human activity during summer seasons when roads are open. Snowmobile activity in winter. Sediment production occurs in disturbed areas.

VII. Visuals		
Coal exploration, oil & gas drilling & gas pipelines as discussed above. (See Minerals/Energy, above.) Forest system roads, trails and private roads for grazing, timber, recreation and private access as discussed above. (See Range, Timber, Transportation and Recreation, above).	1900-Present	Activities restored and reclaimed as discussed. Consistent with Forest Plan VQOs. Forest roads provide opportunities for people to view the Lanscape. Consistent with Forest Plan VQO's.

VIII. Wildlife		
There have been no wildlife habitat improvement projects in the Castle Valley Ridge area.	NA	NA

Present Actions	Implementation Dates (Begin and End)	Residual Effects
I. Minerals		
Coal Mining. Crandall Canyon Mine. Portal and entry development is currently underway on fee property in the South Crandall Lease.	1980 – Present	The mine is in continuous operation. The impacts will continue until the mine is reclaimed.
Deer Creek Mine. Entry development in the Mill Fork Tract is currently underway. Access to the Mill Fork Tract is currently provided through the Deer Creek Mine.	Present	The mine is in continuous operation. The impacts will continue until the mine is reclaimed.
Coal Exploration.		
Gas Exploration/Production. Coalbed methane (Price Coalbed Methane Project and Ferron Natural Gas Project) development in Castle Valley to the east of the proposed project. Approximately 6oo wells have been drilled at 160 acre spacing. A road, pipeline, and powerline network has been established for production.	1997 – Present	Final Environmental Impact Statement, Ferron Natural Gas Project prepared by the Bureau of Land Management in 1999, discloses the cumulative effects of both developments.
II. Recreation		
Ongoing recreation use on Gentry Mountain, focused along Forest roads and trails.	Present	Dispersed recreation affects soils and vegetation. These impacts are similar to what occurs elsewhere on the forest.
Dispersed recreation activities include hiking, horse back riding, sight-seeing, camping, hunting, and cross-country skiing.	Present	Surface disturbance and human activity and occupation. Continued sediment production from disturbed surfaces.
Ongoing trail maintenance includes such activities as logging out trails and tread repair.	Present	
III. Range/Vegetation		
Livestock reductions and consolidation of allotments on sheep allotments: Crandall Ridge and Crandall Canyon. A portion of the Crandall Ridge Allotment was moved into the Trail	2001	Due to changes in sheep operators and concerns for resource conditions, livestock reductions and consolidation of allotments was initiated. Allotment boundaries have been adjusted and

Mountain cattle allotment. Permitted livestock within the area: Gentry Mt. Allotment 1440 cattle, 6/27-9/30. Trail Mt. Allotment 901 cattle, 6/21-9/20. East Mt. Allotment 341 cattle, 6/21-9/10. Crandall Canyon and Crandall Ridge Allotment, approximately 900 sheep, 7/1-9/30. Horse Creek Allotment 666 sheep, 7/1-9/30.		permits modified. This will reduce/eliminate grazing impacts on steep head walls in the head of Crandall Canyon mostly on SITLA lands. Monitoring of vegetative and soil trends continue.
Range improvement inventory.	1998 – 2001	Prescribed burning of aspen and sagebrush stands on East Mountain were completed to maintain healthy plant communities.
Range improvement inventory.	2002	Many water troughs needed replacement or heavy maintenance. Drift fences are still functioning as intended.
Continued grazing under an approved allotment management plan. Vegetative treatment projects are needed to maintain desired condition of aspen.	Present	Continued conifer encroachment into quaking aspen will result in a reduction of available forage unless conifer reductions projects are initiated. Increased competition for forage between wildlife and livestock could occur. Riparian conditions are expected to be maintained.
Noxious weed treatment will continue indefinitely.	Present	Noxious weed infestations are increasing; however, biological agents are expected to reduce stand densities.

IV. Timber		
No timber sales are presently occurring.	NA	No effects.

V. Surface Structures		
Power Lines. None are under construction.	NA	No effects.

VI. Transportation		
Continued use and maintenance of Forest Roads See Future Actions.	Present	See Future Actions

VII. Visuals		

See above activities.	Present	Consistent with Forest Plan VQOs.

VIII. Wildlife		
There are no on-going wildlife habitat improvement projects in the Castle Valley Ridge area.	NA	NA

Future Actions	Implementation Dates (Begin and End)	Residual Effects
I. Minerals		
Coal Mining. Bear Canyon Mine. The coal reserves north of the present lease would probably be leased at some future date. The new lease would reach into the Gentry Mountain Roadless Area. When the Forest Plan revision is approved, more of the Roadless Area would be involved.	2012	Several large producing springs are dependent upon the fault systems traversing the area. Disruption to municipal water supplies and riparian areas could result. Wildlife resources dependent upon the water resources in the area could also be affected.
Coal Exploration. Bear Canyon Mine. Additional coal exploration drilling will most likely occur to acquire additional data on coal reserves. Deer Creek Mine. Additional coal exploration drilling will most likely occur to acquire additional data on coal reserves.	Indefinite Indefinite	Minor, short term impacts to vegetation would occur. Some minor soil erosion. Drilling activities would be timed so as not to interfere with wildlife. Minor, short term impacts to vegetation would occur. Some minor soil erosion. Drilling activities would be timed so as not to interfere with wildlife.
Gas Exploration/Production. There is continuing interest in development of gas reserves on the Wasatch Plateau. Conflicts with coal mining companies could arise over access to the gas reserves.	Indefinite	If economically recoverable gas reserves were found each well could be in production for an estimated 20-25 years. A 1-acre production pad would be required during the production period. Following that, the production pad would be reclaimed. Reclamation would require an additional 3-5 years. Access to each well site could require significant impacts to surface resources.

II. Recreation		
Improvement and maintenance of nearby existing developed recreation sites in Huntington Canyon. Improvement of existing cabins and construction of new cabins on private lands. Potential for construction of new private roads for access to these facilities. Improvement and maintenance of the Castle Valley Ridge Trail System	Indefinite Indefinite Indefinite	Increased use of facilities due to population growth and demand for recreation opportunities. Increased human activity in the area year-round. Increased land disturbance, sediment production, and year-round human presence and activity. Increased use of facilities due to population growth and demand for recreation opportunities. Increased human activity in the area year-round. Minimal

		sediment production from trail maintenance activities.

III. Range/Vegetation		
Controlled burn in the McCadden Hollow, Gentry Hollow, and Wild Cattle Hollow areas on the top of Gentry Mountain to regenerate aspen stands and reduce conifer encroachment. Approx. 1,500 acres treatment is planned.	2010	Healthier aspen stands with a diverse understory of grass, forbs, and browse, and a much smaller conifer component.
Rangeland monitoring and coordination of grazing with other resource activities.	Indefinite	New range improvements may be initiated due to continued monitoring that would include water troughs, and prescribe burning. Through adaptive management new grazing systems may be implemented as scientific information becomes available. The area within the proposed lease area would remain unsuitable for livestock grazing due to steep slopes.
Continued grazing under an approved allotment management plan. Vegetative treatment projects are needed to maintain desired condition of aspen.	Indefinite	Continued conifer encroachment into quaking aspen will result in a reduction of available forage unless conifer reductions projects are initiated. Increased competition for forage between wildlife and livestock could occur. Riparian conditions are expected to be maintained.
Noxious weed treatment will continue indefinitely.	Indefinite	Noxious weed infestations are increasing; however, biological agents are expected to reduce stand densities.

IV. Timber		
Fuels reduction burning from Nuck Woodard Canyon to Tie Fork Canyon. The proposal is to do a staged burn in beetle-kill areas totaling approx. 1,000 acres over 3-4 years. The purpose is to avoid a catastrophic wildfire in the dead timber.	2010-2014	Beneficial effects are reducing fuels build up in conifer stands.

V. Surface Structures		
None planned at this time.	NA	NA

VI. Transportation		

Road maintenance. See Energy/Minerals above.	Indefinite	Continued sediment production from native surface roads even with annual maintenance.
Potential construction of new roads on private lands for access to new cabins. (See Recreation).	Indefinite	See Recreation
Reconstruction and gravel surfacing of South Trough Springs Road (FR 50018). See Minerals Section	2001-Indefinite	Decreased erosion and sediment production from roadway. Road surface stabilized by gravel surface. Road closed from December 1 through July 5th.

VII. Visuals		
See Energy/Minerals, above.	Indefinite	Short Term - Development activity impacts as discussed above. Long Term – Effects consistent with Forest Plan VQOs.

VIII. Wildlife		
There are no on-going wildlife habitat improvement projects in the Castle Valley Ridge area.	NA	NA

APPENDIX C
FS AND BLM COAL LEASE STIPULATIONS

1. The Regulatory Authority shall mean the State Regulatory Authority pursuant to a cooperative agreement approved under 30 CFR Part 745 or in the absence of a cooperative agreement, Office of Surface Mining. The authorized officer shall mean the State Director, Bureau of Land Management. The authorized officer of the Surface Management Agency shall mean the Forest Supervisor, Forest Service. Surface Management Agency for private surface is the Bureau of Land Management. For adjoining private lands with Federal minerals and which primarily involve National Forest Service issues, the Forest Service will have the lead for environmental analysis and, when necessary, documentation in an environmental assessment or environmental impact statement.

2. The authorized officers, of the Bureau of Land Management, Office of Surface Mining (Regulatory Authority), and the Surface Management Agency (Forest Service) respectively, shall coordinate, as practical, regulation of mining operations and associated activities on the lease area.

3. In accordance with Sec. 523(b) of the "Surface Mining Control and Reclamation Act of 1977," surface mining and reclamation operations conducted on this lease are to conform with the requirements of this Act and are subject to compliance with the Office of Surface Mining Regulations, or as applicable, a Utah program equivalent approved under cooperative agreement in accordance with Sec. 523(c). The United States Government does not warrant that the entire tract will be susceptible to mining.

4. Federal Regulations 43 CFR 3400 pertaining to Coal Management make provisions for the Surface Management Agency, the surface of which is under the jurisdiction of any Federal agency other than the Department of Interior, to consent to leasing and to prescribe conditions to insure the use and protection of the lands. All or part of this lease contain lands the surface of which are managed by the United States Department of Agriculture, Forest Service Manti-La Sal National Forest.

The following stipulations pertain to the lessee responsibility for mining operations on the lease area and on adjacent areas as may be specifically designated on the National Forest System lands.

5. Before undertaking activities that may disturb the surface of previously undisturbed leased lands, the lessee may be required to conduct a cultural resource inventory and a paleontological appraisal of the areas to be disturbed. These studies shall be conducted by qualified professional cultural resource specialists or qualified paleontologists, as appropriate, and a report prepared itemizing the findings. A plan will then be submitted making recommendations for the protection of, or measures to be taken to mitigate impacts for identified cultural or paleontological resources.

If cultural resources or paleontological remains (fossils) of significant scientific interest are discovered during operations under this lease, the lessee prior to disturbance shall, immediately bring them to the attention of the appropriate authorities. Paleontological remains of significant scientific interest do not include leaves, ferns, or dinosaur tracks commonly encountered during underground mining operations.

The cost of conducting the inventory, preparing reports, and carrying out mitigating measures shall be borne by the lessee.

6. If there is reason to believe that threatened or endangered (T&E) species of plants or animals, or migratory bird species of high Federal interest occur in the area the lessee shall be required to conduct an intensive field inventory of the area to be disturbed and/or impacted. The inventory shall be conducted by a qualified specialist and a report of findings will be prepared. A plan will be prepared making recommendations for the protection of these species or action necessary to mitigate the disturbance.

The cost of conducting the inventory, preparing reports, and carrying out mitigating measures shall be borne by the lessee.

7. The lessee shall be required to perform a study to secure adequate baseline data to quantify the existing surface resources on and adjacent to the lease area. Existing data may be used if such data is adequate for the intended purposes. The study shall be adequate to locate, quantify, and demonstrate the inter-relationship of the geology, topography, surface hydrology, vegetation, and wildlife. Baseline data will be established so that future programs of observation can be incorporated at regular intervals for comparison.

8. Powerlines used in conjunction with the mining of coal from this lease shall be constructed so as to provide adequate protection for raptors and other large birds. When feasible, powerlines will be located at least 100 yards from public roads.

9. The limited area available for mine facilities at the coal outcrop, steep topography, adverse winter weather, and physical limitations on the size and design of the access road, are factors which will determine the ultimate size of the surface area utilized for the mine. A site specific environmental analysis will be prepared for each new mine site development and for major modifications to existing developments to examine alternatives and mitigate conflicts.

10. Consideration will be given to site selection to reduce adverse visual impacts. Where alternative sites are available, and each alternative is technically feasible, the alternative involving the least damage to the scenery and other resources shall be selected. Permanent structures and facilities will be designed, and screening techniques employed, to reduce visual impacts, and where possible achieve a final landscape compatible with the natural surroundings. The creation of unusual, objectionable, or unnatural land forms and vegetative landscape features will be avoided.

11. The lessee shall be required to establish a monitoring system to locate, measure, and quantify the progressive and final effects of underground mining activities on the topographic surface, underground and surface hydrology and vegetation. The monitoring system shall utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a number of points over the lease area. The monitoring shall incorporate and be an extension of the baseline data.

12. The lessee shall provide for the suppression and control of fugitive dust on haul roads and at coal handling and storage facilities. On Forest Development Roads (FDR), lessees may perform their share of road maintenance by a commensurate share agreement if a significant degree of traffic is generated that is not related to their activities.

13. Except at specifically approved locations, underground mining operations shall be conducted in such a manner so as to prevent surface subsidence that would: (1) cause the creation of hazardous conditions such as potential escarpment failure and landslides, (2) cause damage to existing surface structures, or (3) damage or alter the flow of perennial streams. The lessee shall provide specific measures for the protection of escarpments, and determine corrective measures to assure that hazardous conditions are not created.

14. In order to avoid surface disturbance on steep canyon slopes and to preclude the need for surface access, all surface breakouts for ventilation tunnels shall be constructed from inside the mine, except at specifically approved locations.

15. If removal of timber is required for clearing of construction sites, etc., such timber shall be removed in accordance with the regulations of the surface management agency.

16. The coal contained within, and authorized for mining under this lease, shall be extracted only by underground mining methods.

17. Existing Forest Service owned or permitted surface improvements will need to be protected, restored, or replaced to provide for the continuance of current land uses.

18. In order to protect big game wintering areas, elk calving and deer fawning areas, sagegrouse strutting areas, and other critical wildlife habitat and/or activities, specific surface uses outside the mine development area may be curtailed during specific periods of the year.

19. Support facilities, structures, equipment, and similar developments will be removed from the lease area within 2 years after the final termination of use of such facilities. This provision shall apply unless the requirement of Section 10 of the lease form is applicable. Disturbed areas and those areas previously occupied by such facilities will be stabilized and rehabilitated, drainages reestablished, and the areas returned to a pre-mining land use.

20. The lessee at the conclusion of the mining operations, or at other times as surface disturbance related to mining may occur, will replace all damaged, disturbed, or displaced corner monuments (section corners, quarter corners, etc.) their accessories and appendages

(witness trees, bearing trees, etc.) or restore them to their original condition and location, or at other locations that meet the requirements of the rectangular surveying system. This work shall be conducted at the expense of the lessee, by a professional land surveyor registered in the State of Utah and to the standards and guidelines found in the manual of surveying instruction, U.S. Department of Interior.

21. The lessee at his expense will be responsible to replace any surface water identified for protection, that may be lost or adversely affected by mining operations, with water from an alternate source in sufficient quantity and quality to maintain existing riparian habitat, fishery habitat, livestock and wildlife use, or other land uses.

22. The lessee must comply with all the rules and regulations of the Secretary of Agriculture set forth at Title 36, Chapter II, of the Code of Federal Regulations governing the use and management of the National Forest System (NFS) when not inconsistent with the rights granted by the Secretary of the Interior in the lease. The Secretary of Agriculture's rules and regulations must be complied with for (1) all use and occupancy of the NFS prior to approval of a permit/operation plan by the Secretary of Interior, (2) uses of all existing improvements, such as Forest Development Roads, within and outside the area licensed, permitted or leased by the Secretary of Interior, and (3) use and occupancy of the NFS not authorized by a permit/operation plan approved by the Secretary of the Interior.

All matters related to this stipulation are to be addressed to :

Forest Supervisor
Manti-La Sal National Forest
599 West Price River Drive
Price, Utah 84501
Telephone No.: (435) 637-2817

who is the authorized representative of the Secretary of Agriculture.

APPENDIX D
SPECIAL FOREST SERVICE STIPULATIONS REGARDING COMPLIANCE WITH THE NATIONAL HISTORIC PRESERVATION ACT

1. **Monitoring of Subsidence.** CO-OP will conduct annual subsidence monitoring of National Forest System Lands (NFS) throughout the life of the mine. Should subsidence occur, CO-OP will provide an accurate map of the entire subsidence area. CO-OP will ensure that a qualified archaeologist will then examine the location of the subsidence area relative to previous inventories and known sites within fifteen (15) working days of the identification of the subsidence. Depending on the location of subsidence in relation to previous inventories and known sites, the following stipulations will apply (to each subsidence event):

    a. **Previously Inventoried and No Sites.** If subsidence occurs on NFS lands within an area that has undergone previous archaeological inventory, and no sites are present within the area of subsidence, or no sites eligible to the National Register of Historic Places are present in the area of subsidence, no further work will need to be done. CO-OP or their consulting archaeologist will notify the U.S. Forest Service (USFS) regarding this determination within fifteen (15) working days of making the determination. The USFS will provide the information to SHPO.

    b. **Previously Inventoried and Known Sites.** If subsidence occurs on NFS lands within an area that has undergone previous archaeological inventory, and known archaeological sites, previously determined eligible to the National Register of Historic Places are present in the subsidence area, CO-OP will have a qualified archaeologist examine the effects of subsidence upon the site(s) in question within fifteen (15) working days of making this determination. The archaeologist will provide a report, for review by the USFS in a timely manner that makes recommendations regarding whether or not the effects of subsidence are adverse. The USFS will make a final determination of the effects of subsidence. The USFS will then consult with the SHPO regarding the effects determination. If the effect is determined to be adverse, procedures following 36CFR800.6 and the stipulations below regarding evaluation and archaeological treatment will be followed.

    c. **Not Previously Inventoried.** If subsidence occurs on NFS lands within an area that has not undergone previous archaeological inventory, CO-OP will have a qualified archaeologist conduct a field examination of the subsidence area within fifteen (15) working days of making this determination (in consultation with the USFS and SHPO). Depending on

the presence or absence of sites in the subsidence area, the following stipulations will apply (to each subsidence event):

i. **No Sites.** If no sites are present within the area of subsidence, the archaeologist will make a recommendation of No Historic Properties Affected to the USFS in a timely manner. The USFS will make a final determination of the effects of subsidence. The USFS will then consult with the SHPO regarding the effects determination per 36CFR800.4(c).

ii. **Newly Discovered Sites.** If a site or sites are found within the area of subsidence, the archaeologist will provide a report and make recommendations of eligibility and effect to the USFS (per 36CFR800.4(c)(2) and 36CFR800.5) regarding the site(s) and subsidence effects on the site(s) in a timely manner. The USFS will make a final determination of eligibility of the site(s) and the effects of subsidence on the site(s). The USFS will then consult with the SHPO regarding the effects determination. If the effect to any site eligible to the National Register of Historic Places is determined to be adverse, procedures following 36CFR800.6 and the stipulations below regarding evaluation and archaeological treatment will be followed.

d. **Time Lines.** In all cases SHPO and the Tribes will be afforded thirty (30) calendar days following receipt of reports/consultation requests to respond.

e. **Conducting Consultation.** The USFS will consult with tribes, SHPO, and the Utah Division of Oil, Gas and Mining (UDOGM) during this process at a level appropriate to the nature of the resources (if any) and effects to the resources (if any) taking into account comments and concerns received previously from the tribes and consulting parties.

2. **Discoveries in Area of Potential Effect (APE).** Should unanticipated cultural or historic resources be observed within the APE during, but not limited to, CO-OP's quarterly ground-water monitoring, annual subsidence monitoring, OGM's field visits, construction of any mine-related structures or features, future archeological surveys conducted within the permit area, or otherwise brought to USFS attention, CO-OP will halt any work within the vicinity of the discovery that could harm the discovery and notify the USFS within 24 hours of the discovery. CO-OP will also protect the site. The USFS will notify SHPO of said resources within seven (7) days of resource discovery. If determined appropriate, the USFS will require CO-OP to record the discovery, conduct additional evaluations as necessary, and provide correlating reports. The USFS will make determinations of eligibility and effect regarding the discovery.

a. **No Historic Properties Affected or No Adverse Effects.** If a determination of No Historic Properties Affected or No Adverse Effects is made, the USFS will consult with the SHPO regarding the determination following 36CFR800.4-5.

b. **Adverse Or Potentially Adverse**. If effects to a site that is determined via this process to be eligible to the National Register of Historic Places are determined adverse or potentially adverse, the USFS, CO-OP and SHPO will reconvene to recommend and draft appropriate measures to avoid, minimize, or mitigate adverse effects.

c. **Time Lines.** In all cases SHPO and the Tribes will be afforded thirty (30) calendar days following receipt of reports/consultation requests to respond.

d. **Conducting Consultation.** The USFS will consult with tribes, SHPO, and UDOGM during this process at a level appropriate to the nature of the resources (if any) and effects to the resources (if any) taking into account comments and concerns received previously from the tribes and consulting parties.

3. **Funding of Work.** CO-OP will fund and implement any future and all cultural or historic resources fieldwork, analysis, and monitoring, required under these stipulations.

APPENDIX E
HYDROLOGIC DATA

Table 1 – Springs In The Mining Plan Modification Area

Section	Spring ID	Description	Geology	Likely Recharge Mechanism	Seams Mined, Overburden Depth, Subsidence Zone	Tributary To
24	16-7-24-3	Upper Bear Cyn Seep Ledge	Ksp/Kbh	combined fracture-matrix flow	At coal seam outcrop	Bear Cyn
24	16-7-24-5	Bear Cyn Upper RF Seep	Ksp/Kbh	combined fracture-matrix flow	At coal seam outcrop	Bear Cyn
24	SBC-17 (16-7-24-4)	Spring by waterfall	Ksp/Kbh	combined fracture-matrix flow	At coal seam outcrop	Bear Cyn
24	SBC-14 (WHR-6)	Bear Cyn RF Spring	Ksp/Kbh	combined fracture-matrix flow	Below coal seam outcrop	Bear Cyn
13	16-7-13-1		Tw/Kp	combined fracture-matrix flow	No mining, no subsidence	Bear Cyn
13	16-7-13-1 (SBC-12)		Tw	combined fracture-matrix flow	No mining, no subsidence	Bear Cyn
13	FBC-12	Bear Creek Landslide Spring	Tw	combined fracture-matrix flow	No mining, no subsidence	Bear Cyn
24	SBC-15 (WHR-5)	Wild Horse Ridge Spring #1	Tw	combined fracture-matrix flow	One seam mined, 1200 ft, deformation	Bear Cyn
13	SBC-22		Tw	combined fracture-matrix flow	One seam mined, 1400 ft, deformation	Bear Cyn
19	SBC-16B		Tw/Kp	combined fracture-matrix flow	One seam mined, 1100 ft, deformation	L F Fish C
19	SBC-16 (WHR-4)	Wild Horse Ridge Spring #2	Tw	combined fracture-matrix flow	One seam mined, 1200 ft, deformation	L F Fish C
19	SBC-16A		Tw/Kp	combined fracture-matrix flow	One seam mined, 1200 ft, deformation	L F Fish C
18	16-8-18-2		Tw	combined fracture-matrix flow	Two seams mined, 1200 ft, deformation	L F Fish C
18	SBC-18 WHR-2)	Long Point Spring #1	Tw	combined fracture-matrix flow	Two seams mined, 1200 ft, deformation	L F Fish C
18	SBC-19 (WHR-3)	Long Point Spring #2	Tw	combined fracture-matrix flow	Two seams mined, 1200 ft, deformation	L F Fish C
18	SBC-21 (16-8-18-1)		Tw	combined fracture-matrix flow	Two seams mined, 1200 ft, deformation	L F Fish C
18	16-8-18-4	Head of LF Fish Creek	Tw	combined fracture-matrix flow	Two seams mined, 1400 ft, deformation	L F Fish C
18	SBC-20		Tw	combined fracture-matrix flow	Two seams mined, 1400 ft, deformation	L F Fish C
12	SMH-5		Tw	combined fracture-matrix flow	No mining, no subsidence	McCadde
14	FBC-3		Kp	fracture flow	No mining, no subsidence	McCadde
11	FBC-6A		Tw	combined fracture-matrix flow	No mining, no subsidence	McCadde
11	FBC-6B		Tw	combined fracture-matrix flow	No mining, no subsidence	McCadde
11	SMH-1 (FBC-6)	McCadden Hollow LF Spring	Tw	combined fracture-matrix flow	No mining, no subsidence	McCadde
11	SMH-2 (FBC-5)	McCadden Hollow LF Trough	Tw	combined fracture-matrix flow	No mining, no subsidence	McCadde

Section	Spring ID	Description	Geology	Likely Recharge Mechanism	Seams Mined, Overburden Depth, Subsidence Zone	Tributary To
11	SMH-3 (FBC-13)	McCadden/Trail Ridge Spring	Tw	combined fracture-matrix flow	No mining, no subsidence	McCadde
14	FBC-2		Kp/Tw	combined fracture-matrix flow	No mining, no subsidence	McCadde
12	WR-2		Tw	combined fracture-matrix flow	One seam mined, 1600 ft, deformation	McCadde
12	SMH-4 (FBC-4)	McCadden Hollow Spring	Tw	combined fracture-matrix flow	One seam mined, 1200 ft, deformation	McCadde
12	16-7-12-6	McCadden Hollow RF Spring	Tw	combined fracture-matrix flow	One seam mined, 1400 ft, deformation	McCadde
20	16-8-20-1 (SCC-1)		Tw/Kp	combined fracture-matrix flow	No mining, no subsidence	R F Fish C
18	16-8-18-5 (SCC-2)	Fish Creek RF Spring	Tw	combined fracture-matrix flow	One seam mined, 1200 ft, deformation	R F Fish C
7	FC-5	Mud Spring	Tw	combined fracture-matrix flow	One seam mined, 1300 ft, deformation	R F Fish C
7	WR-4		Tw	combined fracture-matrix flow	One seam mined, 1400 ft, deformation	R F Fish C
7	16-8-7-3 (SCC-5)	Gentry Mtn Drainage Spring	Tw	combined fracture-matrix flow	One seam mined, 1500 ft, deformation	R F Fish C
12	WR-3		Tw	combined fracture-matrix flow	One seam mined, 1600 ft, deformation	R F Fish C
10	FBC-8	Upper Trail Cyn Spring	Tw	combined fracture-matrix flow	No mining, no subsidence	Trail Cyn
10	FBC-9		Tw	combined fracture-matrix flow	No mining, no subsidence	Trail Cyn
10	WR-1		Tw	combined fracture-matrix flow	No mining, no subsidence	Trail Cyn
11	FBC-7	Trail Cyn Water Trough Spring	Tw	combined fracture-matrix flow	No mining, no subsidence	Trail Cyn
6	16-8-6-1 (SCC-6)	Cedar Creek Spring	Tw	combined fracture-matrix flow	No mining, no subsidence	Unnamed
10	FBC-11		Kc/Kp	fracture flow	No mining, no subsidence	Unnamed

Geology: Tw – North Horn, Kp – Price River, Kc – Castlegate, Kbh – Black Hawk, Ksp – Star Point

Information from proponent-provided maps (Plates 7-4, 6-1, 6-2, 5-3A) And DOGM coal database.

Table 2 – Stream Segments In The Mining Plan Modification Area and Downstream

Stream Segment (from headwater origin downstream)	**Flow Regime**	**Geology**	**Seams Mined, Overburden Depth, Subsidence Zone**
Left Fork Fish Creek, headwaters on Gentry Mtn	Intermittent	Tw	No mining, no subsidence
Left Fork Fish Creek, headwaters on Gentry Mtn	Perennial	Tw	Two seams mined, 1200-1400 ft, deformation
Left Fork Fish Creek, escarpment	Perennial	Kp/Kc	Two seams mined, 600-1000 ft, deformation
Left Fork Fish Creek, foot-slopes	Perennial	Kbh	No mining, no subsidence
Right Fork Fish Creek, headwaters on Gentry Mtn	Intermittent	Tw	Two seam mined, 1000 –1400 ft, deformation
Right Fork Fish Creek, escarpment	Perennial	Kp/Kc	Two seams mined, 500-800 ft, deformation
Right Fork Fish Creek, foot-slopes	Perennial	Kbh	No mining, no subsidence
Bear Canyon	Perennial	Kp/Kc/Kbh	No mining, no subsidence
McCadden Hollow	Intermittent	Tw	One seam mined, 1000-1300 ft, deformation
Cedar Creek			No mining, no subsidence

Information from proponent-provided maps

Table 3
Water Monitoring Matrix
Operational Phase of Mining

Streams	Month						
	Feb	May	June	July	Aug	Sept	Oct
BC-1, Upper Bear Creek	oper[1]	oper	field[2]	field	oper	field	oper
BC-2, Lower Bear Creek	oper	oper	field	field	oper	field	oper
BC-3, Lower Right Fork Bear Creek	oper	oper	field	field	oper	field	oper
BC-4, Upper Right Fork Bear Creek	oper	oper	field	field	oper	field	oper
CK-1, Upper Cedar Creek	oper	oper	field	field	oper	field	oper
CK-2, Lower Cedar Creek	oper	oper	field	field	oper	field	oper
MH-1, Lower McCadden Hollow Creek		field		field	field		field
MH-2, Upper McCadden Hollow Creek		field		field	field		field
FC-1, Lower Left Fork Fish Creek		field		field	field		field
FC-2, Lower Right Fork Fish Creek		field		field	field		field
FC-3, Right Fork Fish Creek Property Line		field		field	field		field
FC-4, Upper Right Fork Fish Creek		field		field	field		field
FC-5, Mud Spring		field		field	field		field
FC-6, Upper Left Fork Fish Creek		field		field	field		field
FC-7, Water Right Upper LF Fish Creek		field		field	field		field
FC-8, Water Right Upper LF Fish Creek		field		field	field		field

Springs	Month						
	Feb	May	June	July	Aug	Sept	Oct
SBC-3, Right Fork Bear Creek Well	oper	oper			oper		oper
SBC-4, Big Bear Spring	oper	oper			oper		oper
SBC-5, Birch Spring	oper	oper			oper		oper
SBC-9A, Hiawatha Seam	oper	oper			oper		oper
SBC-12, 16-7-13-1		field		field	field		field
SBC-14, WHR-6	oper	oper			oper		oper
SBC-15, WHR-5		field		field	field		field
SBC-16, WHR-4		field		field	field		field
SBC-16A		field		field	field		field
SBC-16B		field		field	field		field
SBC-17, 16-7-24-4	oper	oper			oper		oper
SBC-18, WHR-2		field		field	field		field
SBC-20, 16-8-16-4		field		field	field		field
SBC-21, 16-8-18-1		field		field	field		field
SBC-22, Stockwater Trough		field		field	field		field
SBC-23, FBC-12		field		field	field		field
SCC-1, 16-8-20-1		field		field	field		field
SCC-2, 16-8-15-5		field		field	field		field
SCC-3, Mohrland Portal		field		field	field		field
SCC-4, 16-8-7-3		field		field	field		field
SMH-1, FBC-6		field		field	field		field
SMH-2, FBC-5		field		field	field		field
SMH-3, FBC-13		field		field	field		field
SMH-4, FBC-4		field		field	field		field
SMH-5, Stockwater Trough		field		field	field		field

Wells	Month						
	Feb	May	June	July	Aug	Sept	Oct
SDH-2, Sec 11, T16S, R7E		level		level	level	level	level
SDH-3, Sec 10, T16S, R7E		level		level	level	level	level
MW-114, Sec 18, T16S, R8E		level		level	level	level	level
MW-117, Sec 12, T16S, R8E		level		level	level	level	level

1, 2: Operational and field testing parameters for water quality are listed in Tables 3-3 and 3-4.

Table 4

Surface Water Monitoring
Baseline Collection

Site	Baseline Monitoring Start Date
BC-1, Upper Bear Creek	September 2, 1980
BC-2, Lower Bear Creek	September 2, 1980
BC-3, Lower Right Fork Bear Creek	January 5, 1987
BC-4, Upper Right Fork Bear Creek	February 29, 2000
CK-1, Upper Cedar Creek	June 9, 1994
CK-2, Lower Cedar Creek	June 9, 1994
MH-1, Lower McCadden Hollow Creek	July 31, 1991
MH-2, Upper McCadden Hollow Creek	May, 2007
FC-1, Lower Left Fork Fish Creek	June 9, 1994
FC-2, Lower Right Fork Fish Creek	July 31, 1991
FC-3, Right Fork Fish Creek Property Line	May, 2007
FC-4, Upper Right Fork Fish Creek	May, 2007
FC-5, Mud Spring	May, 2007
FC-6, Upper Left Fork Fish Creek	May, 2007
FC-7, Water Right Upper LF Fish Creek	May, 2007
FC-8, Water Right Upper LF Fish Creek	May, 2007

Ground Water Monitoring
Baseline Collection

Site	Baseline Monitoring Start Date
SBC-3, Creek Well	January 5, 1987
SBC-4, Big Bear Spring	January 5, 1987
SBC-5, Birch Spring	July 24, 1986
SBC-9A, Hiawatha Seam	September 25, 2002
SBC-12, 16-7-13-1	June 8, 1994
SBC-14, WHR-6	October 26, 1993
SBC-15, WHR-5	October 27, 1992
SBC-16, WHR-4	March 22, 1993
SBC-16A	May, 2007
SBC-16B	May, 2007
SBC-17, 16-7-24-4	May 22, 2000
SBC-18, WHR-2	March 22, 1993
SBC-20, 16-8-16-4	June 8, 1994
SBC-21, 16-8-18-1	June 8, 1994
SBC-22, Stockwater Trough	May, 2007
SBC-23, FBC-12	March 22, 1993
SCC-1, 16-8-20-1	June 8, 1994
SCC-2, 16-8-15-5	June 8, 1994
SCC-3, Mohrland Portal	January 19, 1979
SCC-4, 16-8-7-3	June 8, 1994
SMH-1, FBC-6	October 13, 1992
SMH-2, FBC-5	October 13, 1992
SMH-3, FBC-13	August 29, 1993
SMH-4, FBC-4	October 13, 1992
SMH-5, Stockwater Trough	May, 2007

Table 5
Surface Water Quality Parameters

Field Measurements

- ♦ ♠ Water Levels or Flow
- ♦ ♠ pH
- ♦ ♠ Specific Conductivity (μmhos/cm)
- ♦ ♠ Temperature (C)
- ♦ ♠ Dissolved Oxygen (ppm) (Perennial streams only)

Laboratory Measurements: (mg/l) (ions and trace elements to be analyzed in dissolved form only)

- ♦ ♠ Total Settleable Solids
- ♦ ♠ Total Suspended Solids
- ♦ ♠ Total Dissolved Solids
- ♦ ♠ Total Hardness (as $CaCO_3$)
- ♠ Aluminum (Al)
- ♠ Arsenic (As)
- ♠ Boron (B)
- ♦ ♠ Carbonate (CO_3^{-2})
- ♦ ♠ Bicarbonate (HCO_3^-)
- ♠ Cadmium (Cd)
- ♦ ♠ Calcium (Ca)
- ♦ ♠ Chloride (Cl^-)
- ♠ Copper (Cu)
- ♦ ♠ Iron (Fe) (Total and Dissolved)
- ♠ Lead (Pb)
- ♦ ♠ Magnesium (Mg)
- ♦ ♠ Manganese (Mn) (Total and Dissolved)
- ♠ Molybdenum (Mo)
- ♠ Nitrogen: Ammonia (NH_3)
- ♠ Nitrite (NO_2)
- ♠ Nitrate (NO_3^-)
- ♦ ♠ Potassium (K)
- ♠ Phosphate (PO_4^{-3})
- ♠ Selenium (Se)
- ♦ ♠ Sodium (Na)
- ♦ ♠ Sulfate (SO_4^{-2})
- ♠ Zinc (Zn)
- ♦ ♠ Oil and Grease
- ♦ ♠ Cation-Anion Balance

Sampling Period:

- ♦ Operational and Postmining phases
- ♠ Baseline data collection

Table 6
Ground Water Quality Parameters

Field Measurements

- ♦ ♠ Water Levels or Flow
- ♦ ♠ pH
- ♦ ♠ Specific Conductivity (μmhos/cm)
- ♦ ♠ Temperature (C)

Laboratory Measurements: (mg/l) (ions and trace elements to be analyzed in dissolved form only)

- ♦ ♠ Total Dissolved Solids
- ♦ ♠ Total Hardness (as $CaCO_3$)
- ♠ Aluminum (Al)
- ♠ Arsenic (As)
- ♠ Boron (B)
- ♦ ♠ Carbonate (CO_3^{-2})
- ♦ ♠ Bicarbonate (HCO_3^-)
- ♠ Cadmium (Cd)
- ♦ ♠ Calcium (Ca)
- ♦ ♠ Chloride (Cl^-)
- ♠ Copper (Cu)
- ♦ ♠ Iron (Fe) (Total and Dissolved)
- ♠ Lead (Pb)
- ♦ ♠ Magnesium (Mg)
- ♦ ♠ Manganese (Mn) (Total and Dissolved)
- ♠ Molybdenum (Mo)
- ♠ Nitrogen: Ammonia (NH_3)
- ♠ Nitrite (NO_2)
- ♠ Nitrate (NO_3^-)
- ♦ ♠ Potassium (K)
- ♠ Phosphate (PO_4^{-3})
- ♠ Selenium (Se)
- ♦ ♠ Sodium (Na)
- ♦ ♠ Sulfate (SO_4^{-2})
- ♠ Zinc (Zn)

Sampling Period:
- ♦ Operational and Postmining phases
- ♠ Baseline data collection