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R645-301-300. BIOLOGY

310. INTRODUCTION

The following section to be submitted to the State of Utah, Division of Oil, Gas & Mining (DOGM) describes the biological resources of the Coal Hollow Project near the town of Alton, Utah. Because the area is so well studied, some of the information and data herein was gathered from previous reports and other sources. This chapter contains information including the following:

311. Vegetative, fish, and wildlife resources of the permit area and adjacent areas as described under R645-301-320.

312. Potential impacts to vegetative, fish and wildlife resources and methods proposed to minimize these impacts during coal mining and reclamation operations as described under R645-301-330 and R645-301-340.

313. Proposed reclamation designed to restore or enhance vegetative, fish, and wildlife resources to a condition suitable for the designated postmining land use as described under R645-301-340.

320. ENVIRONMENTAL DESCRIPTION

321. VEGETATION INFORMATION

321.100. Plant Communities of the Permit Area

A vegetation map has been prepared that shows the plant communities that exist within the Coal Hollow permit area (Vegetation Map, Drawing 3-1). This map was prepared using an existing map [Vegetation Community Map, Exhibit No. 6.4-1 (7/13/87), Utah International Inc. by Cedar Creek Associates, Inc.]. A new flight has been scheduled to conduct aerial photography for preparation of new maps of the project area. When these aerial photographs are available Vegetation Map, Drawing 3-1 will be updated to reflect any changes to the plant communities within the permit and adjacent areas. For example, potential changes to the communities over time may have occurred such as sagebrush communities converted to pasture lands or juniper trees encroaching into sagebrush zones.

The plant communities and map symbols present in the Coal Hollow permit area are shown on Table 3-1. Color photographs of the general Coal Hollow Project area showing all plant community types together are shown on Photographs 3-1 *through* 3-3. Photographs of each individual plant community that could be impacted by the project area are shown on Photographs 3-4 *through* 3-10. Most photographs have been inserted near the end of this chapter.

Table 3-1: Vegetation Communities of the Coal Hollow Permit Area

MAP SYMBOL (see Vegetation Map, Drawing 3-1)	PLANT COMMUNITY	TOTAL ACREAGE
SB	Sagebrush	191.06
M	Meadow	174.99
PL	Pasture Land	100.50
PJS	Pinyon-Juniper/Sagebrush	66.43
MB	Mountain Brush	58.12
PJM	Pinyon-Juniper/Mountain Brush	19.79
PJW	Pinyon-Juniper Woodland	7.50
	Total	618.39

Quantitative sampling was conducted in 1987 for most of the plant communities of the region. Because the work accomplished at that time included a much larger permit area, there were more plant communities that could have been impacted at that time. The Coal Hollow Project area is much smaller, so only the plant communities to be impacted by this project have been studied for this document. Existing vegetation data are shown on Tables 3-2 *through* 3-13. These data sets will be updated by conducting additional quantitative sampling scheduled for the 2006 field season. Following is a brief summary of each of the plant communities to be impacted by the Coal Hollow Project. The summaries were based on the quantitative data recorded in the earlier studies, as well as field work accomplished in 2005-06 where qualitative data were recorded.

Sagebrush

One of the most common plant communities of the Coal Hollow permit area was Sagebrush (see Vegetation Map, Drawing 3-1). As mentioned, the vegetation map presented in this document was based on earlier work in the Alton area. This is one community that may have changed over time because sagebrush areas are often plowed to increase pasture for livestock. The new aerial photography and vegetation survey work scheduled for 2006 will address any changes that may have occurred since the time of the earlier mapping work.

The Sagebrush community types in the permit area can be dominated by either big sagebrush (*Artemisia tridentata*) or black sagebrush (*A. nova*). In the study area chosen to sample this community both species were nearly equally represented. The photograph taken recently of this vegetation type shows the dominant species to be big sagebrush (Photograph 3-4).

The total living cover for the Sagebrush community was 54.33% [Table 3-2 (A)]. Shrubs dominated the composition representing 74.69% of the total living cover, followed by grasses at 20.29%, and forbs at 5.01% [Table 3-2 (B)]. The dominant plant species as shown in the species cover values (Table 3-3) were black sagebrush, big sagebrush, cheatgrass (*Bromus tectorum*), and squirreltail (*Elymus elymoides*).

Meadow

The Meadow areas were also quite common in the permit area (see Vegetation Map, Drawing 3-1). Some Meadow areas had more wet or mesic soil conditions when compared to the other plant communities in the Coal Hollow permit area (Photograph 3-5).

Total living cover in the Meadow community was estimated at 95.40% [Table 3-4 (A)]. Grass and grasslike species dominated the community comprising 87.07% of the living cover, followed only by forbs at 12.93% [Table 3-4 (B)]. The dominant species of the community were carices (*Carex* spp.), meadow foxtail (*Hordeum jubatum*), Sandberg's bluegrass (*Poa secunda*), and falcate aster (*Aster falcatus*). A list of the plants present in the cover transects is show on Table 3-5.

Pasture Land

Pasture Lands were often areas that had been cleared of their woody vegetation to provide more herbaceous foliage for livestock (Photograph 3-6). Some of these areas have been marginally irrigated in the past, but most were used as dryland pastures. Sub-irrigation appears to be an important component in the Pasture Lands and Meadows within the permit area.

Because these areas did not contain many native plant species or they were used for grazing, species composition and productivity would be highly viable. Quantitative sampling was not conducted in these altered plant communities.

Pinyon-Juniper/Sagebrush

A transitional community found in the Coal Hollow permit area was the Pinyon-Juniper/Sagebrush (Photograph 3-7). This community was more common than some of the communities, but still consists of relatively small areas located mostly in the northern and western areas of the permit area (see Vegetation Map, Drawing 3-1).

The total living understory of this area has been estimated at 40.40% [Table 3-6 (A)]. The understory composition was comprised of 61.39% shrubs, 17.33% trees, 16.34% forbs, 4.62% grasses, and 0.33% succulents [Table 3-6 (B)].

Table 3-7 shows that the most common plant species represented in the cover estimates were black sagebrush, Utah juniper (*Juniperus osteosperma*), big sagebrush, and desert phlox (*Phlox austromontana*). The study area where the quantitative data were taken for this Pinyon-Juniper/Sagebrush community happened to be in an area where black sagebrush was the most common shrub species; in other Pinyon-Juniper/Sagebrush communities within the permit area, big sagebrush was the dominant shrub.

Mountain Brush

A Mountain Brush community has been identified in the permit area (see Vegetation Map, Drawing 3-1). *Mountain Brush* can refer to several woody species in the Alton Amphitheater area. This is a broad community name and can be made up of different species in the community types named for it. Several woody species can be used to identify the *Mountain Brush* component of the community including scrub oak (*Quercus gambelii*), alder-leaf mountain-mahogany (*Cercocarpus montanus*), squaw-apple (*Peraphyllum ramosissimum*), and Utah serviceberry (*Amelanchier utahensis*), all of which are present in the Alton Amphitheater area. In the permit area, however, the common woody species that drives the community name was scrub oak (Photograph 3-8).

Total living cover of the Mountain Brush community was estimated to be 65.47% [Table 3-8 (A)]. As one would expect, shrubs represented the greatest proportion of the composition at 88.70% (scrub oak could be considered a small tree rather than a shrub; in this document,

however, it has been categorized as a shrub), followed distantly by grasses at 7.94%, forbs at 3.16%, and trees at 0.305% [Table 3-8 (B)].

Cover measurements by species are shown on Table 3-9. This table indicates that the most common species in the Mountain Brush community were scrub oak, big sagebrush, serviceberry, Western wheatgrass (*Elymus smithii*), snowberry (*Symphoricarpos oreophilus*), and crested wheatgrass (*Agropyron wheatgrass*).

Pinyon-Juniper/Mountain Brush

Another plant community identified in the permit area was transitional between the Pinyon-Juniper Woodland the Mountain Brush communities (Photograph 3-9). This plant community was a minor component of the acreage of the permit area (see Vegetation Map, Drawing 3-1), but it is more common in adjacent areas.

The total living cover of the Pinyon-Juniper/Mountain Brush community has been estimated at 58.87% [Table 3-10 (A)]. Shrubs were the major component of composition in this community comprising 84.71% of the total living cover, followed by trees, forbs, grasses and succulents [Table 3-10 (B)].

The Alton Amphitheater, or the entire area of which the permit area is a part, supports several plant communities that could be considered "Pinyon-Juniper/Mountain Brush". The species most common in the Pinyon-Juniper/Mountain Brush of the permit area was scrub oak. Accordingly, the most common species in the Pinyon-Juniper/Mountain Brush of the permit area were scrub oak, serviceberry, pinyon pine (*Pinus edulis*), and Utah juniper (Table 3-11).

Pinyon-Juniper Woodland

Although pinyon pine and Utah juniper trees are strong components in other plant communities in the Coal Hollow permit area, acreage is relatively small for the pure Pinyon-Juniper Woodland community (Photograph 3-10). This community is located at the extreme northern border of the permit area (see Vegetation Map, Drawing 3-1).

Total living understory cover of the Pinyon-Juniper Woodland community has been estimated at 11.93% [Table 3-12 (A)]. Of that living cover, 47.49% of it was comprised from trees, 27.92% shrubs, 22.91% forbs, and 1.12% grasses [Table 3-12(B)]. The most common species by cover of the community were pinyon pine, Utah juniper and desert phlox. For a list of the remainder of the plant species present in the samples by cover, refer to Table 3-13.

Table 3-2: Total Cover and Composition of the Sagebrush Community (SB) in the Coal Hollow Project Area.

Source: Mine Permit Application. 1987. Utah International, Inc., Alton Coal Project.

A. TOTAL COVER	PERCENT COVER
Living Cover	54.533
Bareground	22.667
Litter	22.800
Rock	0.000
Pavement	0.000
TOTAL	100.000

B. COMPOSITION	PERCENT COVER	RELATIVE COVER
Trees	0.000	0.000
Shrubs	40.732	74.694
Grasses	11.066	20.293
Forbs	2.734	5.014
Succulents	0.000	0.000
TOTAL	54.532	100.000

Table 3-3: Cover by Species of the Sagebrush Community (SB) in the Coal Hollow Project Area.

Source: Mine Permit Application. 1987. Utah International, Inc., Alton Coal Project. *Nomenclature updated using*: Welsh, S.L., N.D. Atwood, S. Goodrich, and L.C. Higgins. 2003. A Utah flora, 3rd edition, revised. Brigham Young University Press, Provo, UT.

SPECIES COVER	PERCENT COVER
TREES	
SHRUBS	
Artemisia frigida	0.333
Artemisia nova	20.066
Artemisia tridentata	18.133
Chrysothamnus nauseosus	0.333
Gutierrezia sarothrae	0.400
Peraphyllum ramosissimum	0.400
Symphoricarpos oreophilus	1.067
GRASSES	
Agropyron cristatum	1.467
Bromus tectorum	3.600
Elymus smithii	2.000
Elymus elymoides	2.933
Festuca octoflora	0.133
Koeleria macrantha	0.600
Poa pratensis	0.133
Stipa hymenoides	0.200
FORBS	
Achillea millefolium	0.800
Aster falcatus	0.200
Cirsium sp.	0.133
Erigeron canescens	0.067
Helianthella parryi	0.200
Lactuca sp.	0.067
Lappula occidentalis	0.400
Phlox austromontana	0.067
Salsola tragus	0.333
Sphaeralcea grossulariifolia	0.067
Taraxacum officinale	0.267
SUCCULENTS	0.000
TOTAL	54.399

Table 3-4: Total Cover and Composition of the Meadow Community (M) in the Coal Hollow Project Area.

Source: Mine Permit Application. 1987. Utah International, Inc., Alton Coal Project.

A. TOTAL COVER	PERCENT COVER	
Living Cover	95.400	
Bareground	1.467	
Litter	3.133	
Rock	0.000	
Pavement	0.000	
TOTAL	100.000	

B. COMPOSITION	PERCENT COVER	RELATIVE COVER
Trees	0.000	0.000
Shrubs	0.000	0.000
Grasses	83.067	87.072
Forbs	12.333	12.928
Succulents	0.000	0.000
TOTAL	95.400	100.000

Table 3-5: Cover by Species of the Meadow Community (M) in the Coal Hollow Project Area.

Source: Mine Permit Application. 1987. Utah International, Inc., Alton Coal Project. *Nomenclature updated using*: Welsh, S.L., N.D. Atwood, S. Goodrich, and L.C. Higgins. 2003. A Utah flora, 3rd edition, revised. Brigham Young University Press, Provo, UT.

SPECIES COVER	PERCENT COVER
TREES	
SHRUBS	
GRASSES	
Carex sp.	33.866
Elymus sp.	0.067
Elymus trachycaulum	0.267
Elymus hispidus	1.067
Elymus junceus	0.533
Hordeum jubatum	16.533
Iris missouriensis	0.667
Juncus sp.	2.200
Juncus arcticus	12.000
Phleum pratensis	2.467
Poa secunda	8.800
Poa pratensis	4.067
Scirpus americanus	0.200
Sporobolus airoides	0.333
FORBS	
Achillea millefolium	0.800
Aster falcatus	8.333
Melilotus officinalis	2.067
Plantago sp.	0.553
Trifolium sp.	0.133
Unidentifiable	0.467
SUCCULENTS	0.000
TOTAL	95.420

Table 3-6: Total Cover and Composition of the Pinyon-Juniper/Sagebrush Community (PJS) in the Coal Hollow Project Area.

Source: Mine Permit Application. 1987. Utah International, Inc., Alton Coal Project.

A. TOTAL COVER	PERCENT COVER
Living Cover	40.400
Bareground	29.000
Litter	26.933
Rock	2.200
Pavement	1.467
TOTAL	100.000

B. COMPOSITION	PERCENT COVER	RELATIVE COVER
Trees	7.000	17.327
Shrubs	24.800	61.386
Grasses	1.867	4.621
Forbs	6.600	16.337
Succulents	0.133	0.329
TOTAL	40.400	100.000

Table 3-7: Cover by Species of the Pinyon-Juniper/ Sagebrush Community (PJS) in the Coal Hollow Project Area.

Source: Mine Permit Application. 1987. Utah International, Inc., Alton Coal Project. *Nomenclature updated using*: Welsh, S.L., N.D. Atwood, S. Goodrich, and L.C. Higgins. 2003. A Utah flora, 3rd edition, revised. Brigham Young University Press, Provo, UT.

SPECIES COVER	PERCENT COVER
TREES	
Juniperus osteosperma	5.200
Pinus edulis	1.800
SHRUBS	
Amelanchier utahensis	1.133
Artemisia nova	14.000
Artemisia tridentata	4.467
Gutierrezia sarothrae	0.533
Peraphyllum ramosissimum	2.733
Purshia tridentata	0.733
Quercus gambellii	1.200
GRASSES	
Bromus tectorum	0.133
Elymus smithii	0.067
Elymus elymoides	1.600
Poa secunda	0.067
FORBS	
Astragalus megacarpus	0.200
Astragalus wizlensia	0.067
Clarkia sp.	0.133
Cymopterus purpureus	0.067
Erigeron caespitosus	1.133
Eriogonum sp.	0.333
Lappula occidentalis	0.133
Lappula redowskii	0.533
Lycopodium sp.	0.133
Phlox austromontana	3.067
Salsola tragus	0.200
Sphaeralcea coccinea	0.600
SUCCULENTS	
Opuntia polyacantha	0.133
TOTAL	40.398

Table 3-8: Total Cover and Composition of the Mountain Brush Community (MB) in the Coal Hollow Project Area.

Source: Mine Permit Application. 1987. Utah International, Inc., Alton Coal Project.

A. TOTAL COVER	PERCENT COVER	
Living Cover	65.467	
Bareground	6.133	
Litter	28.067	
Rock	0.333	
Pavement	0.000	
TOTAL	100.000	

B. COMPOSITION	PERCENT COVER	RELATIVE COVER
Trees	0.200	0.305
Shrubs	58.066	88.695
Grasses	5.200	7.943
Forbs	2.001	3.057
Succulents	0.000	0.000
TOTAL	65.467	100.000

Table 3-9: Cover by Species of the Mountain Brush Community (MB) in the Coal Hollow Project Area.

Source: Mine Permit Application. 1987. Utah International, Inc., Alton Coal Project. *Nomenclature updated using*: Welsh, S.L., N.D. Atwood, S. Goodrich, and L.C. Higgins. 2003. A Utah flora, 3rd edition, revised. Brigham Young University Press, Provo, UT.

SPECIES COVER	PERCENT COVER
TREES	
Juniperus osteosperma	0.133
Pinus edulis	0.067
SHRUBS	
Amelanchier utahensis	4.400
Artemisia tridentata	5.933
Cercocarpus montanus	0.067
Chrysothamnus greenii	0.067
Ephedra viridis	0.200
Prunus virginiana	0.600
Quercus gambelii	43.866
Rosa woodsii	0.333
Symphoricarpos occidentalis	2.600
GRASSES	
Agropyron cristatum	1.600
Bromus inermis	0.600
Elymus smithii	2.800
Poa pratensis	0.133
Stipa hymenoides	0.067
FORBS	
Achillea millefolium	0.067
Astragalus rotundifolia	0.133
Balsamorhiza sagittata	0.200
Erigeron pumilus	0.067
Lappula occidentalis	0.133
Lappula sp.	0.067
Medicago sativa	0.067
Phlox austromontana	0.333
Taraxacum officinale	0.067
Vicia americana	0.867
SUCCULENTS	0.000
TOTAL	65.467

Table 3-10: Total Cover and Composition of the Pinyon-Juniper Mountain Brush Community (PJM) in the Coal Hollow Project Area.

Source: Mine Permit Application. 1987. Utah International, Inc., Alton Coal Project.

A. TOTAL COVER	PERCENT COVER
Living Cover	58.867
Bareground	8.467
Litter	28.400
Rock	1.467
Pavement	2.800
TOTAL	100.001

B. COMPOSITION	PERCENT COVER	RELATIVE COVER
Trees	6.866	11.664
Shrubs	49.867	84.713
Grasses	0.467	0.793
Forbs	1.533	2.604
Succulents	0.133	0.226
TOTAL	58.866	100.000

Table 3-11: Cover by Species of the Pinyon-Juniper Mountain Brush (PJM) Community in the Coal Hollow Project Area.

Source: Mine Permit Application. 1987. Utah International, Inc., Alton Coal Project. *Nomenclature updated using*: Welsh, S.L., N.D. Atwood, S. Goodrich, and L.C. Higgins. 2003. A Utah flora, 3rd edition, revised. Brigham Young University Press, Provo, UT.

SPECIES COVER	PERCENT COVER
TREES	
Juniperus osteosperma	1.133
Pinus edulis	5.733
SHRUBS	
Amelanchier utahensis	6.267
Arctostaphylos sp.	0.067
Artemisia tridentata	2.267
Cercocarpus montanus	1.933
Peraphyllum ramosissimum	1.533
Prunus virginiana	0.200
Purshia tridentata	0.333
Quercus gambelii	35.200
Symphoricarpos occidentalis	2.067
GRASSES	
Poa pratensis	0.200
Poa secunda	0.267
FORBS	
Balsamorhiza sagittata	0.067
Cymopterus purpureus	0.067
Erigeron caespitosus	0.067
Eriogonum ovalifolium	0.067
Lupinus kingii	0.067
Lycopodium sp.	0.200
Phlox austromontana	0.533
Verbascum thapsus	0.067
Vicia americana	0.400
SUCCULENTS	
Yucca harrimaniae	0.133
TOTAL	58.868

Table 3-12: Total Cover and Composition of the Pinyon-Juniper Woodland Community (PJW) in the Coal Hollow Project Area.
Source: Mine Permit Application. 1987. Utah International, Inc., Alton Coal Project.

A. TOTAL COVER	PERCENT COVER
Living Cover	11.933
Bareground	38.466
Litter	32.600
Rock	3.933
Pavement	13.067
TOTAL	99.999

B. COMPOSITION	PERCENT COVER	RELATIVE COVER
Trees	5.667	47.486
Shrubs	3.332	27.920
Grasses	0.134	1.123
Forbs	2.734	22.909
Succulents	0.067	0.561
TOTAL	11.934	100.000

Table 3-13: Cover by Species of the Pinyon-Juniper Woodland Community (PJW) in the Coal Hollow Project Area.

Source: Mine Permit Application. 1987. Utah International, Inc., Alton Coal Project.
Nomenclature updated using: Welsh, S.L., N.D. Atwood, S. Goodrich, and L.C. Higgins. 2003. A Utah flora, 3rd edition, revised. Brigham Young University Press, Provo, UT.

SPECIES COVER	PERCENT COVER
TREES	
Juniperus osteosperma	1.400
Pinus edulis	4.267
SHRUBS	
Amelanchier utahensis	0.800
Artemisia nova	0.333
Artemisia tridentata	0.333
Cercocarpus montanus	0.200
Gutierrezia sarothrae	0.333
Peraphyllum ramosissimum	0.600
Quercus gambelii	0.400
Symphoricarpos occidentalis	0.333
GRASSES	
Elymus elymoides	0.067
Poa secunda	0.067
FORBS	
Achillea millefolium	0.067
Astragalus megacarpus	0.133
Cymopterus purpurascens	0.400
Erigeron caespitosus	0.067
Lepidium sp.	0.067
Penstemon linarioides	0.067
Phlox austromontana	1.333
Salsola tragus	0.533
Unidentifiable	0.067
SUCCULENTS	
Opuntia polyacantha	0.067
TOTAL	11.934

321.200. Productivity

Productivity measurements were recorded for the plant communities of the permit area during the same sample period as described in section 321.100 above. Production estimates for the communities at that time area shown in Table 3-14. Current annual biomass production estimates will be made by field measurements or engaging the services of a range conservationist from the USDA Natural Resources Conservation Services (NRCS) in the field season of 2006.

Table 3-14: Biomass Production of Plant Communities in the Coal Hollow Permit Area

Source: Mine Permit Application. 1987. Utah International, Inc., Alton Coal Project, Alton, Utah.

MAP SYMBOL (see Vegetation Map, Drawing 3-1)	PLANT COMMUNITY	TOTAL PRODUCTION (lbs/acre)
SB	Sagebrush	899.54
M	Meadow	2120.82
PL	Pasture Land	n/a
PJS	Pinyon-Juniper/Sagebrush	508.87
MB	Mountain Brush	1470.59
PJM	Pinyon-Juniper/Mountain Brush	1146.91
PJW	Pinyon-Juniper Woodland	33.09

322. FISH AND WILDLIFE INFORMATION

322.100. Agency Consultation and Studies Conducted

Initial consultations have been made to appropriate state and federal agencies regarding threatened, endangered, and sensitive plant and animal species and their habitats in and adjacent to the Coal Hollow permit area. A summary of this work follows.

- In 2005, a review of the Utah Heritage Program database for sensitive species in the proposed project and adjacent areas has been accomplished.
- A spreadsheet has been prepared that shows applicable notes from previous biological surveys of the area.
- Biologists from the USDA Dixie National Forest have been contacted. Life histories and analyses of the species in their forest and in close proximity to the Coal Hollow project area that have been listed as endangered, threatened, candidate, and management indicator species has been prepared to be used for project planning and agency consultations.
- Files from the offices of *Mt. Nebo Scientific, Inc.* regarding sensitive species have been consulted for the project area.
- In June 2005, a field survey for potential habitat of sensitive species within project and adjacent areas was conducted by N. Duane Atwood, Ph.D. and Patrick D. Collins, Ph.D.
- In April 2006, the Bureau of Land Management (BLM) and State of Utah, Division of Wildlife Resources (DWR) were consulted regarding the sage-grouse and habitat in the project area.
- In May 2006, a raptor survey by helicopter was conducted by *Talon Resources*, *Mt. Nebo Scientific, Inc.*, and DWR of the permit area and adjacent areas.

322.200. Site-Specific Resource Information

A review of the Utah Heritage Program database for sensitive species in the proposed mine site and adjacent areas has been accomplished. Field maps with locations of these species have been prepared and have been used for additional surveys and will continue to be used for future biological studies.

Due to the sensitivity of these species, specific location information is considered confidential and has not been submitted in this application. However, review of this information can be arranged by the regulatory authorities.

322.210. Threatened, Endangered, and Candidate Plant and Animal Species

Table 3-15 shows a list of the plant and animal species that are federally listed as threatened, endangered, or candidates for this designation for Kane County, Utah.

Table 3-15: List of Threatened, Endangered, and Candidate Plant & Animal Species in Kane County, Utah

SCIENTIFIC NAME	COMMON NAME	STATUS*
PLANTS		
Asclepias welshii	Welsh's Milkweed	T
Carex specuicola	Navajo Sedge	T
Cycladenia humilis var jonesii	Jones Cycladenia	T
Lesquerella tumulosa	Kodachrome Bladderpod	E
Pediocactus sileri	Siler Pincushion Cactus	T
ANIMALS		
Cicindela limbata albissima	Coral Pink Sand Dunes Tiger Beetle	C
Coccyzus americanus	Yellow-billed Cuckoo (possible)	C
Cynomys parvidens	Utah Prairie-dog	T
Empidonax traillii extimus	Southwestern Willow Flycatcher	E
Gila cypha	Humpback Chub (historical)	E
Gilia elegans	Bonytail (historical)	E
Gymnogypes californianus	California Condor	Exp
Haliaeetus leucocephalus	Bald Eagle	T
Oxyloma kanabense	Kanab Ambersnail	E
Ptychocheilus lucius	Colorado Pikeminnow (historical)	E
Strix occidentalis lucida	Mexican Spotted Owl	T
Xyrauchen texanus	Razorback Sucker (historical)	E

* T=Threatened, E=Endangered C=Candidate, Exp=Experimental

In summary, based on the information provided above and studies conducted to-date, no threatened or endangered species have been located in the permit area.

322.220. High Value Habitats

The State of Utah, Division of Wildlife Resources (DWR) geographic information system (GIS) database was consulted for high-value habitats. Of the species maintained on the database, important habitat of four species have been mapped by DWR within or adjacent to the Coal Hollow Project area. These habitats are described below.

First, black bear (*Ursus amercanus*) habitat was located on the east side of the permit area and continues east for some distance (Drawing 3-2). This habitat has been listed as "year-long" and classified as having "substantial" habitat by DWR.

Next, Rocky Mountain elk (*Cervus canadensis*) habitat was located in the area. "High-value" summer range was mapped throughout the entire area from the town of Alton south into Sink Valley. Additionally, year-long "substantial" habitat was located in areas southeast of the permit area (Drawing 3-3).

Mule deer (*Odocoileus hemionus*) habitat has also been mapped in the area by DWR. The habitat has been classified as "high-value" summer range and was located throughout the permit and adjacent areas (Drawing 3-4).

Finally, sage-grouse (*Centrocercus urophasianus*) habitat has been documented in the project area. DWR has mapped much of the area to be brood habitat (Drawing 3-5). Sage-grouse populations continue to be monitored in the area by DWR, Bureau of Land Management (BLM), and other biologists. The only lek in the vicinity including those areas around Alton and Sink Valley was located west of the Swapp Ranch. This lek was within the permit area boundary. A site-specific study called "*Alton Sage-Grouse Habitat Assessment and Mitigation Plan*" has been conducted for the Coal Hollow Project and has been included in this document (see **Appendix 3-1**).

322.230. Other Species or Habitats

To date, no other species or habitats have been identified through agency consultation that require special protection under state or federal law, however, if they are found through the permitting process, they will be appropriately addressed and monitored.

322.300. Fish and Wildlife Service Review

Upon request, the State of Utah, Division of Oil, Gas & Mining (DOGM) will provide the resource information required under R645-301-322 and the protection and enhancement plan required under R645-301-333 to the U.S. Fish and Wildlife Service Regional or Field Office for their review. This information will be provided within 10 days of receipt of the request from the Service.

323. Maps and Aerial Photographs

323.100. Reference Area Maps

Maps have been prepared for the Coal Hollow Project area, however, more maps will be created following new aerial photography that is scheduled for late-summer or early-fall 2006. Additionally, quantitative vegetation data has been provided for the Coal Hollow permit area (see Section 321.100); additional sampling of the plant communities in the area has been scheduled for the field season of 2006. When this sampling is conducted reference areas chosen to represent future standards of revegetation success will be selected and sampled. Once these two tasks have been completed locations of the reference areas will be shown on the new maps.

323.200. Sample Area Maps

Elevations and locations of monitoring stations used to gather data for fish and wildlife, and any special habitat features, will be delineated on the aforementioned new maps.

323.300. Protection and Enhancement of Fish & Wildlife Maps

Each facility to be used to protect and enhance fish and wildlife and related environmental values will also be represented on the new maps.

323.400. Plant Communities Map

Plant communities of the permit area have been delineated and shown on Vegetation Map, Drawing 3-1. Presently, only the plant communities of the permit area itself have been delineated. Once the new aerial flights have been conducted and new aerial photographs are available, each vegetative type and plant community, including future sample locations will be shown on the new maps with sufficient adjacent areas included to allow evaluation of vegetation as important habitat for fish and wildlife for those species identified under R645-301-322. In other words, not only the plant communities located within permit area, but those communities outside and adjacent to the it will be shown to an appropriate distance as to insure evaluation of this habitat.

330. OPERATION PLAN

331. Mine Plan & Reclamation Timing

In each mined segment, the mine plan includes redistributing subsoil and topsoil followed by seeding this segment with the final seed mix contemporaneously, or at the same time the mining begins in the next segment. The mine plan has been engineered to disturb the smallest practicable area at any one time. With prompt establishment and maintenance of vegetation, immediate stabilization of disturbed areas will minimize surface erosion. Details of the plan has been included in Chapter 5 of this document.

332. Subsidence

Because mining in the Coal Hollow Project area will be a surface operation, a certain amount of subsidence (or slight changes in elevation) is expected. This means the current elevation of the existing area may be slightly altered, but only to the depth of the coal seam harvested. Reclamation has been planned as to minimize the impact to the renewable resources identified in this section by promptly reclaiming each mine segment contemporaneously with a mixture of native plant species that will re-establish the plant communities to vegetative cover that will be diverse, effective, permanent, and consistent with the postmining land use. More details regarding subsidence has been provide in Chapter 5 of this document.

The mine plan is not expected to negatively impact the plants and wildlife in the Coal Hollow Project area. Onsite revegetation research and sage-grouse mitigation plans have been designed. Details of this work will be submitted to DOGM specialists for their comments and approval.

333. Procedures to Minimize Adverse Impacts to Fish & Wildlife

The Coal Hollow Project will minimize disturbances and adverse impacts to fish and wildlife and related environmental values during coal mining and reclamation operations. The project will comply with the Endangered Species Act of 1973 during coal mining and reclamation operations.

The location and operation of haul and access roads and support facilities will be placed to avoid or minimize impacts on important fish and wildlife species or other species protected by state or federal law. Enhancement of such resources will be achieved, where practicable. An example is provided below for sage-grouse habitat.

After consultation with appropriate agencies and biologists regarding habitats and sensitive species, the sage-grouse and its habitat were of greatest concern in the area. There has been a decreasing trend in the populations of this species since 1964 (see **Appendix 3.1** for more details). There was a general consensus among the biologists and agencies consulted that due to the: 1) marginal habitat in the Alton Amphitheater area, 2) loss of habitat in recent years for nesting and brood-rearing, and 3) relatively low population numbers in the area, that the local population of sage-grouse is vulnerable to elimination, regardless of mining activities proposed by

the Coal Hollow Project. Accordingly, the following measures to minimize impacts and enhance habitat for this species have been propose and are subject to further consideration by the operator and regulatory agencies.

Conservation Area

As mentioned previously, there was a sage-grouse lek located within the boundary of the Coal Hollow permit area. Leks are areas where the adult birds congregate for courtship and mating each year (see **Appendix 3-1**). The current roosting area for the local populations of the bird are not within the area proposed for mining. Consequently, this and another alternative areas will be protected from future mining activities. The Conservation Area will be protected and enhanced for sage-grouse habitat, with emphasis on the breeding season. In addition to the Conservation Area, many of the adjacent areas that could be protected and enhanced are located in grasslands and upper sagebrush stands along an upper terrace providing a partial visual barrier from mining activities that will occur more in the valley bottoms. Furthermore, to create an even more distinct visual barrier, subsoils from mining could be stockpiled at the ridgeline of the operations.

Short-Term Mitigation Plan

Taken directly from the "*Alton Sage-Grouse Habitat Assessment and Mitigation Plan*" (**Appendix 3-1**), the following short-term mitigation plan for sage-grouse has been proposed.

In addition to ensuring the protection of nearby grassland and shrubland for alternate breeding and nesting areas, mining activities will be minimized so that the lowest disturbance will be created during the breeding season at areas adjacent to the original lek. After mining has been completed, reclamation specialists will return the original grade and valley form to pre-disturbance conditions. Reclamation will include seeding similar plant species with comparable plant composition, structure and function as those of the original plant community. In sites used by sage-grouse for breeding and roosting that had previous livestock grazing, livestock will be used post-reclamation to maintain similar vegetation characteristics as pre-mining conditions.

Intact sagebrush stands will be avoided for storing mined subsoil and topsoil piles. Sites could be selected for storing these materials that are distant from prime sage-grouse habitat, in particular potential nesting habitat. Coal processing equipment will be located in areas that create the least possible disturbance to sage-grouse and sage-grouse habitat. Intact sagebrush sites will be cleared of all young juniper trees with the use of chainsaws or hand tools. Trees will be removed from these stands. Juniper woodlands surrounding intact stands can be cut back to increase patch size and increase the amount of area that has the potential for nest site selection by hens.

Long-Term Mitigation Plan

Taken directly from the "*Alton Sage-Grouse Habitat Assessment and Mitigation Plan*" (**Appendix 3-1**), the following long-term mitigation plan has been proposed.

A significant contribution that mining can provide for enhanced sage-grouse habitat is the removal of juniper from the Alton valley. The removal of trees during mining operations with subsequent reclamation activities will create conditions that promote grass, forb and eventually sagebrush establishment. Two years after juniper was removed from plots located in eastern Oregon, Bates et al. (2000) recorded a 200-300% in percent cover and production of herbaceous vegetation. Increased plant community vigor results from decreased competition with juniper for subsurface resources (water, nutrients) and space. As a result, transpiration rates and soil surface evaporation rates will decrease and higher soil moisture will be available for plant growth and survival. Based on anecdotal, evidence, it is also possible that spring discharge will increase and seeps and spring may emerge that were lost with initial encroachment. This would provide more sites where birds would be able to obtain water during the summer and fall months.

Removing trees from extensive areas creates greater connectivity of suitable habitat. In 2005, the BLM cleared portions of the land to increase sagebrush habitat. This improvement was beneficial for improving relatively small site conditions, however, the amount of land treated was minimal compared to the level needed to sustain the sage-grouse population in the Alton area. Long-term mining plans will remove hundreds of acres of juniper woodlands, significantly increasing conditions that are more suitable to sage-grouse nesting and post- nesting requirements. This landscape-level operation could greatly enhance sagebrush restoration objectives by the BLM that is currently limited by constrained budgets and manpower.

Over time, juniper encroachment has likely been the primary factor in isolating the Alton sage-grouse population from nearby populations. According to local sources, a sage-grouse population is located approximately 6 miles north of Alton. It is likely that migration once occurred between these populations allowing an exchange of individuals and genes between the two populations. Fragmentation of the landscape by juniper has likely resulted in minimal or no movement of birds between the two populations. Similarly, two populations that once occurred further south (near Kanab) have become locally extinct, likely due to the lack of connectivity with more northern populations. According to Fuhlendorf (2001), small populations of prairie chickens became disconnected from other larger populations with increased croplands and juniper invasion. These small populations became locally extinct due to the lack of migration and gene flow potential. Therefore, by reducing the degree of fragmentation caused by expanding juniper, the potential for migration and population sustainability is increased.

Primary brood-rearing habitat in the Alton valley is associated with alfalfa fields near the town of Alton. Birds likely utilize these areas due to the availability of forbs, insects, and water. To reduce the dependency of the birds on these areas, irrigated alfalfa fields will be created in Swapp Valley (south of the Swapp Ranch house). In addition to alfalfa, many sage-grouse forage species (forbs) will be included in the seed mix. This will increase brood-rearing habitat closer to breeding and nesting habitat. This in turn will reduce potential predation that occurs near towns by ravens, crows, cats, dogs and people. It will also reduce bird mortality associated with large-scale farming practices.

The Alton sage-grouse population will be enhanced by importing birds from nearby populations

that are relatively large and stable. Captured and relocated birds (initially 10-15) in the Alton area will increase genetic diversity as well as stabilize population numbers to offset losses associated with disease and emigration (unrelated to mining activities). Additionally, birds from the Alton population (5-10) can be trapped and released in a nearby population through the mining period. Once complete, these birds can be trapped again and returned to the original Alton population. This will ensure the survival of members of the original Alton population.

Habitat Reclamation Plan

Taken directly from the "*Alton Sage-Grouse Habitat Assessment and Mitigation Plan*" (**Appendix 3-1**), the following habitat reclamation plan has been proposed.

Seed mixes that are used for reclamation will consist of native grasses and forb species that provide cover and food in order to accelerate shrub re-establishment, bareroot or potted sagebrush and bitterbrush transplants will be planted. To ensure the integrity of the planting materials, indigenous seed and cuttings could be collected for reclamation. At Bryce Canyon National Park, seed and transplants obtained from indigenous materials had greater long-term survival and higher cover and production than commercial varieties of the same species (Petersen et al. 2004).

Cursory surveys conducted on April 30, 2006 found that there is a low probability that a dominant invasive species (i.e. cheatgrass, medusahead) could establish on reclaimed sites. However, post-reclamation surveys will be conducted for undesirable invasive plants. If a breakout does occur, mechanical followed by chemical treatments will be applied.

Seeding and planting will occur in the fall season following the growing season and into dormancy. During the following growing season, vegetation sampling will be conducted to monitor reclamation success. Measurements will be continued each year until the reclamation goals have been achieved. Additional seeding can be applied during subsequent years if the minimum standards of acceptance have not been achieved. Juniper seedlings found in reclaimed areas will be removed.

Monitoring Plan

Taken directly from the "*Alton Sage-Grouse Habitat Assessment and Mitigation Plan*" (**Appendix 3-1**), the following monitoring plan has been proposed.

Birds trapped and relocated to the Alton population will be collared with radio- collars. Birds will be monitored throughout the year to assess bird survival, nest site and nest success, brood-rearing sites, and key winter habitat areas. Lek counts will be conducted each year to determine the number of birds at the lek. Reclamation sites will be monitored to assess restoration success. With the establishment of desirable plant communities, sagebrush obligate species habitat will be improved. Birds that depend on these communities include sage sparrows (*Oreoscoptes montanus*), sage thrasher (*Amphispiza belli*), and Brewer's sparrow (*Spizelis breweri*). Also, mule

deer habitat will increase, especially with the establishment of antelope bitterbrush and other palatable browse species. Grassland development will also increase forage for elk (*Cervus canadensis*). Reclaimed sites will be monitored to assess utilization by these and other wildlife species.

To provide consistent monitoring and assessment, plans are being discussed to employ a graduate student from an established university to use this project as the basis for a graduate thesis. This would provide peer-reviewed research and monitoring of this project. It would also provide a mechanism for publishing the results of this project as a source of information and knowledge that can be applied to similar work in other areas.

340. **RECLAMATION PLAN**

341. Revegetation

This document contains a reclamation plan for final revegetation of all lands disturbed by coal mining and reclamation operations, except water areas and the surface of roads approved as part of the postmining land use, as required in R645-301-353 *through* R645-301-357. It also shows how the Coal Hollow Project will comply with the biological protection performance standards of the State Program.

341.100. Reclamation Timetable

A detailed schedule and timetable for the completion of each major step in the mine plan has been included in Chapter 5 of this document. Briefly, the mine will conduct operations in one area (segment) at a time. Once mined, the plan includes redistributing subsoil and topsoil followed by seeding this segment with the final seed mix contemporaneously, or at the same time the mining the next segment begins. However, seeding will be accomplished only in appropriate periods (usually late-fall, but early-spring could also be an option). The mine plan has been engineered to disturb the smallest practicable area at any one time. No more than 40 acres will be disturbed at one time. With prompt establishment and maintenance of vegetation, immediate stabilization of disturbed areas will minimize surface erosion. Details of the plan has been included in Chapter 5 of this document.

341.200. Reclamation Description

The Coal Hollow Project will be reclaimed and revegetated to meet the appropriate postmining land use. Some areas will be reclaimed to the native plant communities that existed prior to mining conditions. Other areas will be reclaimed to enhance habitat for sage-grouse or other wildlife species. Finally, in those areas where the landowner requests a change in the plant community to increase productivity for domestic livestock, they will be reclaimed accordingly.

341.210. Seed Mixtures

Revegetation seed mixtures for each plant community disturbed by mining activities at the Coal Hollow Project area are given in this section. Table 3-16 shows the plant communities that have been proposed for disturbance by mining operations at the Coal Hollow Project area.

Table 3-16: Vegetation Communities Proposed for Disturbance by Mining Activities in the Coal Hollow Permit Area.

MAP SYMBOL (see Vegetation Map, Drawing 3-1)	PLANT COMMUNITY
SB	Sagebrush
M	Meadow
PL	Pasture Land
PJS	Pinyon-Juniper/Sagebrush
MB	Mountain Brush
PJM	Pinyon-Juniper/Mountain Brush
PJW	Pinyon-Juniper Woodland

Seed mixtures for each disturbance type are shown on Tables 3-17 *through* 3-23. These rates have been based on drill seeding methods described in this document. When broadcast seeding is employed these rates will be doubled.

Table 3-17: Revegetation Seed Mixture for the Sagebrush/Grass Community at the Coal Hollow Project

	Rate** (# PLS/Ac)	Seeds/ft^2
SHRUBS		
Artemisia nova	0.20	4.16
*Artemisia tridentata var. vaseyana**	0.10	5.74
Ceratoides lanata	3.00	3.79
*Purshia tridentata**	15.00	5.17
Symphoricarpos oreophilus	3.00	5.17
FORBS		
Achillea millefolium	0.03	1.91
Hedysarum boreale	5.00	3.86
Linum lewisii	0.70	4.47
Lupinus argenteus	15.00	4.30
Penstemon palmeri	0.30	4.20
Sphaeralcea grossulariifolia	0.40	4.59
Viguiera multiflora	0.20	4.84
GRASSES		
Elymus smithii	1.50	4.34
Elymus trachycaulus	1.50	5.51
Poa pratensis	0.10	5.00
Poa secunda	0.20	4.25
Stipa hymenoides	1.00	4.32
TOTALS	**47.23**	**75.60**

* This species also to be planted by containerized seedlings at a rate of 200 plants per acre to enhance sage-grouse habitat.

**Based on drill seeding methods

Table 3-18: Revegetation Seed Mixture for the Meadow Community at the Coal Hollow Project

	Rate* (# PLS/Ac)	Seeds/ft^2
SHRUBS		
FORBS		
Iris missouriensis	15.00	7.23
Achillea millefolium	0.10	6.36
GRASSES (or Grass-likes)		
Carex microptera	0.40	7.78
Carex nebrascensis	0.50	6.13
Elymus trachycaulus	2.00	7.35
Phleum pratensis	0.20	5.97
Poa pratensis	0.10	5.00
Poa secunda	0.30	6.37
Scipus americanus.	2.00	8.26
Sporobolus airoides	0.20	8.03
TOTALS	**20.80**	**68.47**

*Based on drill seeding methods

Table 3-19: Revegetation Seed Mixture for the Pasture Lands at the Coal Hollow Project

(Final determination to be made by landowners)	Rate* (# PLS/Ac)	Seeds/ft^2
SHRUBS		
FORBS		
Achillea millefolium	0.04	2.54
Astragalus cicer	1.50	4.99
Hedysarum boreale	6.00	4.63
Linum lewisii	1.00	6.38
Medicago sativa	1.00	4.82
GRASSES		
Elymus hispidus	2.00	4.27
Elymus junceus	1.00	4.02
Elymus lanceolatus	1.50	5.30
Elymus smithii	1.50	4.34
Phleum pratensis	0.20	5.97
Poa pratensis	0.10	5.00
Poa secunda	0.30	6.37
Scirpus americanus.	1.00	4.13
Sporobolus airoides	0.10	4.02
TOTALS	**17.24**	**66.78**

*Based on drill seeding methods

Table 3-20: Revegetation Seed Mixture for the Pinyon-Juniper/Sagebrush Community at the Coal Hollow Project

	Rate* (# PLS/Ac)	Seeds/ft^2
SHRUBS		
Amelanchier utahensis	5.00	2.96
Artemisia nova	0.20	4.16
Artemisia tridentata vaseyana	0.07	4.02
Ceratoides lanata	3.00	3.79
Purshia tridentata	12.00	4.13
Symphoricarpos oreophilus	2.50	4.30
FORBS		
Artemisia ludoviciana	0.04	4.13
Eriogonum umbellatum	1.00	4.80
Hedysarum boreale	5.00	3.86
Lupinus argenteus	15.00	4.30
Sphaeralcea coccinea	0.50	5.74
Viguiera multiflora	0.20	4.84
GRASSES		
Elymus spicatus	1.00	3.21
Elymus smithii	1.50	4.34
Elymus trachycaulus	1.50	5.51
Poa pratensis	0.10	5.00
Poa secunda	0.20	4.25
Stipa hymenoides	1.00	4.32
TOTALS	**49.81**	**77.67**

*Based on drill seeding methods

Table 3-21: Revegetation Seed Mixture for the Mountain Brush Community at the Coal Hollow Project

	Rate* (# PLS/Ac)	Seeds/ft^2
SHRUBS		
Amelanchier utahensis	10.00	5.92
Artemisia nova	0.20	4.16
Artemisia tridentata var. vaseyana	0.07	4.02
Cercocarpus montanus	3.00	4.06
Purshia tridentata	12.00	4.13
Symphoricarpos oreophilus	3.00	5.17
Ephedra viridis	8.00	4.59
FORBS		
Artemisia ludoviciana	0.04	4.13
Sphaeralcea coccinea	0.40	4.59
Vicia americana	12.00	5.51
Viguiera multiflora	0.20	4.84
GRASSES		
Bromus carinatus	2.00	4.59
Elymus spicatus	1.50	4.82
Elymus trachycaulus	1.50	5.51
Poa pratensis	0.10	5.00
Poa secunda	0.20	4.25
Stipa hymenoides	1.00	4.32
TOTALS	**55.21**	**79.62**

*Based on drill seeding methods

Table 3-22: Revegetation Seed Mixture for the Pinyon-Juniper/Mountain Brush Community at the Coal Hollow Project

	Rate* (# PLS/Ac)	Seeds/ft^2
SHRUBS		
Amelanchier utahensis	8.00	4.74
Artemisia nova	0.20	4.16
Artemisia tridentata var. vaseyana	0.07	4.02
Cercocarpus montanus	3.00	4.06
Purshia tridentata	12.00	4.13
Symphoricarpos oreophilus	3.00	5.17
Ephedra viridis	8.00	4.59
FORBS		
Artemisia ludoviciana	0.04	4.13
Balsamhoriza sagittata	3.50	4.42
Sphaeralcea coccinea	0.40	4.59
Vicia americana	10.00	4.59
Viguiera multiflora	0.20	4.84
GRASSES		
Bromus carinatus	2.00	4.59
Elymus spicatus	1.50	4.82
Elymus trachycaulus	1.00	3.67
Poa pratensis	0.07	3.50
Poa secunda	0.20	4.25
Stipa hymenoides	1.00	4.32
TOTALS	**54.18**	**78.60**

*Based on drill seeding methods

Table 3-23: Revegetation Seed Mixture for the Pinyon-Juniper Woodland Community at the Coal Hollow Project

	Rate* (# PLS/Ac)	Seeds/ft^2
SHRUBS		
Amelanchier utahensis	5.00	2.96
Artemisia nova	0.20	4.16
Artemisia tridentata vaseyana	0.07	4.02
Ceratoides lanata	3.00	3.79
Purshia tridentata	12.00	4.13
Symphoricarpos oreophilus	2.50	4.30
FORBS		
Artemisia ludoviciana	0.04	4.13
Eriogonum umbellatum	1.00	4.80
Hedysarum boreale	5.00	3.86
Lupinus argenteus	15.00	4.30
Sphaeralcea coccinea	0.50	5.74
Viguiera multiflora	0.20	4.84
GRASSES		
Elymus spicatus	1.00	3.21
Elymus smithii	1.50	4.34
Elymus trachycaulus	1.50	5.51
Poa pratensis	0.10	5.00
Poa secunda	0.20	4.25
Stipa hymenoides	1.00	4.32
TOTALS	**49.81**	**77.67**

*Based on drill seeding methods

341.220. Planting & Seeding Methods

Seedbed Preparation & Analyses

The final seedbed of the reclaimed areas will be prepared by first replacing the subsoil and topsoil in the same order it existed prior to removal by the mining activities. Next, a basic soil sampling regime will be implemented prior to seeding that should identify fertility problems and will provide a basis for determining necessary soil amendments. The parameters analyzed will be:

- Electrical conductivity (EC)
- Sodium adsorption ratio (SAR)
- pH
- Texture
- Organic matter
- Available phosphorus (P)
- Potassium (K)
- Nitrate

If heavy equipment results in soil compaction at the surface of the reclaimed areas, they will then be ripped, disked, and harrowed to loosen the seedbed prior to seeding. In other areas where less compaction has occurred, these areas will be disked and harrowed. The disking and harrowing of all areas will be done parallel with the contour wherever possible to decrease the potential for water erosion downslope. In other areas where compaction is not a problem, dozer tracking can be used to roughen the surface, and to trap seed, fertilizer, mulch, and other amendments as well as decrease erosion by wind and water. In such cases seeding will be done immediately after this treatment, whereas soil amendments, where required, would be applied over the surface during seedbed preparations.

In some of the more sloped areas that will be reclaimed to the native plant community, "roughening" or "gouging" may also be employed. The gouges would be depressions created at the surface with dimensions of approximately 1.5 ft (d) x 3 ft (l) x 3 ft (w).

Seeding & Transplanting

Seeding will be accomplished using different methods depending on the area to be seeded. In the more flat areas such as the meadows and existing pasture lands, a typical farmland drill will be used for seeding. In other areas where the surface may be more rough, a modified rangeland drill or "rough terrain seeder" will be used. Finally, in the areas where access is more difficult to reach by heavy equipment due to slope steepness or other limiting factors, broadcast seeding or hydro-seeding will be employed. For a list of plant species to be seeded refer to Tables 3-17 *through* 3-23.

Containerized plants will be planted in those areas proposed for sage-grouse habitat enhancement. These plants will be planted from containers at least 10 cubic inches in size and

inoculated with appropriate site-specific or commercial mycorrhizal inocula at specified infection rates. The containerized plants will be planted at a rate that totals at least 400 individuals per acre. For a list of the species to be planted, refer to Table 3-17.

Containerized plants should be dormant when they arrive at the site in the spring or fall and will be planted as soon after delivery as possible. Plants will be planted in a fashion to simulate a natural habitat. If competing vegetation is present at the time of planting, this vegetation will be removed by scalping the area or herbicide application beforehand that provide a time period ample as to not affect the containerized seedling. A small depression will be created in the seedbed around the seedling at the time of planting to increase survivability by harvesting and holding water. The plants will be "watered-in" when they are planted by adding water to the depression. If possible, the plants will be watered during dry periods for the first growing season.

341.230. Mulching Techniques

Mulch will be placed on the seedbed surface once soil amendments have been incorporated and seeding has been accomplished. The mulch should control erosion by wind and water, decrease evaporation and seed predation, and increase survivability of the seeded species. Like the seeding methods, mulch will be applied with a variety of techniques and materials depending on the reclaimed area.

Certified weed-free *straw* will be used in those areas where drill seeding has been employed at a rate of 1 ton/acre. The straw will be crimped or otherwise held to the surface by tackifier or plastic mesh stapled to the ground.

In those areas where broadcast seeding is employed, straw or *hydro-mulch* may be used. In other areas where hydro-seeding is employed, hydro-mulching will also be done. In such cases, seed and mulch will be applied as separate applications, with seeding accomplished first. The mulch will be held to the surface by an effective tackifier that is added to the slurry mix prior to application.

Finally, in areas that need extra protection due to steepness of slope or where soils are especially erodible, erosion control mat will be utilized. Several excellent materials are available and will be applied at the manufactures recommended rates.

341.240. Irrigation

No irrigation has been planned for the reclaimed area with the exception of watering the containerized plants as mentioned above. Irrigation may be an option, however, in some areas where irrigation is available from current farming activities.

341.250. Revegetation Monitoring

Vegetation of the reclaimed areas will be monitored regularly to measure the success of plant

establishment and to determine if problem areas exist. Qualitative and quantitative data will be recorded at regular intervals. The qualitative data will include: site location, sample date, observers, slope, exposure, acreage, animal disturbance, erosion damage, dominant plant species observed, and other pertinent notes. Quantitative data recorded will include: total cover (living cover, rock, litter, bare ground), cover by species, composition, frequency, and woody species density.

Methods for quantitative monitoring will be as follows. Transect lines will be placed randomly on each of the revegetation sites. Random sample locations will then be placed from these transect lines and the aforementioned data will be recorded. Ocular methods with square meter quadrat will be used to provide cover and frequency data, whereas, point quarter and/or belt transects will be used to estimate woody species densities.

341.300. Mining, Reclamation & Revegetation Research

Mining, reclamation & revegetation research has been planned and is in the process of being submitted to DOGM by *Talon Resources*. Additionally, DOGM may require greenhouse studies, field trials, or equivalent methods of testing proposed or potential revegetation materials and methods to demonstrate that revegetation is feasible pursuant to R645-300-133.710.

342. Fish and Wildlife Enhancement.

This application includes a fish and wildlife plan for the reclamation and postmining phase of the operation consistent with R645-301-330, the performance standards of R645-301-358 and include the following (for details see section 330, OPERATION PLAN).

342.100. Measures for Enhancement of Habitat

Enhancement measures that will be used during the reclamation and postmining phase of the operation to develop aquatic and terrestrial habitat. Such measures may include restoration of streams and other wetlands, retention of ponds and impoundments, establishment of vegetation for wildlife food and cover, and the replacement of perches and nest boxes (see also section 330, OPERATION PLAN).

342.200. Reclamation Plants for Enhancement

Where fish and wildlife habitat is to be a postmining land use, the plant species to be used on reclaimed areas have been selected on the basis of the criteria described below.

342.210. Nutritional Values of Plant Species

Among other qualities (e.g. erosion control qualities, establishment capabilities, and seed availability), plant species for revegetation of the Coal Hollow Project have been chosen for their proven nutritional value for wildlife (see Table 3-17 *through* 3-23).

342.220. Cover Quality of Plant Species

Among other qualities (e.g. erosion control qualities, establishment capabilities, and seed availability), plant species for revegetation of the Coal Hollow Project have been chosen for their cover qualities for wildlife (see Table 3-17 *through* 3-23).

342.230. Habitat Enhancement & Plant Species

Among other qualities, plant species for revegetation of the Coal Hollow Project have been chosen for their proven habitat enhancement qualities for wildlife (see Table 3-17 *through* 3-23). The plants have also been chosen for their ability to support and enhance fish or wildlife habitat after the release of performance bonds. At final revegetation, the selected plants will be grouped and distributed in a manner which optimizes edge effect, cover, and other benefits to fish and wildlife.

342.300. Cropland & Revegetation

Where cropland is to be the postmining land use, and where appropriate for wildlife- and crop-management practices, the Coal Hollow Project will intersperse the fields with trees, hedges, or fence rows throughout the harvested area to break up large blocks of monoculture and to diversify habitat types for birds and other animals.

342.400. Residential & Industrial Reclamation

Where residential, public service, or industrial uses are to be the postmining land use, and where consistent with the approved postmining land use, the Coal Hollow Project will intersperse reclaimed lands with greenbelts utilizing species of grass, shrubs, and trees useful as food and cover for wildlife. No residential or industrial areas have been planned at this time.

350. PERFORMANCE STANDARDS

351. General Requirements

All coal mining and reclamation operations will be carried out according to plans provided under R645-301-330 *through* R645-301-340.

352. Contemporaneous Reclamation

Revegetation on all land that is disturbed by coal mining and reclamation operations, will occur as contemporaneously as practicable with mining operations, except when such mining operations are conducted in accordance with a variance for combined SURFACE and UNDERGROUND COAL MINING AND RECLAMATION ACTIVITIES issued under R645-302-280. DOGM may establish schedules that define contemporaneous reclamation.

353. Revegetation: General Requirements

Operators of the Coal Hollow Project will establish on regraded areas and on all other disturbed areas, except water areas and surface areas of roads that are approved as part of the postmining land use, a vegetative cover that is in accordance with the mine permit and reclamation plan.

353.100. Vegetative Plant Cover Qualities

353.110. Diverse, Effective, & Permanent

The vegetation cover established at final reclamation will be diverse, effective and permanent.

353.120. Native Plant Species

The cover will be comprised of species native to the area, or of introduced species where desirable and necessary to achieve the approved postmining land use and approved by the DOGM (see Tables 3-17 *through* 3-23).

353.130. Final Vegetation Cover & Quantities

The final cover will be at least equal in extent of cover to the natural vegetation of the area, or those standards set for final revegetation success.

353.140. Vegetation Cover and Soil Stabilization

The cover will be capable of stabilizing the soil surface from erosion.

353.200. The reestablished plant species will also contain the qualities listed below.

353.210. (a) Be compatible with the approved postmining land use.

353.220. (b) Have the same seasonal characteristics of growth as the original vegetation.

353.230. (c) Be capable of self-regeneration and plant succession.

353.240. (d) Be compatible with the plant and animal species of the area.

353.250. (e) Meet the requirements of applicable Utah and federal seed, poisonous and noxious plant; and introduced species laws or regulations.

353.300. Vegetative Cover Exceptions

DOGM may grant exception to the requirements of R645-301-353.220 and R645-301-353.230 when the species are necessary to achieve a quick-growing, temporary, stabilizing cover, and measures to establish permanent vegetation are included in the approved permit and reclamation plan.

353.400. Cropland Exceptions

When the approved postmining land use is cropland, DOGM may grant exceptions to the requirements of R645-301-353.110, R645-301-353.130, R645-301-353.220 and R645-301-353.230.

354. Timing of Revegetation

Disturbed areas will be planted during the first normal period for favorable planting conditions after replacement of the plant-growth medium. The normal period for favorable planting is that planting time generally accepted locally for the type of plant materials selected (see section 341.100, Reclamation Timetable).

355. Mulching & Other Soil Stabilizing Practices for Revegetation

Suitable mulch and other soil stabilizing practices will be used on all areas that have been regraded and covered by topsoil or topsoil substitutes (see section 340, RECLAMATION PLAN).

356. Standards for Revegetation Success

356.100. Success Criteria

Success of revegetation will be judged on the effectiveness of the vegetation for the approved postmining land use, the extent of cover compared to the extent of cover of the reference area or other approved success standard, and the general requirements of R645-301-353.

356.110. Vegetation Information Guidelines

Standards for success, statistically valid sampling techniques for measuring success, and approved methods are identified in the DOGM's "Vegetation Information Guidelines, Appendix A." The approved techniques in that document will be used for the Coal Hollow Project.

As stated above, the reclaimed plant communities at the site will be diverse, permanent, capable of stabilizing the soil surface for erosion, and will be compatible with the post-mining land use. The reclaimed areas will be compared to the reference areas. Methods to be employed to determine that the standards have been met follow:

Cover Ocular methods by meter square quadrats.

Shrub Density Point quarter method.

Frequency Relative number of times that it occurred in the square meter quadrats.

Production Total annual biomass production will be estimated by clipping, drying and weighing current annual growth. Herbaceous and woody species will be summarized separately. "Double sampling" using four quadrats will be estimated around the clipped plots.

Diversity Diversity (including seasonality) will be measured by several methods. First, a straightforward method outlined by S.L. Emrich (Colorado Mined Land Reclamation Division) utilizes cover data. In this method each plant species is ranked by relative importance and listed by lifeform, total cover, and relative cover. These variables are later compared with the reference area that have been chosen as a standard for revegetation success. This does not mean that the same species must become established on the reclaimed land, but rather the community characters are compared. In this method the combined relative importance of a set number of species established on the reclaimed land should not exceed 75% relative importance, whereas, a maximum dominance of 40% relative importance is set for each species. This insures that the goal is to establish several species that will complement each other in the utilization of the resources.

For another diversity comparison, the average number of vascular species per meter square quadrat will be obtained by summing the frequency of all species in an area and dividing by 100.

Still another diversity measurement will be species richness or simply the total number of species encountered in the quadrats for each area.

Finally, total diversity will be measured by using the MacArthur and Wilson's (1967) formula where the proportion of the sum frequency of each species of an area was calculated. The proportion of each species will be squared and the values for all species in the area are to be summed. This index integrates the number of species encountered and the degree to which frequency of occurrence is equitably distributed among those species. The formula is given below:

$$Total\ Diversity = \frac{1}{\sum P_i^2}$$

where,

P_i = the proportion of the sum frequency for a community contributed by the ith species.

356.120. Revegetation Success Standards

Standards for revegetation success will include criteria representative of unmined lands in the area being reclaimed to evaluate the appropriate vegetation parameters of ground cover, production, or stocking. Ground cover, production, or stocking will be considered equal to the approved success standard when they are not less than 90 percent of the success standard. The sampling techniques for measuring success will use a 90-percent statistical confidence interval (i.e., one-sided test with a 0.10 alpha error).

356.200. Postmining Land Use

Standards for success will be applied in accordance with the approved postmining land uses (see Chapter 4).

356.210. Grazing or Pasture Land

Some areas will be reclaimed as pasture and grazing land (see Vegetation Map, Drawing 3-1). For these and other areas determined by the landowners, the ground cover and production of living plants on the revegetated area will be at least equal to that of a reference area or other success standards approved by DOGM.

356.220. Cropland

For areas developed for use as cropland, crop production on the revegetated area will be at least equal to that of a reference area or such other success standards approved by DOGM. The requirements of R645-302-310 through R645-302-317 apply to areas identified as prime farmland (*no areas have been identified as prime farmland in the Coal Hollow Project Area*).

356.230. Wildlife Habitat

Several areas will be returned to wildlife habitat. For these areas success of vegetation will be determined on the basis of tree and shrub stocking and vegetative ground cover (see also section 356.100, Success Criteria).

356.231. Consultation & Approval

Minimum stocking and planting arrangements will be specified by DOGM on the basis of local and regional conditions and after consultation with and approval by Utah agencies responsible for the administration of forestry and wildlife programs. Consultation and approval will be on a permit specific basis.

356.232. Woody Species Success Criteria

Trees and shrubs that will be used in determining the success of stocking and the adequacy of plant arrangement will have utility for the approved postmining land use. At the time of bond release, such trees and shrubs will be healthy, and at least 80 percent will have been in place for at least 60 percent of the applicable minimum period of responsibility. No trees and shrubs in place for less than two growing seasons will be counted in determining stocking adequacy.

356.233. General Vegetative Cover

Vegetative ground cover will not be less than that required to achieve the approved postmining land use.

356.240. Industrial, Commercial or Residential Success Criteria

For areas to be developed for industrial, commercial, or residential use less than two years after regrading is completed, the vegetative ground cover will not be less than that required to control erosion. At this time, no areas have been proposed to be reclaimed as industrial, commercial or residential for the Coal Hollow Project.

356.250. Previous Disturbed Areas Success Criteria

For areas previously disturbed by mining that were not reclaimed to the requirements of R645-200 through R645-203 and R645-301 through R645-302 and that are remined or otherwise redisturbed by coal mining and reclamation operations, at a minimum, the vegetative ground cover will be not less than the ground cover existing before redisturbance and will be adequate to control erosion. Other than those lands where the native plant communities have been disturbed for rangeland improvements or pasture lands, no areas would be considered "previously disturbed" in the project area.

356.300. Sediment Control Structures

Siltation structures will be maintained until removal is authorized by the DOGM and the disturbed area has been stabilized and revegetated. In no case will the structure be removed sooner than two years after the last augmented seeding.

356.400. Removal of Sediment Control Structures

When a siltation structure is removed, the land on which the siltation structure was located will be revegetated in accordance with the reclamation plan and R645-301-353 *through* R645-301-357.

357. Revegetation Responsibility Periods

357.100. Beginning Date

The period of extended responsibility for successful vegetation will begin after the last year of augmented seeding, fertilization, irrigation, or other work, excluding husbandry practices that are approved by DOGM in accordance with paragraph R645-301-357.300.

357.200. Duration

Vegetation parameters identified in R645-301-356.200 will equal or exceed the approved success standard during the growing seasons for the last two years of the responsibility period. The period of extended responsibility will continue for five or ten years based on precipitation data reported pursuant to R645-301-724.411 based on the following conditions.

357.210. (a). In areas of more than 26.0 inches average annual precipitation, the period of responsibility will continue for a period of not less than five full years.

357.220. (b). In areas of 26.0 inches or less average annual precipitation, the period of responsibility will continue for a period of not less than ten full years.

357.300. Husbandry Practices

357.301. Approval Information

DOGM may approve certain selective husbandry practices without lengthening the extended responsibility period. Practices that may be approved are identified in R645-301-357.310 *through* R645-301-357.365. The operator may propose to use additional practices, but they would need to be approved as part of the Utah Program in accordance with 30 CFR 732.17. Any practices used will first be incorporated into the mining and reclamation plan and approved in writing by DOGM. Approved practices are normal conservation practices for unmined lands within the region which have land uses similar to the approved postmining land use of the disturbed area.

Approved practices may continue as part of the postmining land use, but discontinuance of the practices after the end of the bond liability period will not jeopardize permanent revegetation success. Augmented seeding, fertilization, or irrigation will not be approved without extending the period of responsibility for revegetation success and bond liability for the areas affected by said activities and in accordance with R645-301-820.330.

357.302. Demonstration of Appropriate Reclamation Techniques

The Coal Hollow Project will demonstrate that husbandry practices proposed for a reclaimed area are not necessitated by inadequate grading practices, adverse soil conditions, or poor reclamation procedures.

357.303. Bonded Area & Husbandry Practices

DOGM will consider the entire area that is bonded within the same increment, as defined in R645-301-820.110, when calculating the extent of area that may be treated by husbandry practices.

357.304. Separate Responsibility Periods

If it is necessary to seed or plant in excess of the limits set forth under R645-301-357.300, DOGM may allow a separate extended responsibility period for these reseeded or replanted areas in accordance with R645-301-820.330.

357.310. Reestablishing Trees and Shrubs

357.311. Planting Within the Responsibility Period

Trees or shrubs may be replanted or reseeded at a rate of up to a cumulative total of 20% of the required stocking rate through 40% of the extended responsibility period.

357.312. Planting Shrubs in Established Vegetation

If shrubs are to be established by seed in areas of established vegetation, small areas will be scalped (see section 341.220, Planting & Seeding Methods). The number of shrubs to be counted toward the tree and shrub density standard for success from each scalped area will be limited to one.

357.320. Weed Control and Associated Revegetation

Weed control through chemical, mechanical, and biological means discussed in R645-301-357.321 *through* R645-301-357.323 may be conducted through the entire extended responsibility period for noxious weeds and through the first 20% of the responsibility period for other weeds. Any revegetation necessitated by the following weed control methods will be performed according to the seeding and transplanting parameters set forth in R645-301-357.324.

357.321. Chemical Weed Control

Weed control through chemical means will follow the current Weed Control Handbook (published annually or biannually by the Utah State University Cooperative Extension Service) and herbicide labels.

357.322. Mechanical Weed Control

Mechanical practices that may be approved include hand roguing, grubbing and mowing.

357.323. Biological Weed Control

Selective grazing by domestic livestock may be used by the Coal Hollow Project. Biological control of weeds through disease, insects, or other biological weed control agents is allowed but will be approved on a case-by-case basis by the Division, and other appropriate agency or agencies which have the authority to regulate the introduction and/or use of biological control agents.

357.324. Weed Control & Desirable Species Damage

Where weed control practices damage desirable vegetation, areas treated to control weeds may be reseeded or replanted according to the following limitations. Up to a cumulative total of 15% of a reclaimed area may be reseeded or replanted during the first 20% of the extended responsibility period without restarting the responsibility period. After the first 20% of the responsibility period, no more than 3% of the reclaimed area may be reseeded in any single year without restarting the responsibility period, and no continuous reseeded area may be larger than one acre. Furthermore, no seeding will be done after the first 60% of the responsibility period or Phase II bond release, whichever comes first. Any seeding outside these parameters will be considered to be "augmentative seeding," and will restart the extended responsibility period.

357.330. Control of Other Pests

357.331. Big Game

Control of big game (deer, elk, moose, antelope) may be used only during the first 60% of the extended responsibility period or until Phase II bond release, whichever comes first. Any methods used will first be approved by DOGM and, as appropriate, the land management agency and the State of Utah Division of Wildlife Resources (DWR). Methods that may be used include fencing and other barriers, repellents, scaring, shooting, and trapping and relocation. Trapping and special hunts or shooting will be approved by DWR. Other control techniques may be allowed but will be considered on a case-by-case basis by the DOGM and by DWR. Appendix C of the DOGM's "Vegetation Information Guidelines" includes a non-exhaustive list of publications containing big game control methods.

357.332. Small Mammal & Insects

Control of small mammals and insects will be approved on a case-by-case basis by DWR and/or the Utah Department of Agriculture. The recommendations of these agencies will also be approved by the appropriate land management agency or agencies. Small mammal control will be allowed only during the first 60% of the extended responsibility period or until Phase II bond release, whichever comes first. Insect control will be allowed through the entire extended responsibility period if it is determined, through consultation with the Utah Department of Agriculture or Cooperative Extension Service, that a specific practice is being performed on adjacent unmined lands.

357.340. Natural Disasters and Illegal Activities Occurring After Phase II Bond Release

Where necessitated by a natural disaster, excluding climatic variation, or illegal activities, such as vandalism, not caused by any lack of planning, design, or implementation of the mining and reclamation plan on the part of the Coal Hollow Project, the seeding and planting of the entire area which is significantly affected by the disaster or illegal activities will be allowed as an accepted husbandry practice and thus will not restart the extended responsibility period. Appendix C of the Division's "Vegetation Information Guidelines" references publications that show methods used to revegetate damaged land. Examples of natural disasters that may necessitate reseeding which will not restart the extended responsibility period include wildfires, earthquakes, and mass movements originating outside the disturbed area.

357.341. Extent of Area

The extent of the area where seeding and planting will be allowed will be determined by the DOGM in cooperation with the Coal Hollow Project.

357.342. Standards of Success

All applicable revegetation success standards will be achieved on areas reseeded following a disaster, including R645-301-356.232 for areas with a designated postmining land use of forestry or wildlife.

357.343. Seeding & Planting in Phase II Areas

Seeding and planting after natural disasters or illegal activities will only be allowed in areas where Phase II bond release has been granted.

357.350. Irrigation

The irrigation of transplanted trees and shrubs, but not of general areas, is allowed by DOGM through the first 20% of the extended responsibility period. Irrigation may be by such methods as, but not limited to, drip irrigation, hand watering, or sprinkling.

357.360. Highly Erodible Area and Rill and Gully Repair

The repair of highly erodible areas and rills and gullies will not be considered an augmentative practice, and will thus not restart the extended responsibility period, if the affected area as defined in R645-301-357.363 comprises no more than 15% of the disturbed area for the first 20% of the extended responsibility period and if no continuous area to be repaired is larger than one acre.

357.361. Highly Erodible Areas Responsibility Period

After the first 20% of the extended responsibility period but prior to the end of the first 60% of the responsibility period or until Phase II bond release, whichever comes first, highly erodible area and rill and gully repair will be considered augmentative, and will thus restart the responsibility period, if the area to be repaired is greater than 3% of the total disturbed area or if a continuous area is larger than one acre.

357.362. Extent of Area Affected

The extent of the affected area will be determined by the DOGM in cooperation with the Coal Hollow Project.

357.363. Definition of Highly Erodible Areas

The area affected by the repair of highly erodible areas and rills and gullies is defined as any area that is reseeded as a result of the repair. Also included in the affected areas are interspacial areas of thirty feet or less between repaired rills and gullies. Highly erodible areas are those areas which cannot usually be stabilized by ordinary conservation treatments and if left untreated can cause severe erosion or sediment damage.

357.364. Erodible Areas & Sediment Control

The repair and/or treatment of rills and gullies which result from a deficient surface water control or grading plan, as defined by the recurrence of rills and gullies, will be considered an augmentative practice and will thus restart the extended responsibility period.

357.365. Erodible Area Designs & Repairs

The Coal Hollow Project shall demonstrate by specific plans and designs the methods to be used for the treatment of highly erodible areas and rills and gullies. These will be based on a

combination of treatments recommended in the Soil Conservation Service Critical Area Planting recommendations, literature recommendations including those found in Appendix C of the Division's "Vegetation Information Guidelines", and other successful practices used at other reclamation sites in the State of Utah. Any treatment practices used will be approved by the Division.

358. Protection of Fish, Wildlife, and Related Environmental Values

The Coal Hollow Project will, to the extent possible using the best technology currently available, minimize disturbances and adverse impacts on fish, wildlife, and related environmental values and will achieve enhancement of such resources where practicable.

358.100. Threatened & Endangered Species

A review of the Utah Heritage Program database for sensitive species in the proposed mine site and adjacent areas has been accomplished. Field maps with locations of these species have been prepared and have been used for additional surveys and will continue to be in used future biological studies or when disturbance by mining in specific areas is proposed.

Due to the sensitivity of these species, specific location information is considered confidential and has not been submitted in this application. However, review of this information can be arranged by the regulatory authorities (see section 322.200, Site-Specific Resource Information).

No coal mining and reclamation operation will be conducted which is likely to jeopardize the continued existence of endangered or threatened species listed by the Secretary or which is likely to result in the destruction or adverse modification of designated critical habitats of such species in violation of the Endangered Species Act of 1973. The Coal Hollow Project will promptly report to the DOGM any state- or federally-listed endangered or threatened species within the permit area of which the operator becomes aware. Upon notification, DOGM will consult with appropriate state and federal fish and wildlife agencies and, after consultation, will identify whether, and under what conditions, the operator may proceed.

358.200. Eagles

The coal mining and reclamation operations at the Coal Hollow Project will not be conducted in a manner which would result in the unlawful taking of a bald or golden eagle, its nest, or any of its eggs. The operator of the Coal Hollow Project will promptly report to the DOGM any golden or bald eagle nest within the permit area of which the operator becomes aware. Upon notification, the DOGM will consult with the U.S. Fish and Wildlife Service (USFWS) and DWR and, after consultation, will identify whether, and under what conditions, the mining operations may proceed.

358.300. Removal of a Threatened & Endangered Species

Nothing in the R645 Rules will authorize the taking of an endangered or threatened species or a bald or golden eagle, its nest, or any of its eggs in violation of the Endangered Species Act of 1973 or the Bald Eagle Protection Act, as amended, 16 U.S.C. 668 et seq.

358.400. Riparian & Wetland Areas

There are some riparian and wetland areas associated with springs and seeps in the Coal Hollow permit area (see Chapter 7). The Coal Hollow Project plans to avoid disturbances to them, enhance them where practicable, and restore, or replace, wetlands and riparian vegetation along rivers and streams if disturbance to them it done.

Additionally, the coal mining and reclamation operations at the Coal Hollow Project will avoid disturbances to, enhance where practicable, or restore, habitats of unusually high value for fish and wildlife (see Section 333, Procedures to Minimize Adverse Impacts to Fish & Wildlife in this document).

358.500. Best Technology Available

The Coal Hollow Project will apply the best technology currently available in all disciplines of the coal mining and reclamation activities.

358.510. Powerline & Transmission Facilities

The Coal Hollow Project will ensure that electric powerlines and other transmission facilities used for, or incidental to, coal mining and reclamation operations on the permit area are designed and constructed to minimize electrocution hazards to raptors, except where DOGM determines that such requirements are unnecessary.

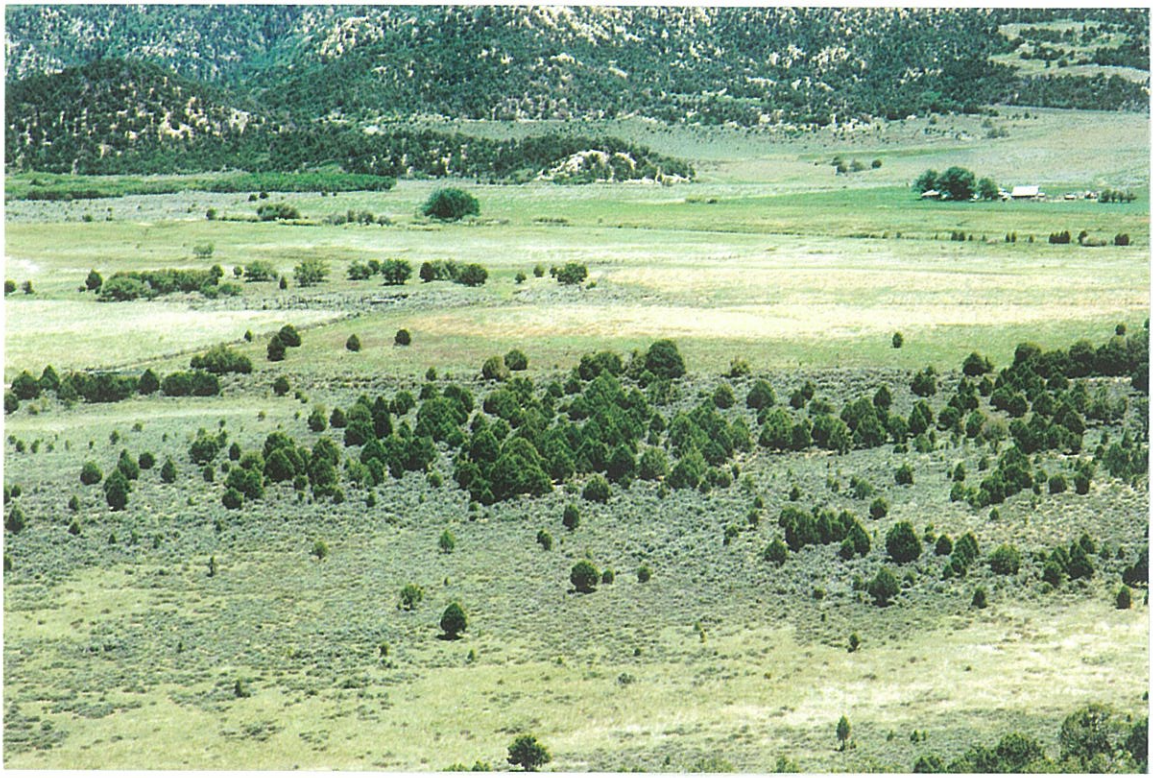
358.520. Fences & Conveyers

The Coal Hollow Project will design fences, overland conveyers, and other potential barriers to permit passage for large mammals, except where the DOGM determines that such requirements are unnecessary.

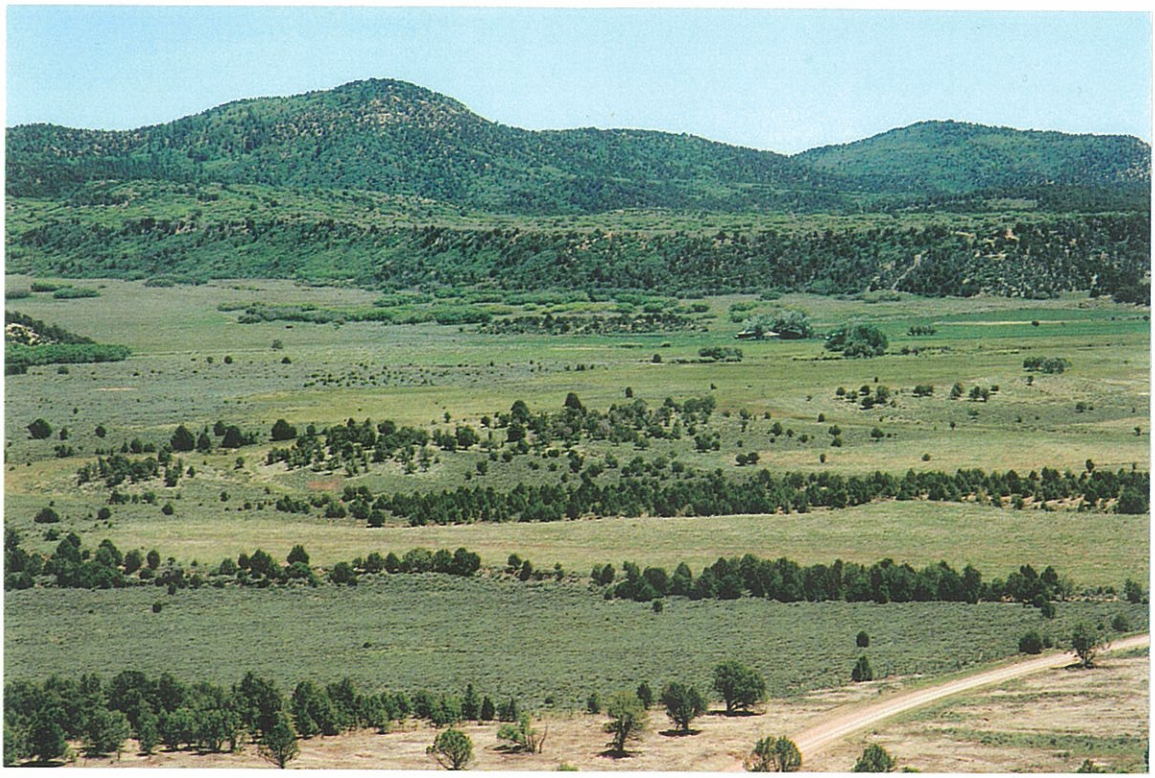
358.530. Toxic-Forming Areas

The Coal Hollow Project will fence, cover, or use other appropriate methods to exclude wildlife from ponds which contain hazardous concentrations of toxic-forming materials.

PHOTOGRAPHS



Photograph 3-1: Plant Communities of the Coal Hollow Project (General View; 1 of 3)



Photograph 3-2: Plant Communities of the Coal Hollow Project (General View; 2 of 3)

Photograph 3-3: Plant Communities of the Coal Hollow Project (General View; 3 of 3)

Photograph 3-4: Sagebrush Community of the Coal Hollow Project

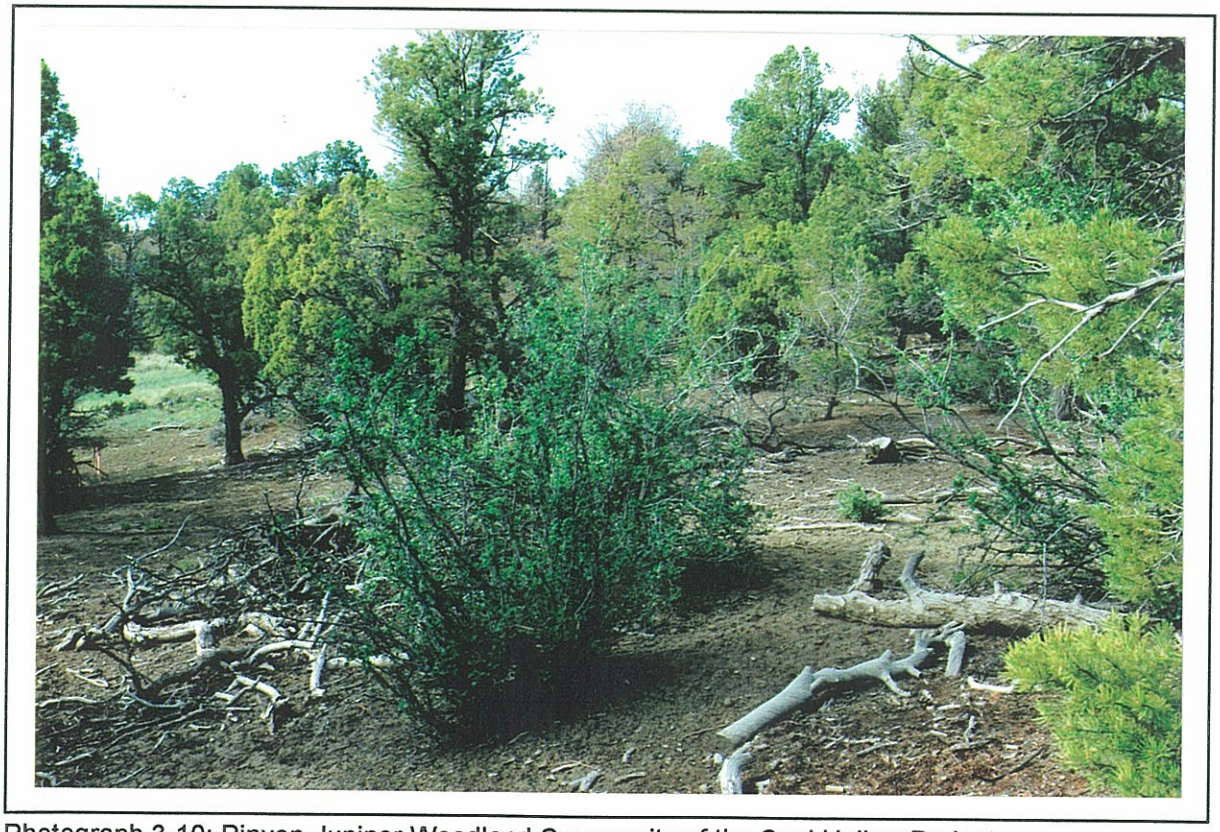
Photograph 3-5: Meadow Community of the Coal Hollow Project

Photograph 3-6: Pasture Land Community of the Coal Hollow Project

Photograph 3-7: Pinyon-Juniper/Sagebrush Community of the Coal Hollow Project

Photograph 3-8: Mountain Brush Community of the Coal Hollow Project

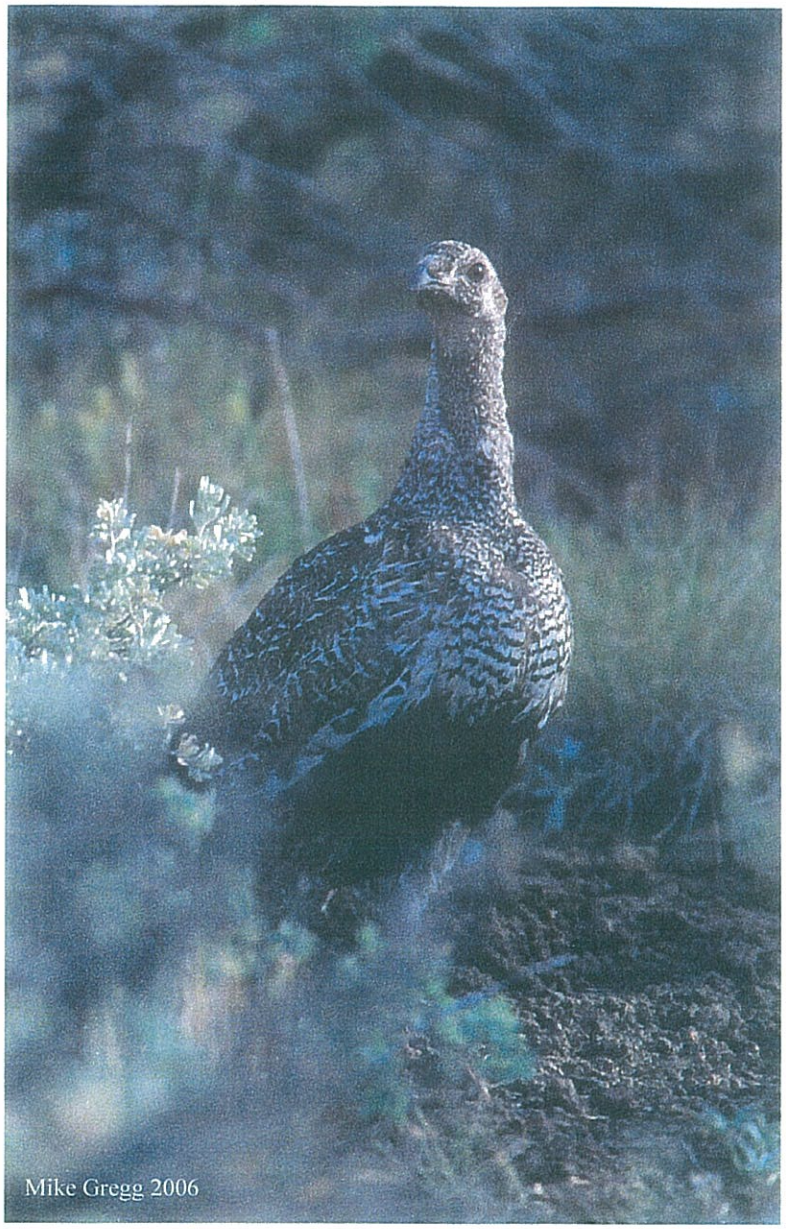
Photograph 3-9: Pinyon-Juniper/Mountain Brush Community of the Coal Hollow Project



Photograph 3-10: Pinyon-Juniper Woodland Community of the Coal Hollow Project

APPENDIX 3-1

ALTON SAGE-GROUSE HABITAT ASSESSMENT AND MITIGATION PLAN



Steven L. Petersen, Ph.D.

Alton, Utah Ecological Site Description

The town of Alton Utah (-112.474° longitude, 37.462° latitude), the Alton Amphitheater, and Sink Valley are located between the Pink Cliffs to the west and the Paunsaugunt plateau to the east (Figure 1). The town and surrounding valley occur within a larger watershed basin confined by steep side-slopes to shallow foothills. The soils in this area are high in clay content.

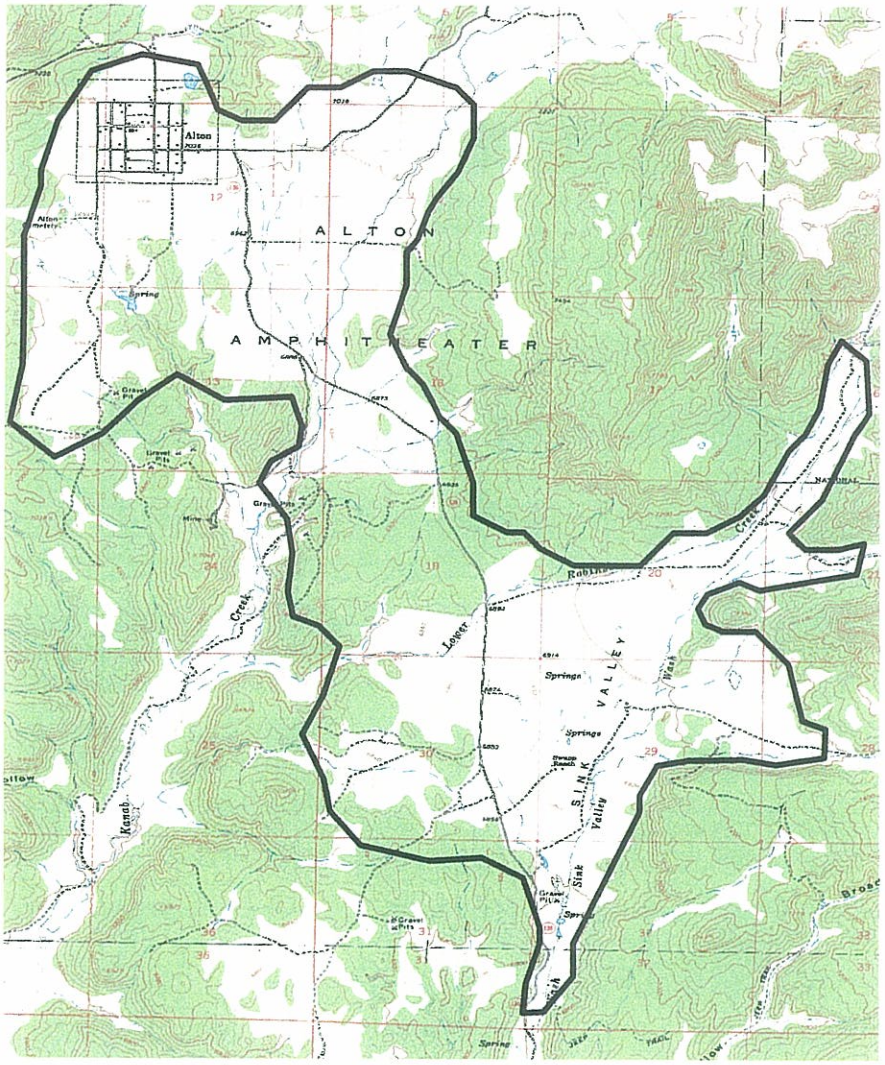


Figure 1. 7.5 minute topographic map of the Alton region. The black line delineates the zone where mining activity and mitigation will be concentrated.

Four predominant plant associations occur within the immediate Alton region (Figure 2). Plant associations are the pinyon – juniper dominated woodland area, the sagebrush dominated community, the valley floor grassland region, and irrigated croplands.

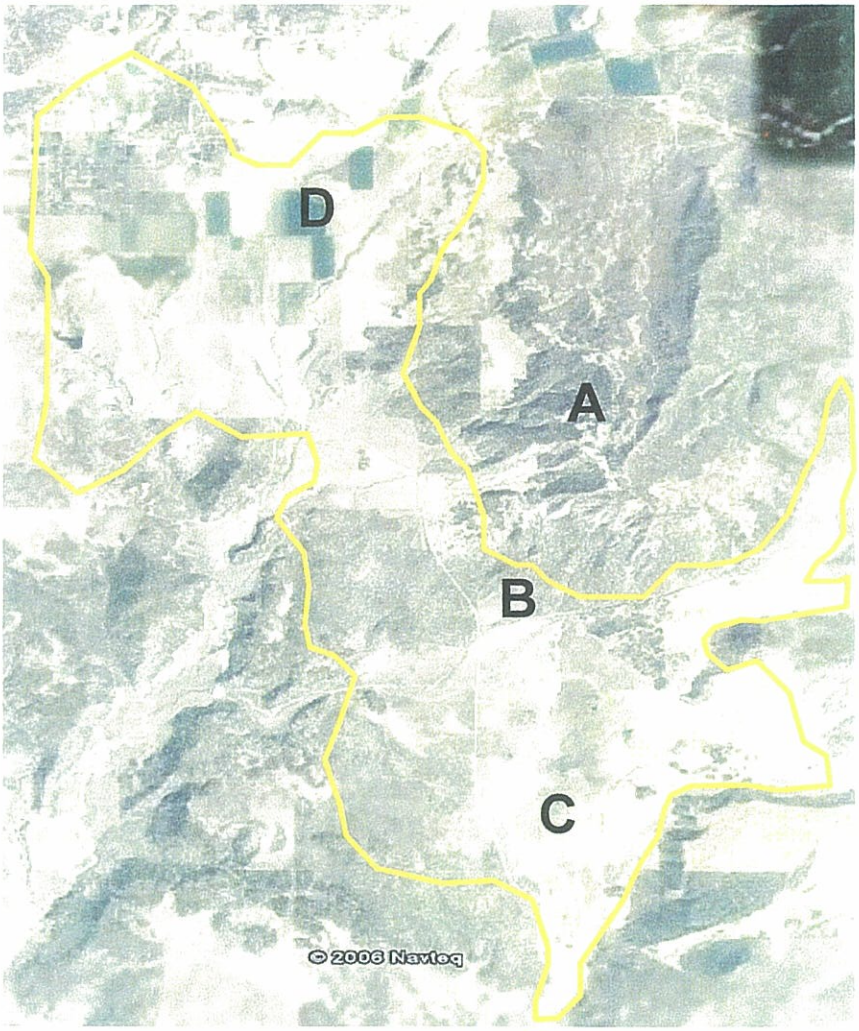


Figure 2. Satellite image of the Alton region (Google-earth 2006). The yellow line delineates the zone of mining activity and mitigation. Vegetation associations include A) Pinyon-juniper dominated woodlands, B) Sagebrush Communities, C) Valley-floor grasslands, and D) Irrigated cropland.

Pinyon-Juniper Dominated Woodlands

Utah juniper (*Juniperus osteosperma*) and pinyon pine (*Pinus edulis*) dominated plant communities (PJ) occur widely throughout the Alton area, ranging from the

open valley floor to steep mountain slopes (Figure 3). Several shrub species that occur within these communities include big sagebrush (*Artemisia tridentata* var. *tridentata* and var. *vaseyana*), black sagebrush (*Artemisia nova*), and antelope bitterbrush (*Purshia tridentata*). Predominant grass species occurring in this region are bluebunch wheatgrass (*Agropyron spicatum*), Idaho fescue (*Festuca idahoensis*), and needlegrass (*Stipa* species). There are a variety of forb species that can be found exhibiting a wide range in density and cover. Common forb species in these woodlands include tailcup lupine (*Lupinus caudatus*) and western yarrow (*Achillea millefolia*).

Figure 3. Juniper and pinyon dominated plant communities located throughout the Alton basin.

Juniper-dominated plant communities, which are transitional between lower elevation arable lands and higher elevation coniferous forests, serve an important ecological role providing seasonal areas for livestock grazing and wildlife habitat such as critical big game winter range (Roundy and Vernon 1999). Prior to European settlement, juniper and pinyon woodlands were primarily confined to shallow rocky soil slopes underlain by fractured bedrock (Miller and Wigand 1994, Miller and Rose 1995). Before this woodland encroachment occured, plant communities were dominated by short and tall sagebrush species, grasslands, riparian zones, and quaking aspen parklands (Burkhardt and Tisdale 1969, Miller et al. 2000, Bates et al. 1999).

Today, juniper and pinyon encroached ecosystems that occur throughout the Intermountain West have increased 10 fold from 1.5 million hectares to 15 million hectares (Miller et al. 2001). This expansion of PJ woodlands has increased as a result of fire suppression (e.g. reduced fire frequency), climate change, heavy grazing, or any combination of these factors (Eddleman 1983). As a result, juniper has moved into more productive, deeper, and well-drained soils from where they historically had been excluded (Burkhardt and Tisdale 1969, Miller and Rose 1995, West et al. 1978). Within the Alton area, most trees have expanded into the foothills and valley bottoms within the past century. This is noted by the relatively young age class of most trees within the area (100-150 years old).

Juniper and pinyon, which are deep-rooted tree species, have the ability to extract water from a wide range of soil depths. Extending deep into groundwater reserves, these trees have been found to directly impact aquifer recharge. They have high transpiration rates, especially during the active growing season. Reports indicate that during peak growth rates, juniper trees will transpire between 30-40 gallons of water each day. Juniper and pinyon can intercept a significant proportion of the precipitation prior to reaching the soil surface. In Texas, for example, evapotranspiration by juniper accounted for 80-95% of the water loss from rangelands (Thurow and Taylor 1995), and in Oregon, western juniper intercepted up to 74% of the precipitation during any given storm event (Eddleman 1983).

Juniper trees are very competitive with other plant species for limited resources, in particular water. The rapid uptake of water by juniper and pinyon trees reduces the availability of water to shallower rooted plant species. In fully occupied juniper woodlands, shrub mortality is initially evident, followed by a decline in grass and forb density and cover (Figure 4). As a result, the intercanopy area will often experience a severe decrease in plant structure and diversity. This in turn exposes bare soil to raindrop impacts, accelerated erosion rates, decreasing infiltrations rates, and high sediment movement and deposition in runoff. Once fully occupied, fuel loads in juniper woodlands (i.e. shrubs, grasses, and other low-growing

vegetation) become limiting, preventing naturally occurring fire from spreading. This in turn can result in long periods without natural disturbance.

Figure 4. Juniper and pinyon dominated plant communities located 50m west of the country road between Alton and Sink Valley.

Sagebrush Communities

Sagebrush dominated plant communities occur along the foothills and intermittently throughout the valley bottom in the Alton area (Figure 5). These sites are dominated by moderate to tall growing shrub species. Similar to juniper encroached areas, dominant species include big sagebrush (*Artemisia tridentata* var. *tridentata* and var. *vaseyana*), black sagebrush (*Artemisia nova*), and antelope bitterbrush (*Purshia tridentata*). Similarly, common grasses and forbs include bluebunch wheatgrass (*Agropyron spicatum*), Idaho fescue (*Festuca idahoensis*), and bottlebrush squirreltail (*Sitanion hystrix*).

Sagebrush dominated stands in the Alton area are limited in size and extent. Most sites that would have once sustained characteristic sagebrush dominated communities have been encroached by juniper. Under natural fire regiimes, sagebrush dominated communities have characteristic fire-return-intervals of approximately 30-37 years (Heyerdahl et al. In Press). Following fire, perennial grasslands establish rapidly until over time sagebrush plants establish and develop

to maturity. With an ignition source along with a buildup of fuels, fire will soon reoccur destroying plants and returning the system to an earlier seral community. With fire suppression in addition to rapid and far-reaching juniper dispersal, the fire-return-interval for many of these systems has increased to 75-150 years. As a result, juniper woodlands have expanded and sagebrush communities have decreased within this area since the 1990's.

Intact sagebrush stands provide important habitat for a variety of sagebrush obligate and sagebrush facultative bird and mammal species. Sage sparrow (*Oreoscoptes montanus*), sage thrasher (*Amphispiza belli*), and Brewers sparrow (*Spizells breweri*) are sagebrush dependant passerine species found throughout the sagebrush grassland biome. Pygmy rabbit (*Brachylagus idahoensis)* and greater sage-grouse are species dependant of contiguous stands of sagebrush communities for providing adequate habitat.

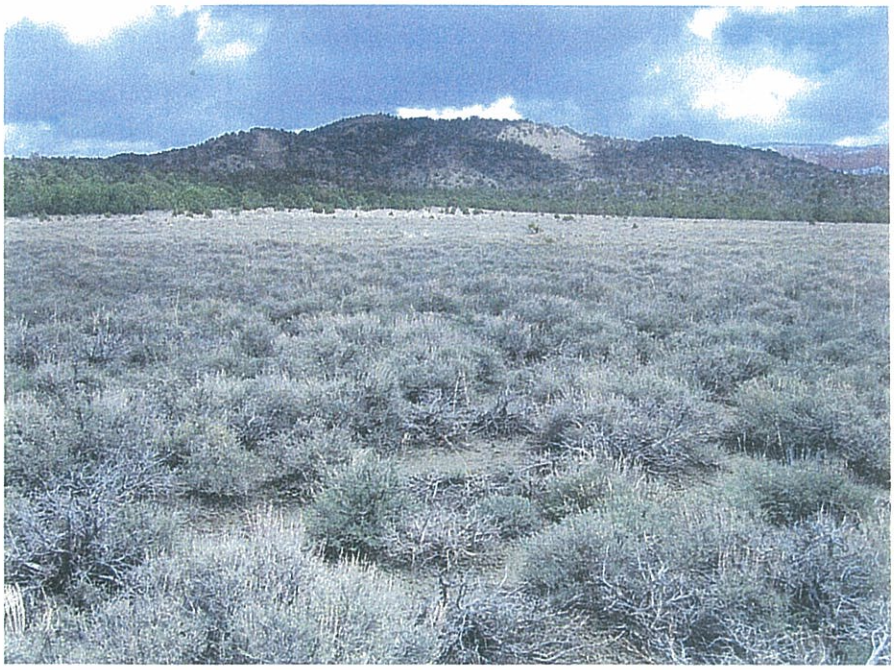


Figure 5. Sagebrush dominated plant communities located east of the country road north of Sink Valley.

Valley Floor Grasslands

Much of the valley bottoms in the Alton Amphitheater and Sink Valley areas are primarily pasture grasslands (Figure 6). These sites are dominated by grass and wet-meadow plant species that occur in fenced fields and pastures. During early spring months (March – April), surface water in the lower portions of this community type lead to ponding and surface flows (based on field observations between late March to early April). The grasses growing in these pastures are primarily introduced species, including Kentucky bluegrass (*Poa pratensis*), timothy (*Phleum pretense*), and intermediate wheatgrass (*Agropyron intermedium*). Sedge (*Carex*) species also occur in these fields, especially where water levels in the soil profile are high. Several forb species also grow in these fields including lomatium (*Lomatium* spp.), and wild iris (*Iris missouriensis*).

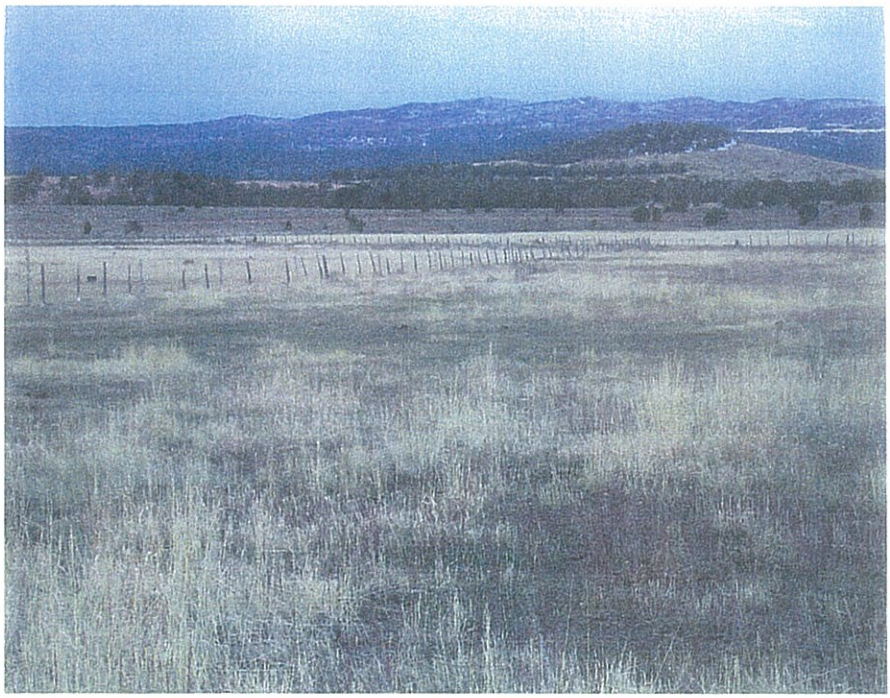


Figure 6. valley floor grassland communities that are dominated by pasture and fields consisting primarily of introduced grass species and native forbs. This photo was taken near the sage-grouse lek, adjacent to the Swapp Ranch house in Sink Valley.

Alton Land Use History

The Alton area has a long history of human occupation and use. Following the arrival of western civilization in this valley, the environment has undergone significant alterations.

Fire suppression and juniper expansion

Due to a prolonged history of fire prevention, this region has experienced an unnatural expansion of Utah juniper and pinyon pine along the mountain sides, foothills, and valley floor.

Crop and pasture production

Early settlers converted much of the low lying land into crop production and pasture development. Near Alton, a large portion of the land has been used for raising alfalfa hay. Irrigation has been utilized to sustain season-long hay production. Pastures extend across much of this valley for livestock and wildlife grazing. Pastures and crops have been separated by miles of fence that has been maintained for long time periods (Figure 7).

Sagebrush removal and disking

In many areas, especially south of Alton and north of Sink Valley, sagebrush was disked to remove the shrubs in order to open sites for grass establishment and growth. Introduced species seeded in these pastures included timothy, crested wheatgrass, intermediate wheatgrass and Kentucky bluegrass.

Irrigation and hydrologic modification

The original stream corridors and subsurface groundwater resources were used for irrigating crops and providing water to residents of the town. It is likely that original creek flow-paths have been significantly modified over time by farming and ranching operations.

Soil plowing and road-related disturbance

Based on current land conditions and practices, it is probable that much the soil in this area has been plowed for crop and pasture production. Where plowed, plowpans (compact soil layer) can occur which can restrict plant growth, root penetration and water infiltration. Equal to plowing, road construction has introduced a significant ecological disturbance to the area. These roads are used often, especially during the summer months by local citizens as well as tourists and other motorists. Roads provide ideal corridors for the spread of invasive plants.

City and Home Construction

The town of Alton occurs at the North end of the valley adjacent to the Alton Amphitheater. In addition to the town, a number of homes and ranches have been constructed throughout the Alton region extending to the southern end of the mining and mitigation zone. Activities associated with community life include farming, vehicle use, hunting, and other outdoor recreation and work related activities.

Figure 7. Ecological alterations to the Alton area apparent in this photo include fence construction, hay production, irrigation, road development, and juniper encroachment. This photo was taken east of Alton along the county road.

Sage-grouse Ecology

Population Dynamics

Sage-grouse (*Centrocercus urophasianus*) is a relatively long-lived bird species belonging to the pheasant family (*Phasanidea*). The average lifespan of an adult female is approximately 5-6 years, and less for males at 4-5 years. Sage-grouse vary in summer to winter migration from populations that travel only short distances throughout the year to other populations that will travel over 50 miles before returning to the lek the following spring.

Sage-grouse once occurred from Canada to New Mexico and east to the Dakotas. Today, the range in sage-grouse has decreased in both extent and population density. Figure 8 represents the level of change that has occurred since the settlement of western North America. Data indicate that since 1985, bird populations have decreased by 17-47%. Data provided by the USGS (2003) suggest that sage-grouse numbers have declined annually by 2% since the 1960's (Figure 9).

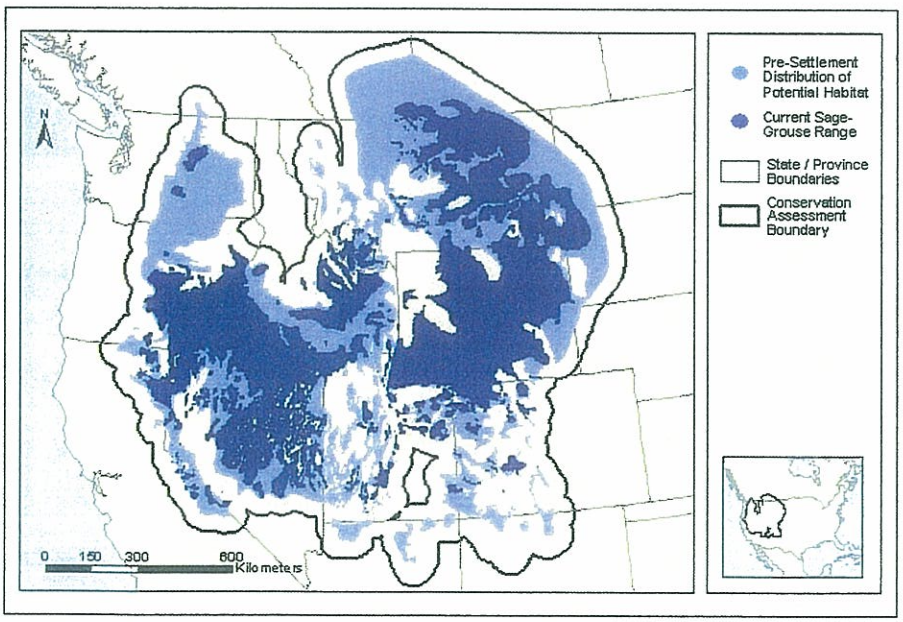


Figure 8. Range of sage-grouse during pre-settlement periods (light blue) in comparison with current sage-grouse populations. These data were provided by the USGS.

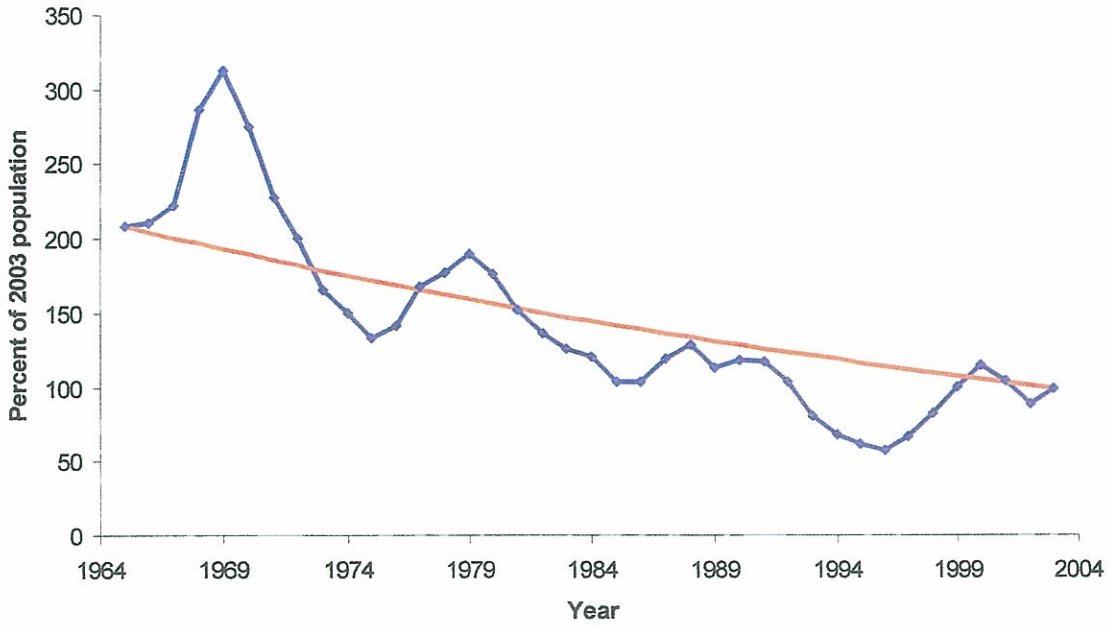


Figure 9. Trend in the sage-grouse population from 1964 to 2003. Data indicate an approximate 2% annual decline. 11 of the 13 states where sage-grouse occur have experienced long-term declines (USGS 2003).

The decline in sage-grouse breeding and nesting success, primarily during the last 50 years, has resulted in a reduction in the distribution of sage-grouse throughout North America by approximately 50% (Aldridge and Brigham 2002). This decrease has been attributed primarily to the reduction of suitable sagebrush habitat resulting from fragmentation, exotic weed invasion, conifer encroachment, overgrazing, cultivation, and altered fire regimes (Miller and Eddleman 2001, Pedersen et. al. 2003, Connelly et al. 2004). Currently, there is considerable discussion focused on strategies to maintain or restore the health of sage-grouse populations across the non-arable portions of the sagebrush biome. Researchers have begun to identify sage-grouse habitat attributes important for maintaining healthy populations throughout the year (Connelly et al. 2004, Crawford et al. 2004, Gregg et al.1994, Barnett and Crawford 1994).

Sage-grouse adult survival is relatively high which is reason for relatively stable adult populations from year to year. According to Connelly (2004), there is a 50-

75% annual survival rate for breeding-aged birds. Gregg (2006) found that female birds had on average 50-60% annual survival whereas male survival was lower (approx. 30%). Sage-grouse productivity, however, is low. Although adult birds may have high reproductive potential, hens will occasionally fail to attempt nesting or will attempt to nest, but fail in producing a viable clutch. More important however is the low juvenile survival rate. Low chick survival is attributed to predation, food and starvation, poor habitat, weather, and harvest. Periodically sage-grouse experience "boom years" in which bird production and survival is higher than average. During these years, populations can experience significant fluctuations in abundance.

Breeding and lek characteristics

Leks are confined areas where adult birds congregate for courtship and mating. From mid-March to late April, birds return to established lekking grounds where males exhibit elaborate courtship displays in attempt to attract observing females. Most adult birds, especially males, will return to the same lek year after year (Gregg et al. 1994). It is common for a lek to be revisited for many decades. Lek habitat consists of relatively short-growing vegetation that minimizes visual obstruction, necessary for performing and observing courtship displays and reducing predation from ground-based predators. Typical plant species that occur in leks are low sagebrush (*Artemisia arbuscula*) and low-growing grasses.

Examples of natural or artificial disturbances applied to a lek suggest that sage-grouse will tolerate modified conditions or will shift to alternate breeding sites. At Jackson Hole, Wyoming, observations of a lek located at the end of the local airport found that birds continued courtship and display behavior in spite of the disturbance of aircraft landing and taking off overhead. In northern Nevada, high water levels and snowpack on the lek during a single years breeding season resulted in the birds shifting breeding activities to a nearby alternate site located on an adjacent hillside. Finally, Tate et al. (1979) and Eng et al. (1979) found that when a lek was disturbed by mining activities, birds utilized a temporary artificial

alternate breeding ground. This shift was improved when audio recordings of strutting male grouse were played from audio equipment located in the alternate lek area.

Nesting and nest-site characteristics

For a 5-week period prior to nesting and after mating, birds move away from the lek and focus their attention on foraging. During this time, adult female birds eat 50-80% sagebrush leaves and 20-50% forbs (Connelly 2004). This provides an opportunity for the hens to acquire nutrients and body mass needed for maternal required during and following nesting.

Females establish nests primarily under mature sagebrush plants, often in mountain big sagebrush communities (Wallestad and Pyrah 1974). Nest sites generally occur within a couple miles of the lek, however, some birds may fly significant distances before establishing nest sites. Birds select nest sites based on canopy height and cover (Connelly 2004). Based on data collected from nest site locations, birds use stands that have on average 15-25% sagebrush cover and a minimum height of 40-80cm. Autenrieth (1981) suggests that poor reproductive success may result from a lack of key habitat structure. Delong (1994) also stated that nest failure can be caused by predation by coyotes, ravens and other small mammal and avian predators.

Post-nesting Habitat

After nesting, adult females and their brood will move to areas high in food resources, consuming mostly forbs and insects. For the first 2-3 weeks of their lives, chicks will consume almost entirely insect species, especially caterpillars, ants, and june beetles. Following this period, chicks modify foraging behavior mostly consuming a variety of forb species. As the season progresses, birds reach older and more developed growth stages, and simultaneously forb availability declines. Therefore, young birds will shift their diet toward sagebrush leaves, similar to diets of adult birds.

Winter Habitat

During late fall and into the winter, birds use medium to tall (25-80cm) sagebrush communities for hiding and foraging. Birds have been found to prefer south and west-facing slopes where air temperatures are greater during the day. During this time, birds forage almost exclusively on sagebrush leaves. Optimal sagebrush cover for winter habitat ranges between 12-43% (Connelly 2004).

Alton Sage-grouse population

Biologists from the Bureau of Land Management in Kanab, Utah captured, collared, and monitored 4 birds within a one year time period beginning in Spring 2005 (Church 2006). Based on these data, they found that the collared sage-grouse remain in the Alton area throughout their lifecycle, migrating only short distances between Sink Valley and the Alton Amphitheater.

Breeding Habitat

The only lek in the Alton area is approximately 100 yards west from the Swapp Ranch House (371533 Easting 4138811 Northing UTM Nad 27; Figure 10). The lek is located in a pasture that is enclosed by a juniper-post barb-wire fence.

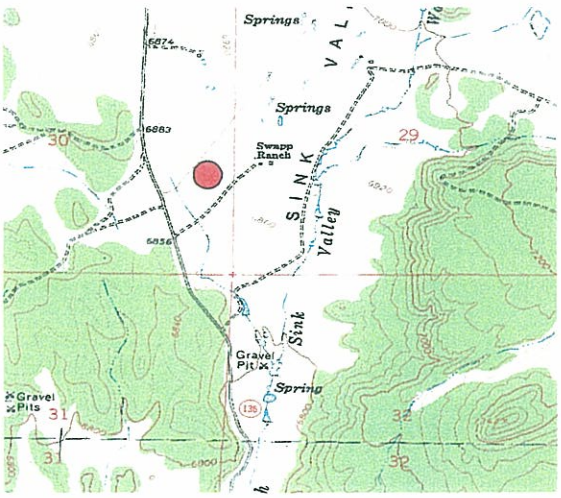


Figure 10. Location of the Sink Valley lek, located west of Swapp Ranch.

On March 30, 2006, 12 males and 4 females were observed on the lek between 6:30am to 8:00am. Adult males were observed displaying within 5-25 yards from the fence on the north-side of the pasture (Figure 11). Studies indicate that female to male ratios generally range between 1:1.5 to 1:2 birds. Therefore, the predicted number of female sage-grouse in the Alton area ranges between 18 and 24 birds and the total number of sage-grouse in the population is approximately 30-36 birds. Compared to sage-grouse populations that number in the hundreds, this population is considered relatively small.

Figure 11. Sage-grouse males displaying on the Sink Valley lek on March 30, 2006 at approximately 7:00am.

Northeast of the lek is a site used for roosting during the breeding period (371877 Easting 4139610 Northing UTM Nad 27; Figure 12a). This site was identified by a large number of localized fecal piles clustered within a common area (Figure 12b).

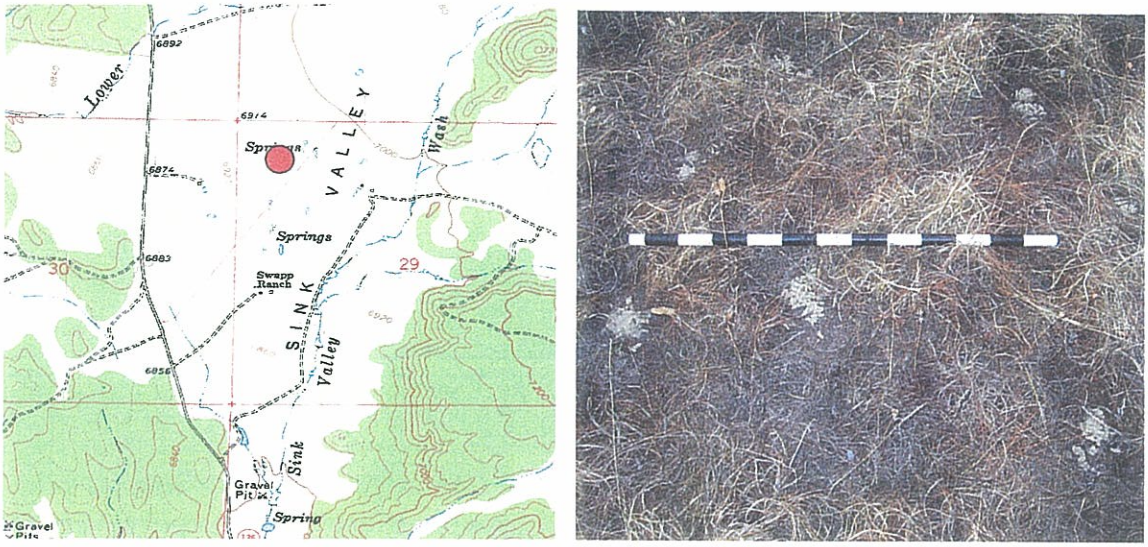


Figure 12. a) Roost site approximately 0.25 miles northeast of the Sink Valley lek (left). b) The area had dozens of tight fecal piles (right) deposited during this season's breeding period.

Nesting Habitat

Nesting is limited to infrequent stands of black and mountain big sagebrush stands. Within most of these stands, early to mid-level phases of juniper encroachment are noticeable (Figure 13). Without juniper control, intact sagebrush communities and therefore sage-grouse habitat will likely be lost from this area within the next few decades.

Summer and Winter Habitat

Within the Alton region, much of the potential sage-grouse nesting and winter habitat has been lost due to extensive juniper encroachment. As a result, during the fall of 2005 the BLM conducted a juniper removal project. This project created a narrow strip of land where all trees were cut and shreaded. Over time, this strip will become reestablish with sagebrush plants and other herbaceous plant species. Because of the short distance from juniper, it is possible that much of this area will not be used by birds for nesting or early brood-rearing. On the western end of the valley, juniper have been thinned to reduce impacts to watershed hydrology and plant structure. Since a significant number of juniper

trees were left uncut (selective harvest technique), this area remains inadequate habitat for sage-grouse nesting and brood-rearing.

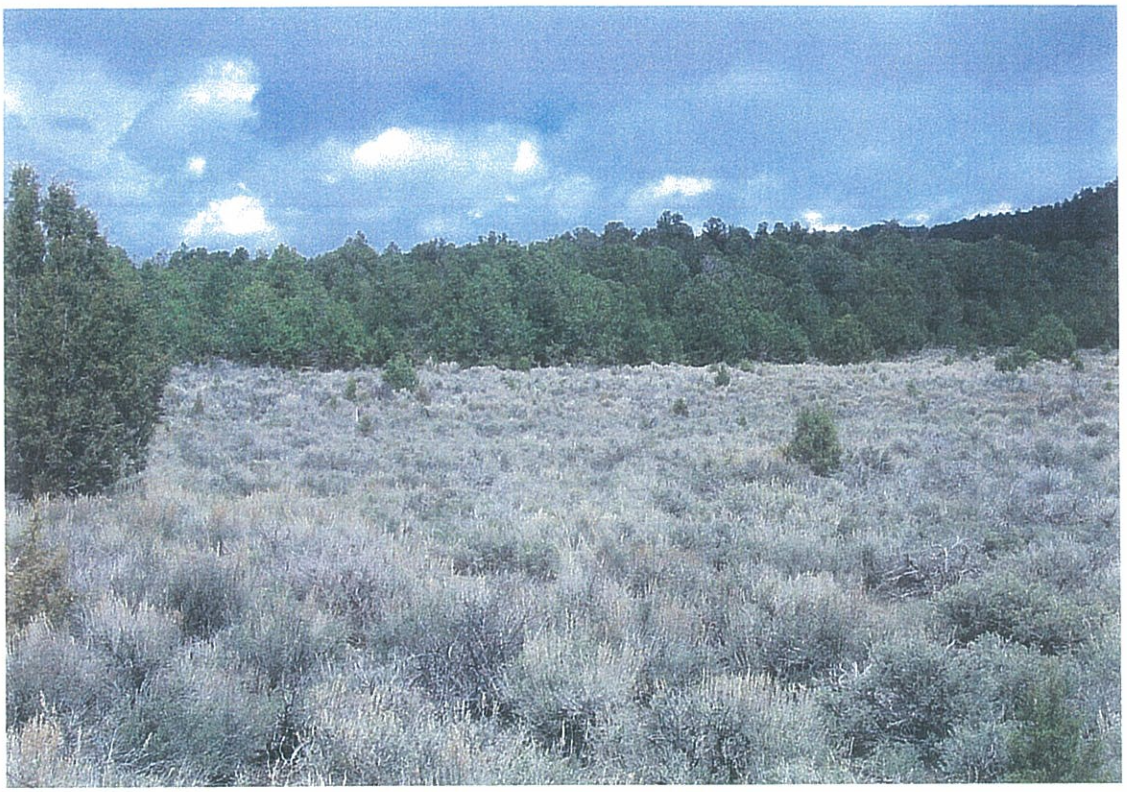


Figure 13. Juniper encroachment in a black sagebrush community in the Sink Valley area. This is typical of most of the remaining sagebrush stands in the area.

Long-term Sage-grouse Status

Because of 1) the invasion of Utah juniper and pinyon pine into the few remaining stands of intact sagebrush and 2) the lack of a contiguous sagebrush community required for nesting, brood-rearing and winter habitat, the long-term survivability of the Alton sage-grouse population is poor. Additionally, the expansion of juniper throughout the region has fragmented the Alton population from other nearby populations, limiting the ability of bird migration and therefore restricted gene flow. As a result of restricted migration potential and juniper expansion, the local sage-grouse population will likely experience population declines and even eventual local extinction.

Proposed Mitigation Plan

Habitat Assessment and Mitigation of Breeding and Roosting Sites

On March 30 and April 1, 2006, vegetation measurements were taken of plants within the lek area and nearby adjacent sites. The purpose of this study was to determine if sites exist that could potentially function as alternative lek and roosting habitat during the period that the original lek and surrounding area would be disturbed by mining activities. Sites sharing similar vegetation, topographic attributes, disturbance patterns (i.e. grazing) and close proximity to sites planned for mining were identified (Figure 14). These sites were also similar in slope, aspect, and distance to juniper trees (Table 2). Two random transects were established within the lek area, the original roosting area, and the sample sites. Plant cover was sampled by species using a point-intercept method.

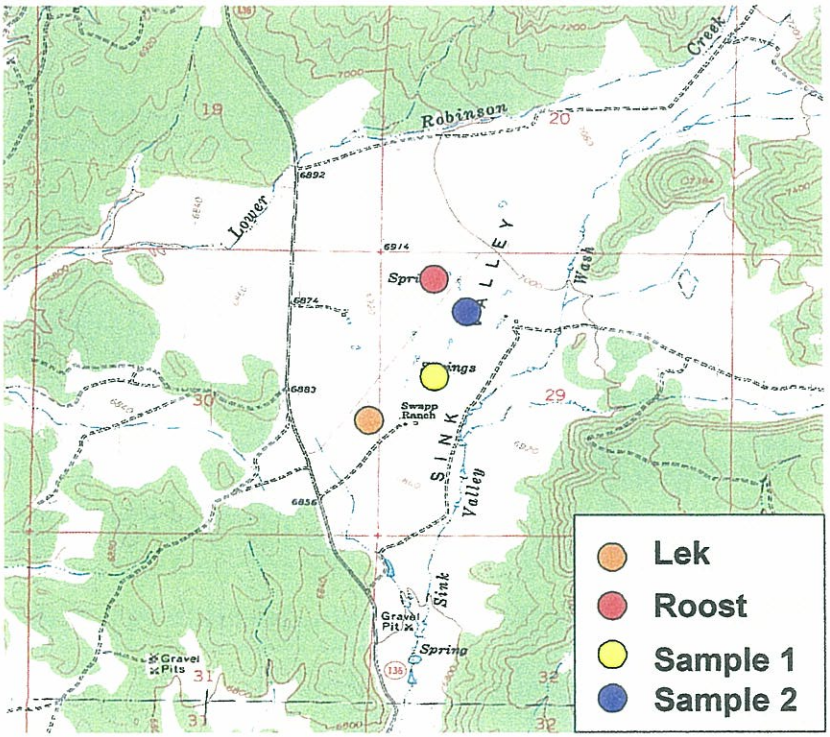


Figure 14. Location of the lek, roost, and potential alternate sites for lek and roosting habitat.

Table 2. Difference in slope, aspect, and distance to juniper at the lek, roost site, and potential alternate sites (sample sites).

	Lek	Roost	Sample 1	Sample 2
Slope (%)	3.5	4.5	4.5	4.0
Aspect (°)	204	199	201	182
Distance to Juniper (m)	>100	>150	>75	>200

Results from this work indicate that the lek and sample site 1 are similar in plant cover, bare ground, litter composition, and canopy height (figure 15). Similarly, the roosting area and sample site 2 have similar plant cover, bare ground and litter composition. Average plant height was greater in the roosting area (62%) than sample site 2 (43%). These data indicate that sites outside the mining area have similar traits to the actual lek and roost sites, and could potentially serve as alternate sites for breeding and roosting.

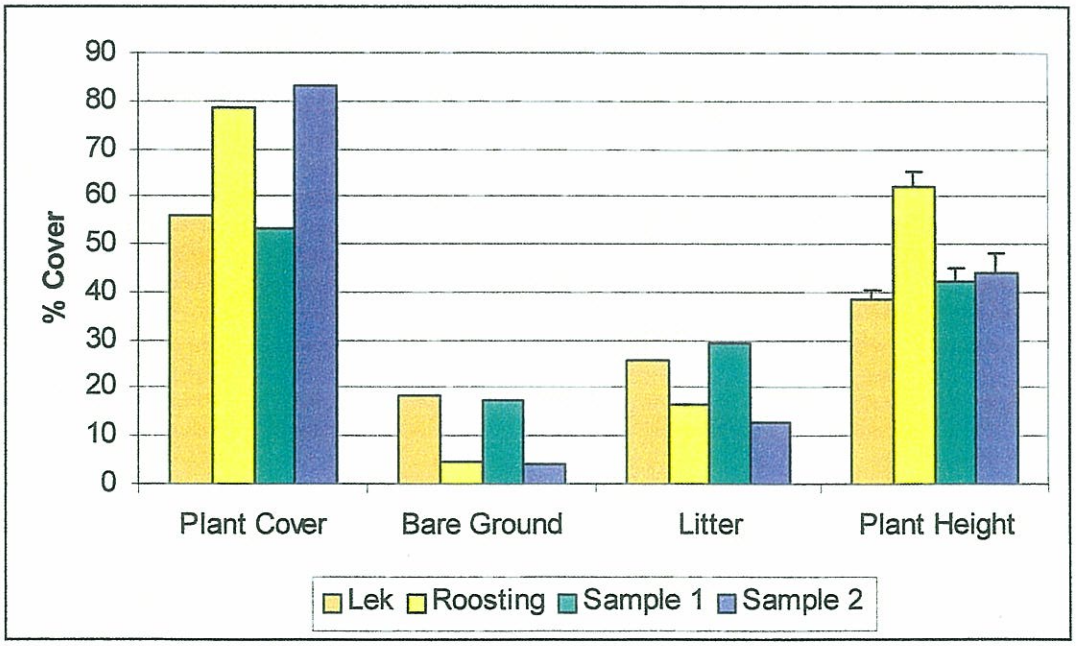


Figure 15. Percent cover of plants (combined), bare ground and litter. Plant height was measured in centimeters (right).

Creation of a Conservation Area

The current roosting area is not within the proposed mining site. This area and the alternate sample sites will be protected from any mining activity. In this "Conservation Area", habitat will be protected and enhanced for sage-grouse, especially during the breeding season. In addition to the Conservation Area, much of these grasslands and upper sagebrush stands are located along an upper terrace that provides a partial visual barrier from mining activities that will occur in the valley bottom. To create a more distinct visual barrier, spoils from mining will be stockpiled at the ridgeline (up to 20' higher) further decreasing motion and sound within the Conservation Area created during mining activities.

Short-Term Mitigation Plan

In addition to ensuring the protection of nearby grasslands and shrublands for alternate breeding and nesting areas, mining activities will be minimized so that the lowest disturbance will be created during the breeding season at areas adjacent to the original lek. After mining has been completed, reclamation specialists will return the original grade and valley form to pre-disturbance conditions. Reclamation will include seeding similar plant species with comparable plant composition, structure and function as those of the original plant community. In sites used by sage-grouse for breeding and roosting that had previous livestock grazing, livestock will be used post-reclamation to maintain similar vegetation characteristics as pre-mining conditions.

Intact sagebrush stands will be avoided for storing mining generated spoil and topsoil stockpiles. Sites will be selected for storing these materials that are distant from prime sage-grouse habitat, in particular potential nesting habitat. Coal processing equipment will be located in areas that create the least possible disturbance to sage-grouse and sage-grouse habitat. Intact sagebrush sites will be cleared of all young juniper trees with the use of chainsaws or hand tools. Trees will be removed from these stands. Juniper woodlands surrounding intact

stands can be cut back to increase patch size and increase the amount of area that has potential for nest site selection by hens.

Long-term Mitigation Plan

A significant contribution that mining can provide for enhanced sage-grouse habitat is the removal of juniper from the Alton valley. The removal of trees during mining operations with subsequent reclamation activities will create conditions that promote grass, forb and eventually sagebrush establishment. Two years after juniper was removed from plots located in eastern Oregon, Bates et al. (2000) recorded a 200-300% in percent cover and production of herbaceous vegetation. Increased plant community vigor results from decreased competition with juniper for subsurface resources (water, nutrients) and space. As a result, transpiration rates and soil surface evaporation rates will decrease and higher soil moisture will be availability for plant growth and survival. Based on anecdotal evidence, it is also possible that spring discharge will increase and seeps and spring may emerge that were lost with initial encroachment. This would provide more sites where birds would be able to obtain water during the summer and fall months.

Removing trees from extensive areas creates greater connectivity of suitable habitat. In 2005, the BLM cleared portions of the land to increase sagebrush habitat. This improvement was beneficial for improving relatively small site conditions, however, the amount of land treated was minimal compared to the level needed to sustain the sage-grouse population in the Alton area. Long-term mining plans will remove hundreds of acres of juniper woodlands, significantly increasing conditions that are more suitable to sage-grouse nesting and post-nesting requirements. This landscape-level operation could greatly enhance sagebrush restoration objectives by the BLM that is currently limited by constrained budgets and manpower.

Over time, juniper encroachment has likely been the primary factor in isolating the Alton sage-grouse population from nearby populations. According to local sources, a sage-grouse population is located approximately 6 miles north of Alton. It is likely that migration once occurred between these populations allowing an exchange of individuals and genes between the two populations. Fragmentation of the landscape by juniper has likely resulted in minimal or no movement of birds between the two populations. Similarly, two populations that once occurred further south (near Kanab) have become locally extinct, likely due to the lack of connectivity with more northern populations. According to Fuhlendorf (2001), small populations of prairie chickens became disconnected from other larger populations with increased croplands and juniper invasion. These small populations became locally extinct due to the lack of migration and gene flow potential. Therefore, by reducing the degree of fragmentation caused by expanding juniper, the potential for migration and population sustainability is increased.

Primary brood-rearing habitat in the Alton valley is associated with alfalfa fields near the town of Alton. Birds likely utilize these areas due to the availability of forbs, insects, and water. To reduce the dependency of the birds on these areas, irrigated alfalfa fields will be created in Swapp Valley (south of the Swapp Ranch house). In addition to alfalfa, many sage-grouse forage species (forbs) will be included in the seed mix. This will increase brood-rearing habitat closer to breeding and nesting habitat. This in turn will reduce potential predation that occurs near towns by ravens, crows, cats, dogs and people. It will also reduce bird mortality associated with large-scale farming practices.

The Alton sage-grouse population will be enhanced by importing birds from nearby populations that are relatively large and stable. Captured and relocated birds (initially 10-15) in the Alton area will increase genetic diversity as well as stabilize population numbers to offset losses associated with disease and emigration (unrelated to mining activities). Additionally, birds from the Alton

population (5-10) can be trapped and released in a nearby population through the mining period. Once complete, these birds can be trapped again and returned to the original Alton population. This will ensure the survival of members of the original Alton population.

Habitat Reclamation Plan

Seed mixes that are used for reclamation will consist of native grasses and forb species that provide cover and food (clover, lomatium, etc.). In order to accelerate shrub re-establishment, bareroot or potted sagebrush and bitterbrush transplants will be planted. To ensure the integrity of the planting materials, indigenous seed and cuttings will be collected for reclamation. At Bryce Canyon National Park, seed and transplants obtained from indigenous materials had greater long-term survival and higher cover and production than commercial varieties of the same species (Petersen et al. 2004).

Cursory surveys conducted on April 30th found that there is a low probability that a dominant invasive species (ie. Cheatgrass, medusahead) could establish on reclaimed sites. However, post-reclamation surveys will be conducted for undesirable invasive plants. If a breakout does occur, mechanical followed by chemical treatments will be applied.

Seeding and planting will occur in the fall season following the growing season and into dormancy. During the following growing season, vegetation sampling will be conducted to monitor reclamation success. Measurements will be continued each year until the reclamation goals have been achieved. Additional seeding can be applied during subsequent years if the minimum standards of acceptance have not been achieved. Juniper seedlings found in reclaimed areas will be removed.

Monitoring plan

Birds trapped and relocated to the Alton population will be collared with radio-colllars. Birds will be monitored throughout the year to assess bird survival, nest site and nest success, brood-rearing sites, and key winter habitat areas. Lek counts will be conducted each year to determine the number of birds at the lek. Reclamation sites will be monitored to assess restoration success. With the establishment of desirable plant communities, sagebrush obligate species habitat will be improved. Birds that depend on these communities include sage sparrows (*Oreoscoptes montanus*), sage thrasher (*Amphispiza belli*), and Brewer's sparrow (*Spizells breweri*). Also, mule deer habitat will increase, especially with the establishment of antelope bitterbrush and other palatable browse species. Grassland development will also increase forage for elk (*Cervus elephas*). Reclaimed sites will be monitored to assess utilization by these and other wildlife species.

To provide consistent monitoring and assessment, plans are being discussed to employ a graduate student from an established university to use this project as the basis for a graduate thesis. This would provide peer-reviewed research and monitoring of this project. It would also provide a mechanism for publishing the results of this project as a source of information and knowledge that can be applied to similar work in other areas.

Conclusion

The sage-grouse population in the Alton area is currently vulnerable to elimination regardless of mining activities. This is primarily to the loss of habitat required for nesting and brood-rearing. Therefore, a "no action" alternative will lead to population decline and potentially local extinction. To sustain sage-grouse levels in the valley, significant habitat modifications are required. Mining activities provide an opportunity to enhance sage-grouse habitat by adhering to a well-developed and established mitigation program. Information and knowledge

gained through this work can enhance our understanding of sage-grouse population dynamics and habitat requirements.

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CHAPTER 4

LAND USE AND AIR QUALITY

R645-301-400

CHAPTER 4

R645-301-400. LAND USE

410. REGIONAL LAND USE

Land use and agricultural production in the Coal Hollow Project region centers around livestock production. Rangeland use for cattle grazing is the predominant land use in the Region. The majority of the land is classified as unimproved rangeland.
Some farming is done within the surrounding lands but crop choice and production levels are severely restricted by climate, soil, and water availability conditions. Alton and Sink Valley incur frequent early spring frost conditions as a result of cold air drainage into these low-lying valleys. These conditions and the resultant short growing season restrict crop choice to the more hardy wheat and small grain crops and alfalfa hay.
This land is also used as watershed, recreational hunting, and wildlife habitat.

Within the permit boundaries, all lands and mineral resources are owned privately. These lands are mainly used for grazing, and native wildlife habitat.

411. ENVIRONMENTAL DESCRIPTION

The permit area is within elevations 6840 feet and 7000 feet. It incorporated valley floors and hills, cradled between the Dixie National Forest. Climate is largely determined by local topography and the location of the area relative to the principal sources of moisture, the Pacific Ocean and the Gulf of Mexico. The existence of barriers between southern Utah and these moisture sources produces the dry temperature climate for which this area is renowned. A weather station was constructed in the summer of 2005 to monitor, monthly, precipitation, Temperature, Wind direction and speed, and is shown in Photographs 4-1 and 4-2.

Winter season Pacific storms reaching the Utah area must first cross the Sierra Nevada and Cascade Ranges to the west. Lifting of the air masses during passage over these barriers result in the majority of the moisture in the air condensing and falling out as precipitation. Thus, air mass reaching southern Utah from the west is generally dry and the associated precipitation is light. A similar barrier to moisture from the Gulf of Mexico can be found in the Rocky Mountains east of southeast Utah. During the summer, moist air masses do move into the southern part of Utah from the Gulf of California. Precipitation usually falls as thundershowers associated with these air masses. Precipitation for the area generally averages 16 inches per year. Temperature varies from a mean maximum temperature of 92 degrees during the summer months to a mean minimum temperature of 18 degrees during the winter months. Maximum snow depths average about 12" but usually melt fairly rapidly.

The predominant wind direction of south-central Utah ranges from southwest through west, with secondary peaks from the southeast and northwest. Surface winds near the permit area average about eight miles per hour. Higher wind speeds are usually associated with the passage of frontal systems or thunderstorms, generally during the springtime.

411.100 Premining Land Use Information

The premining use of the land within the permit boundaries is grazing, farming, and wildlife habitat.

Rangeland use for cattle grazing is the predominant land use in the Alton Coal area. Together with lands too steep or unproductive for cattle grazing, these two lands account for 90% of land commitments.

The land within the permit area consists of unmanaged expanses of rolling to steep Pinion-Juniper landscapes, sagebrush and mountain brush, meadow, and pasture land. Some cattle grazing occurs within the pastureland, but is limited due to the short growing season.

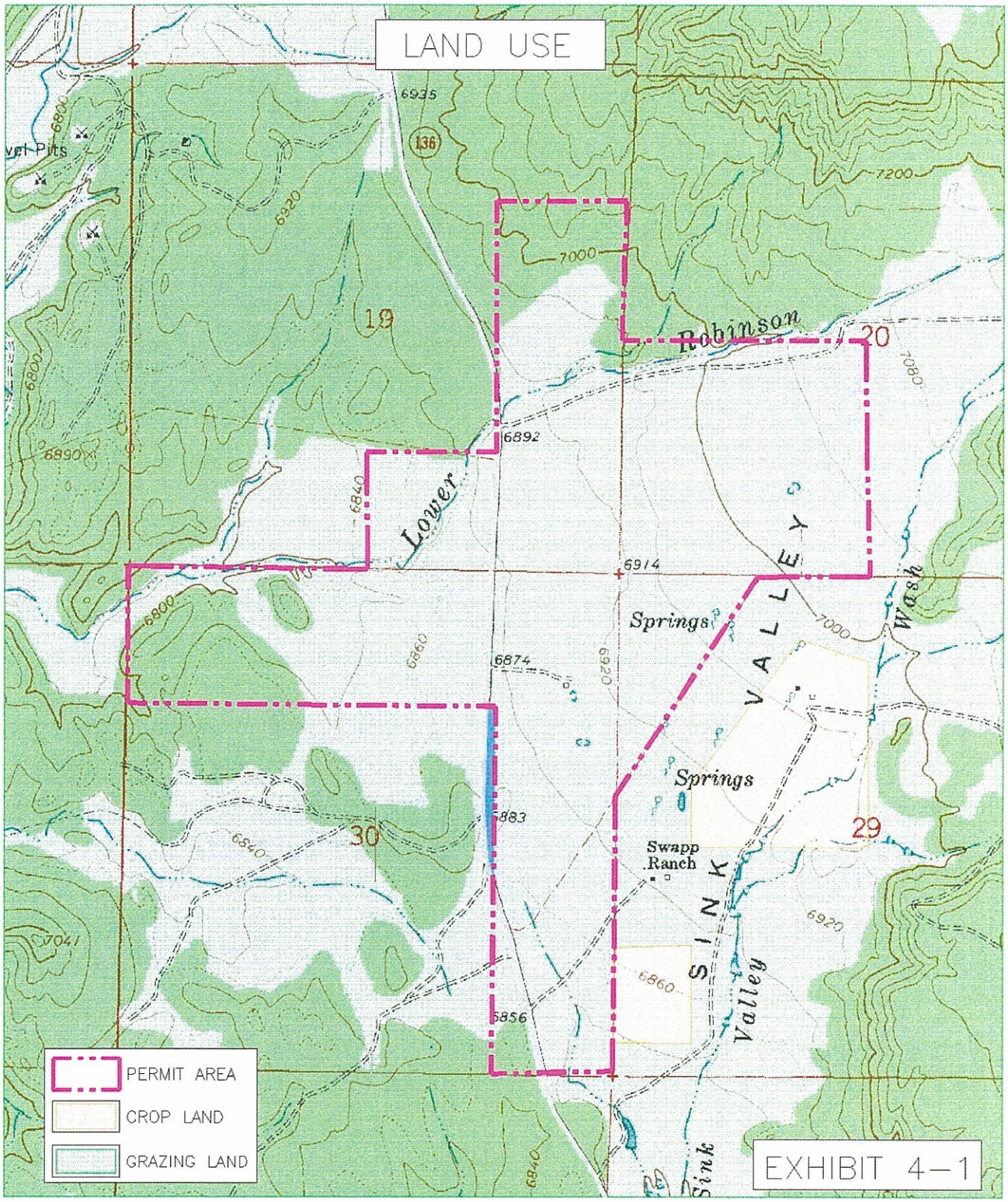
Agricultural crop production is sustained on some land east of the permit area. 85% to 90% of this crop is not harvested, but is used for intense cattle grazing. Crop Lands North of the permit area and south of Alton are devoted to hay production for on-ranch winter cattle feed. Exhibit 4-1 reflects land use within and around the permit area. Photographs 4-3 and 4-4 show actual layout of Crop land and Grazing land.

The wildlife habitats within the mine area are reflected on Drawings 3-2 through 3-5, and discussed in Chapter 5 of this Mine Reclamation Plan. Black Bear, Rocky Mountain Elk, Mule Deer, and Greater Sage Grouse are some wildlife that uses the lands within the Permit area.

After reclamation, the mining area will be restored to support uses it was capable of supporting prior to mining. Vegetation will be restored to provide habitat and a food source for wildlife. Access roads, fence lines, and supporting structures will be reconstructed pursuant to the wishes of the surface landowner.

Utility corridors and other Right-of-ways

Kane County maintains a county road, County road 10, which runs north-south through the western part of the permit area. This is reflected on Drawing 1-1. Alton Coal Development, under the direction and in corporation with Kane County, plans to temporarily relocate county road 10, east while mining operations commence to the west. This is reflected on Drawing 5-1. After mining is completed below the now existing road bed, the county road will be moved back to its original, permanent location and constructed as required by Kane County Road Department.


LAND USE
PERMIT AREA
CROP LAND
GRAZING LAND
EXHIBIT 4—1
Robinson
Lower
Springs
Springs
Swapp Ranch
SINK VALLEY
Sink Valley
Wash
19
20
29
30
6935
6892
6914
6874
6883
6856
7000
7200
7080
6920
6860
6840
6800
6890
7041

411.110 Surface Land Status/Mine Plan Area

Ownership of the surface rights within and contiguous to the mine plan and permit area is shown on Drawing 1-3. The surface within the permit area is privately owned and leased by Alton Coal Development. The contiguous lands, outside the permit area, are administered by Bureau of Land Management, along with other private owners, as reflected on Drawing 1-3.

Alton Coal Development feels that the mining of the permit area will enhance the post-mining use of the land. Gulleys and reels will be eliminated. Drainages will be enhanced allowing a better use of land. Wildlife habitat will benefit from the planting and reclamation of lands for that purpose. Reclamation will be to Approximate Original contour.

411.120 Land Capability

The Coal Hollow Project Area has several land uses ranging from wildlife habitat to pasture land. Current vegetative cover and productivity of the plant communities in the permit area are shown in Chapter 3 (321.100 *through* 321.200). Soil resources information of the permit area is provided in Chapter 2 (222.100 *through* 222.400). Topography of the area is described in several chapters, but specifically in Chapter 6. Current hydrologic conditions of the permit and adjacent areas the project provided in Chapter 7.

411.130 Existing Land Uses/Land Use Classifications

Kane County has zoned the area within the permit boundaries and surrounding area as Agriculture.

411.140 Cultural and Historic Resource Information

A cultural resource inventory was conducted by Montgomery Archaeological Consultants Inc. (MOAC) in June 2005 for Alton Coal Development, LLC. The project area is located in the Sink Valley area in the Alton Amphitheater. This survey covers the entire permit area, approximately 433 acres, all of which are on private property.

The inventory resulted in the documentation of one previously recorded historic/prehistoric site, five previously recorded prehistoric sites, and nine new prehistoric sites. All but two eligible sites will be avoided by mining operations. Those two locations will require a data recovery treatment plan.

Appendix 4-1, Cultural resource inventory of Alton Coal Developments Sink Valley-Alton Amphitheater Project Area, Kane County, Utah, reflects maps, photographs, and results of the inventory.

411.141 Cultural and Historic Resources Maps

Cultural and Historic Resource Maps are included in Appendix 4-1.

411.141.1 Boundaries of Public Parks

There are no public parks in the permit area. There are known archeological sites as reflected in the Montgomery survey, Appendix 4-1.

411.141.2 Cemeteries Located within 100 feet

No cemeteries exist within the permit area or within 100 feet of the permit area or within any adjacent area subject to potential impacts.

411.141.3 Trails, Wild and Scenic Rivers System

No trails or wild and scenic rivers or study area rivers exist within the permit area or areas of potential impact.

411.142 Coordination with the State Historic Preservation Officer

Coordination with the State Historic Preservation Officer (SHPO) will take place prior to any mining. Clearances will be obtained through SHPO by means of Phase Testing, a data recovery treatment plan, or other appropriate mitigation processes.

The Permit area is not within any publicly owned parks or places listed on the National Register of Historic Places.

411.142.1 Adverse Impacts on publicly owned parks or places listed on the National Register of Historic Places.

The Permit area is not within any publicly owned parks or places listed on the National Register of Historic Places.

411.142.2 Valid Existing Rights / Joint Agency Approval

The Permit area is not within any publicly owned parks or places listed on the National Register of Historic Places.

411.143 Mining on Historical Resources

Alton Coal Development determines there will be no significant effects of mining on historical resources. Alton Coal Development proposes there will be no impacts on mining on human values, cultural or historical.

411.143.1 Collection of Additional Information

Alton Coal Development will continue to conduct field investigations when determined needed.

A map showing the survey area already investigated for archeological importance is included in Appendix 4-1.

411.200 Previous Mining

There has been no mining within the permit area.

412 RECLAMATION PLAN

412.100 Post mining Land Use Plan

Where surface disturbance result from mining operations, soil reclamation and revegetation will restore the areas to premining usefulness as range land and wildlife habitat. The plans for this reclamation are presented in chapters 2, 3, 5, and 7.

412.200 Landowner or Surface Manager Comments

The whole of the permit area is private lands, owned by private parties. Alton Coal Development has leased these lands for the sole purpose of mining coals lying underneath. Land owner agreements have been generated, and recorded at Kane County, Utah, and are reflected in Appendix 1-1, Exhibits 1 and 2.

412.300 Suitability and Compatibility

Reclamation will be conducted as to assure final fills are suitable for reclamation and revegetation. Reclamation will be compatible with the surrounding area, providing grasses and brushes enhancing grazing and wildlife. See chapters 2 and 3 of this document for further detail and information.

413 PERFORMANCE STANDARDS

413.100 Post mining Land Use

All disturbed areas will be restored in a timely manner to conditions that are capable of supporting the uses they were capable of supporting before any mining.

413.200 Through 413.220 Determining Premining Uses of Land

The premining uses of land to which the post mining land use is compared will be those uses which the land previously supported, if the land has not been previously mined and has been properly managed.
Land within the permit Area has not been mined in the past. Post mining land use will be that of grazing lands, reclaimed in vegetation comparable to premining vegetation, although grasses and brush will replace Premining Pinion/Juniper communities.

413.300 Through 413.334 Criteria for Alternative Post mining Land Use

No alternative post mining land use is planned or proposed.

420 AIR QUALITY

421 CLEAN AIR ACT

Coal mining and reclamation operations will be conducted in compliance with the requirements for the Clean Air Act and Any other applicable Utah or Federal statutes and regulations containing air quality standards.

422 UTAH BUREAU OF AIR QUALITY

Alton Coal Development, LLC is preparing a Notice of Intent for a new source at the Coal Hollow Project. Upon approval of the NOI the Executive Secretary of the Utah Air Quality Board will issue an Approval Order for a new source, which must be obtained before mine construction proceeds.

423 AIR POLLUTION CONTROL PLAN

The Air Quality Approval Order will contain the Applicant's Air Pollution Control Plan, including an air quality monitoring program to provide sufficient data in evaluating the effectiveness of the fugitive dust control practices and compliance with federal and Utah air quality standards.

423.100 Air Quality Monitoring Plan

An Air Quality Monitoring Program to provide sufficient data to evaluate the effectiveness of the fugitive dust control practices will be developed and become part of the Air Quality Approval Order.

423.200 Air Pollution Control Plan

The Coal Hollow Mine will have an annual production of 2,000,000 tons of coal, therefore Alton Coal Development, LLC will prepare an air pollution control plan to implement fugitive dust control practices and to evaluate the effectiveness of fugitive dust control practices.

424 PLAN FOR FUGITIVE DUST CONTROL PRACTICES

Proposed mining will exceed 1,000,000 tons annually. Therefore the Applicant will prepare an Air Quality Monitoring Plan, and if the Division so requires, the Applicant will provide data sufficient to determine the effectiveness of the fugitive dust control plan required by R645-301-424.

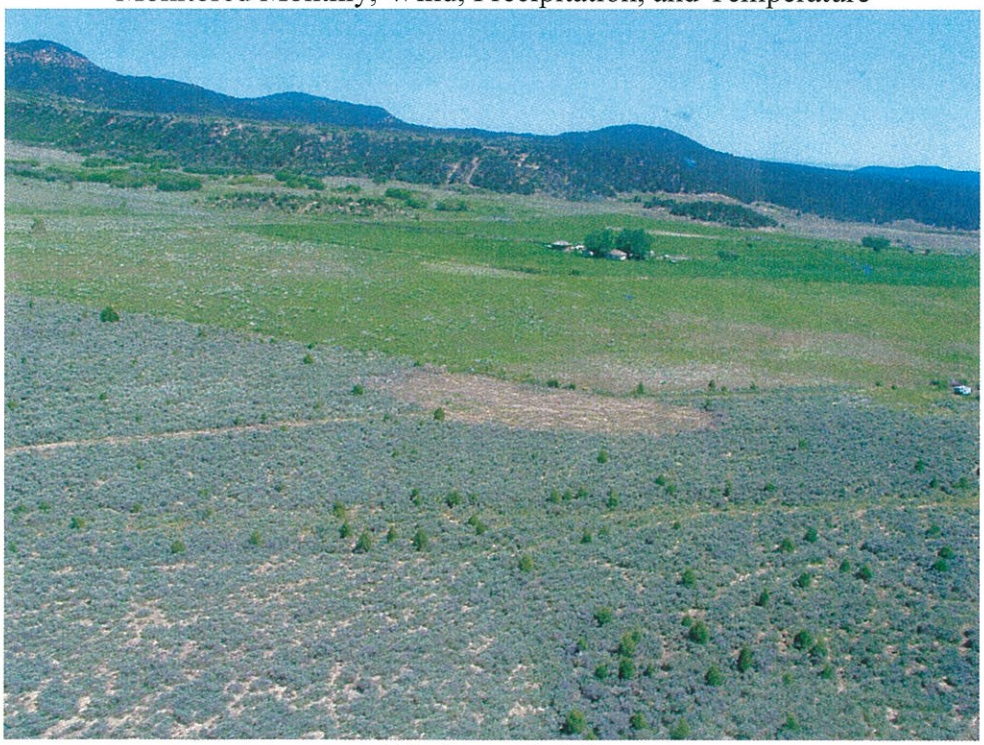
PHOTOS R645-301-411.100
Pre-mining Land use Information

Photograph 4-3
Cropland foreground with Grazing Land Around (view to the north)

Photograph 4-4
Cropland in the background, Grazing Foreground (view to the south)

PHOTOS R645-301-411
Environmental Description

Photograph 4-1
Weather Station Location: Constructed Summer 2005
Monitored Monthly, Wind, Precipitation, and Temperature



Photograph 4-2
Weather Station Location, in clearing (view SE)