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3.5 ECOLOGICAL RESOURCES

3.5.1 Introduction

This section describes the existing ecological resources within the proposed Ludeman Project (proposed project) area. The analysis consisted of a review of documents, databases, and reports in conjunction with field surveys.

All vegetation sampling procedures were designed according to the Wyoming Department of Environmental Quality – Land Quality Division (WDEQ-LQD) Rules and Regulations for Non-Coal Permitting, Guideline 2 (November 1997).

The wetland survey was conducted within the entire proposed project area in accordance with the Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region (USACE 2008). Identification of potential wetlands was based on visual assessment of vegetation and hydrology indicators, as well as intrusive soil sampling to determine the presence of wetland criteria indicators. Hydrology and soils were evaluated whenever a plant community type met hydrophytic vegetation parameters based on the Dominance Test and Prevalence Index (as defined by the USACE Great Plains Regional Supplement), or whenever indicators suggested the potential presence of a seasonal wetland area under normal circumstances. Per the Great Plains Interim Regional Supplement, for wetland delineation purposes, an area is considered to be vegetated if it has five percent or more total plant cover at the peak of the growing season.

The wildlife study was to collect both quantitative and qualitative data on vertebrate occurrence, abundance, diversity, and general habitat affinity in the proposed project area. This included identification of habitats that could support Threatened and Endangered (T&E) species and other high value or unusual wildlife habitats.

The baseline wildlife surveys followed standard survey requirements and protocols used by the WGFD, USFWS, and BLM, as well as the non-coal permitting guidelines issued by the WDEQ-LQD. Procedures and schedules recommended in the Handbook of Biological Techniques (WGFD 1982) were reviewed, and those in keeping with project-specific guidance from the WGFD were followed.

3.5.2 Regional Setting

The proposed Ludeman Project area is located in east-central Wyoming in Converse County. The proposed project area is located approximately 40 miles northeast of Casper, Wyoming. State Highway 95 provides access to the proposed project area from the

Towns of Glenrock and Rolling Hills to the west and State Highway 93 provides access from Douglas to the southeast. Interstate 25 provides access to both of these state highways from the south of the proposed project area.

The proposed project area is located within the Pathfinder to Guernsey sub-basin of the greater Platte River Basin. The greater Platte River Basin is located within the Rocky Mountain, Wyoming Basin, and Great Plains Physiographic Provinces. The topography of the basin includes valleys, high plains, hills, and mountains. Elevations in the basin range from 12,013 to 4,025 feet above mean sea level. Average annual precipitation for the basin ranges from 8 to 12 inches per year (Trihydro 2006).

The majority of the proposed project area is privately owned and the predominate land use is rangeland as discussed in Section 3.1

3.5.3 **Climate**

Meteorological data have been compiled for ten sites surrounding the proposed project.

The proposed project area lies in a semi-arid climate in the upper Northern High Plains. The landscape is composed of a river valley and rolling hills covered with native grasses, sparse sage brush, and some woody areas in the low lying valley. A detailed description of and presentation of climatologic data is presented in Section 3.6.

The region experiences average maximum temperatures near 90° and average minimum temperatures around 10° F. The site average temperature is expected to be 47° F with extremes of -30° to +100° F. The region generally receives little precipitation with annual averages between 10 and 13 inches. Spring and early summer precipitation events are responsible for the majority of the yearly average.

The region is characteristically windy with annual averages of 10 to 15 mph. Winds at the proposed project site are expected to average 13 mph annually, with summer averages dipping to 11 mph and winter averages reaching 15 mph. The predominant wind directions are from the west and the west/southwest.

3.5.4 **Baseline Data**

Ecological studies including baseline flora and fauna data were collected to fulfill the objectives specified in USNRC NUREG-1569, *Standard Review Plan for In situ Leach Uranium Extraction License Applications.* Ecological surveys were also conducted in accordance with applicable WDEQ-LQD, WGFD, and USFWS established guidelines. These agencies were consulted accordingly during development of survey plans to ensure adequate objectives, methodologies, and survey techniques were utilized.

The wetland survey was conducted by TREC, Inc. (TREC) of Casper, Wyoming during the spring/summer of 2008. The vegetation survey was conducted by BKS Environmental Associates (BKS) of Gillette, Wyoming during the spring/summer of 2008. Wildlife surveys were conducted by Jones and Stokes of Gillette during the summer and fall of 2008.

The following sections were developed from the final survey reports completed by TREC, BKS and Jones and Stokes.

3.5.5 **Terrestrial Ecology**

3.5.5.1 Vegetation

3.5.5.1.1 Survey Methodology

General

All sampling procedures were designed according to the Wyoming Department of Environmental Quality – Land Quality Division (WDEQ-LQD) Rules and Regulations for Non-Coal Permitting, Guideline 2 (November 1997). Due to the size of the license area, transects were not sampled in consecutive order. If the transects had been strictly sampled in consecutive order, adequate representation for each vegetation community would not have been achieved.

Mapping

Six different plant communities were identified for this area using 2006 National Agricultural Image Program (NAIP) true color orthophotos, which were verified through field survey. These communities include Big Sagebrush Shrubland, Lowland Grassland, Silver Sagebrush Shrubland, Upland Grassland, Upland Grassland Rough Breaks Complex and Crested Wheatgrass Field. Disturbed communities were mapped but excluded from all vegetation parameter sampling.

Transect Origin Selection

A computerized systematic grid (through ArcGIS) was used to randomly locate sample points within each vegetation community. These computer generated random numbers were then uploaded to a hand-held Garmin Global Positioning System (GPS) unit for actual location in the field.

Cover

A sample size of 25, 50-meter point-intercept cover transects were sampled within each of the Upland Grassland, Lowland Grassland, Upland Grassland Rough Breaks Complex, Silver Sagebrush Shrubland, and Crested Wheatgrass Field communities. The Big Sagebrush Shrubland community had a sample size of 26 transects. A total of 151 cover points were sampled in the proposed project area.

In the vegetation communities, each 50-meter transect represented a single sample point. Percent cover measurements were taken from point-intercepts at one-meter intervals along a 50-meter transect. Transects that exceeded the boundaries of the vegetation community being sampled were redirected back into its vegetation community at a 90 degree angle from the original transect direction at the point of intercept. In instances where a 90 degree angle of reflection did not place the transect within the sampled community, a 45 degree angle of reflection was used. Each point-intercept represents two percent of a total cover measurement.

Percent cover measurements record "first-hit" point-intercepts by live foliar vegetation species, litter, rock, or bare ground. Multiple hits on vegetation were recorded, but used only for the purpose of constructing plant species lists for each plant community.

Species Composition

A list of plant species encountered during 2008 quantitative sampling is presented in Addendum 3.5-A by vegetation community type. The species list includes plant species sampled in cover transects as well as plant species observed along the belt transect. Plant names in the Rocky Mountain Vascular Plants of Wyoming (Dorn, 3rd Edition) were utilized.

Total Vegetation Cover

Percent vegetation cover is the vertical projection of the general outline of plants to the ground surface. Vegetation data cover was recorded by species, using first hit data. All point-intercepts of living vegetation and growth produced during the current growing season were counted toward total vegetation cover. Lichens and moss are excluded from total vegetation cover, but are included within total cover. Total vegetation cover measurements were expressed in absolute percentages for each sample point. Cover summaries for each vegetation community within the proposed project area are presented in Addendum 3.5-B.

Total Ground Cover

Total ground cover equals the sum of cover values for percent vegetation, percent lichens and moss, percent litter, and percent rock. Litter includes all organic material that is older than the current year's growth. According to a WDEQ-LQD rule change, manure is now considered bare ground. Rock fragments were recorded when equal to or greater than two centimeters in size (i.e., sheet flow, minimum non-erodible particle size). Total ground cover measurements were expressed in absolute percentages for each sample point.

Shrub Density

Shrub density data was collected in conjunction with randomly selected cover transects, wherever possible. All shrubs, full, half or sub, were counted within 50 centimeters on either side of the 50-meter cover transect (1-meter x 50-meter belt transect), yielding a 100 square meter (m^2) belt transect. Sample adequacy was not calculated for shrub density. The number of belt transects equaled the number of cover transects for a given vegetation type. Summarization of this data can be found in Addendum 3.5-C.

Extended Reference Area

The Extended Reference Area (EXREFA) is a native land unit used to evaluate revegetation success on portions of the same native plant community that was affected by the recovery operation. For this study area, the recovery operation will affect the four plant communities: Big Sagebrush Shrubland, Lowland Grassland, Upland Grassland, and Upland Grassland Rough Breaks Complex. All areas of these communities not affected by recovery activities will serve as the EXREFA. The EXREFA will be as large as practical, considering land ownership patterns and land management history. The EXREFA that remains unaffected over the course of the recovery operation will be used to evaluate revegetation success. The EXREFA will consist of all mapped areas outside those disturbed by recovery activities, but within the license boundary. The EXREFA will be defined when reclamation occurs.

3.5.5.1.2 Vegetation Survey Results

Mapping

The proposed license area is 19,888.10 acres. Of these acres, the Upland Grassland community was 7,908.00 acres (39.76 percent), the Big Sagebrush Shrubland was 5,674.70 acres (28.53 percent), the Upland Grassland Rough Breaks Complex community was 4,045.70 acres (20.34 percent), the Lowland Grassland community was 1,265.30 acres (6.36 percent), the Silver Sagebrush Shrubland was 309.90 acres (1.56 percent) and the Crested Wheatgrass Field was 307.40 acres (1.55 percent). Disturbed areas were 377.10 acres (1.90 percent). Refer to Table 3.5-1 below for acreage of each vegetation

community both within the License Area and within a one-half mile buffer. Refer to Addendum 3.5-D for vegetation community mapping units of the proposed project area.

Table 3.5-1: Acreage and Percent of Total Area for Each Map Unit

Mapping Units	Project Area	Percent of Area	1/2 Mile Buffer Area	Percent of Area
Upland Grassland	7,908.00	39.76	2,819.72	27.12
Big Sagebrush Shrubland	5,674.70	28.53	2,983.48	28.69
Upland Grassland Rough Breaks Complex	4,045.70	20.34	2,379.34	22.88
Lowland Grassland	1,265.30	6.36	442.80	4.26
Silver Sagebrush Shrubland	309.90	1.56	1,026.16	9.87
Crested Wheatgrass Field	307.40	1.55	439.03	4.22
Disturbed	377.10	1.90	307.54	2.96
TOTAL	**19,888.10**	**100.00**	**10,398.07**	**100.00**

General

Cool season perennial grasses and introduced perennial grasses (also cool season) were combined when determining species dominance in vegetation cover. They are, however, reported separately in the individual summaries and tables. BKS uses an in-house program to generate the communities' summaries; rounding differences between this program and the raw data can range from 0.01 to 0.32.

3.5.5.1.3 Upland Grassland

Cover

The Upland Grassland plant community comprised 7,908.00 of the 19,888.10 acres of the License Area (39.76 percent). Twenty-five cover transects were sampled for this community. Absolute total vegetation cover was 64.16 percent. Absolute bare soil and litter/rock percentages were 18.56 percent and 14.40 percent, respectively. Absolute total ground cover was 82.24 percent. *Elymus smithii* (western wheatgrass), provided the highest relative vegetation cover at 18.51 percent, while *Alyssum desertorum* (desert alyssum) provided the next highest relative vegetation cover at 15.45 percent. Refer to Table 3.5-2 below for the absolute cover values.

Table 3.5-2: 2008 Absolute Cover for the Upland Grassland Vegetation Community

Vegetation Parameter	Mean
Absolute Total Vegetation Cover (percent)	64.16
Absolute Total Cover (percent)	82.24

Sample Adequacy

There were 25 samples taken in the Upland Grassland plant community. The sample adequacy formula outlined in WDEQ-LQD Guideline 2 was utilized to determine the minimum required size of the sample population. The Upland Grassland met sample adequacy guidelines. Refer to Table 3.5-3 below for sample adequacy values.

Table 3.5-3: Summary of Sample Adequacy Calculations for Percent Vegetation Cover in the Upland Grassland

	Mean	Standard Deviation	Calculated Sample Adequacy Number*	Actual Sample Number	Z-Value	Confidence Level Achieved
Mapping Unit						
Upland Grassland						
Total Vegetation Cover	64.16	11.09	9.79	25.00	2.05	97.98
Total Ground Cover	82.24	6.67	2.16	25.00	4.36	100.00

*Based on WDEQ Sample Adequacy Formula Guideline 2.

Species Composition and Diversity

Species composition for the Upland Grassland plant community was dominated by native and introduced cool season perennial grasses with 43.39 percent relative cover, followed by annual forbs with 21.59 percent relative cover. Warm season perennial grasses had 9.55 percent relative cover. Annual grasses had 7.66 percent relative cover. Perennial forbs had 7.90 percent relative cover. Succulents had 3.18 percent relative cover. Full and sub-shrubs had a total 1.30 percent relative cover. A total of 41 different species were found within the Upland Grassland plant community. Eight of these species were cool season perennial grass and grasslike plants. Warm season perennial grasses and annual grasses had three species each. A total of five annual forbs were present. Perennial forbs had a total of 14 species. Full shrubs and lichens had one specie each, while sub/half shrubs had four species. Two succulents were present. The annual grasses for this area were dominated by *Bromus tectorum* (cheatgrass), *Bromus japonicus* (Japanese brome)

and *Vulpia octoflora* (sixweeks fescue). The cool season perennial grasses were dominated by *Elymus smithii* (western wheatgrass), *Hesperostipa comata* (needleandthread), *Carex filfolia* (threadleaf sedge) and *Poa secunda* (Sandberg bluegrass). Warm season perennial grass consisted of *Bouteloua gracilis* (blue grama) and *Calamovilfa longifolia* (Prairie sandreed). Perennial forbs were dominated by *Phlox hoodii* (Hood's phlox) and *Sphaeralcea coccinea* (scarlet globemallow). Annual and biennial forbs included desert alyssum, and *Plantago patagonica* (Pursh's plantain). Present shrubs/subshrubs were *Artemisia tridentata* (Big Sagebrush), and *Artemisa frigida* (fringed sagewort). Also present were lichen species and *Opuntia polyacantha* (plains prickly pear). For a complete list of species within the Upland Grassland community refer to Addendum 3.5-A. Also refer to Table 3.5-4 for relative Upland Grassland cover summary and to Addendum 3.5-B for a complete Upland Grassland cover summary.

Table 3.5-4: Vegetation Cover Sampling Data Summary of Species by Lifeform for the Upland Grassland Community

	Vegetation Cover	
	Absolute (percent)	Relative (percent)
Annual Grasses	5.20	7.66
Native Cool Season Grasses	28.96	42.68
Introduced Cool Season Grasses	0.48	0.71
Warm Season Grasses	6.48	9.55
Annual Forbs	14.64	21.59
Perennial Forbs	5.36	7.90
Perennial Shrubs	0.56	0.83
Perennial Sub-Shrubs	0.32	0.47
Succulents	2.16	3.18

Shrub Density

The Upland Grassland community supported an average of 1,344.13 shrubs per acre or 0.33 shrubs/m^2. The following full and half/sub-shrub species were found: big sagebrush, fringed sagewort, *Artemisia ludoviciana* (Louisiana sagewort) and *Gutierrezia sarothrae* (broom snakeweed). Refer to Addendum 3.5-C for a complete Upland Grassland density summary.

Other Data

There were no federally listed threatened or endangered species found during sampling. The Converse County designated noxious weed cheatgrass was encountered in the area during sampling.

3.5.5.1.4 Big Sagebrush Shrubland

Cover

The Big Sagebrush Shrubland plant community comprised 5,674.70 of the 19,888.10 acres of the proposed project area (28.53 percent). Twenty-six cover transects were sampled for this community. Absolute total vegetation cover was 59.70 percent. Absolute bare soil and litter/rock percentages were 23.38 percent and 15.62 percent, respectively. Absolute total ground cover was 76.73 percent. Big sagebrush provided the highest relative vegetation cover at 15.64 percent while cheatgrass, provided the next highest cover at 14.00 percent. Refer to Table 3.5-5 below, for the absolute cover values

Table 3.5-5: 2008 Absolute Cover for the Big Sagebrush Shrubland Vegetation Community

Vegetation Parameter	Mean
Absolute Vegetation Cover (percent)	59.70
Absolute Total Cover (percent)	76.73

Sample Adequacy

There were 26 samples taken in the Big Sagebrush Shrubland plant community. The sample adequacy formula outlined in WDEQ-LQD Guideline 2 was utilized to determine the minimum required size of the sample population. The Big Sagebrush Shrubland met sample adequacy guidelines. Refer to Table 3.5-6 below for sample adequacy values.

Table 3.5-6: Summary of Sample Adequacy Calculations for Percent Vegetation Cover in the Big Sagebrush Shrubland

	Mean	Standard Deviation	Calculated Sample Adequacy Number*	Actual Sample Number	Z-Value	Confidence Level Achieved
Mapping Unit						
Big Sagebrush Shrubland						
Total Vegetation Cover	59.70	13.90	17.76	26.00	1.55	93.94
Total Ground Cover	76.63	10.13	5.73	26.00	2.73	99.68

*Based on WDEQ Sample Adequacy Formula Guideline 2.

Species Composition and Diversity

Species composition for the Big Sagebrush Shrubland plant community was dominated by native and introduced cool season perennial grasses with 37.46 percent relative cover, followed by annual grasses at 17.15 percent relative cover. Warm season perennial grasses had 11.60 percent relative cover. Annual forbs had 6.94 percent relative cover. Perennial forbs had 2.15 percent relative cover. Shrubs and subshrubs had a total 15.77 percent relative cover. Succulents had 6.81 percent relative cover. A total of 43 different species were found within the Big Sagebrush Shrubland plant community. Cool season perennial grasses and grasslike plants had nine species. Warm season perennial grasses, biennial forbs, succulents, and lichens had one species each. A total of three annual grass species were present. Annual forbs and sub/half shrubs had four species each. There were 17 perennial forbs present. Two full shrub species were present. The annual grasses for this area were cheatgrass, Japanese brome, and sixweeks fescue. The cool season perennial grasses were dominated by threadleaf sedge, western wheatgrass, needle and thread, and Sandberg bluegrass. Blue grama was the dominant warm season perennial grass. Perennial forbs were dominated by Scarlet globemallow, *Vicia americana* (American vetch) and *Allium textile* (textile onion). Annual forbs included desert alyssum, Pursh's plantain and *Lappula redowskii* (bluebur stickseed). Shrubs and subshrubs included big sagebrush, and *Artemisia pedatifida*, birdsfoot sagewort. Also present were lichen species and plains prickly pear. For a complete list of species within the Big Sagebrush Shrubland community refer to Addendum 3.5-A. Also refer Table 3.5-7 for relative Big Sagebrush Shrubland cover summary and to Addendum 3.5-B for a complete Big Sagebrush Shrubland cover summary.

Table 3.5-7: Vegetation Cover Sampling Data Summary of Species by Lifeform for the Big Sagebrush Shrubland Community

	Vegetation Cover	
	Absolute (percent)	Relative (percent)
Annual Grasses	10.46	17.15
Native Cool Season Grasses	18.92	31.03
Introduced Cool Season Grasses	3.92	6.43
Warm Season Grasses	7.08	11.60
Annual Forbs	4.23	6.94
Perennial Forbs	1.32	2.15
Perennial Shrubs	9.54	15.64
Perennial Sub-Shrubs	0.08	0.13
Succulents	4.15	6.81

Shrub Density

The Big Sagebrush Shrubland community supported an average of 4,051.70 shrubs per acre or 1.00shrubs/m^2. The following full and half/sub-shrub species were found: big sagebrush, *Artemisia cana* (silver sagebrush), fringed sagewort, birdsfoot sagewort, and *Krascheninnikovia lanata* (winterfat). Refer to Addendum 3.5-C for a complete Big Sagebrush Shrubland density summary.

Other Data

There were no federally listed threatened or endangered species found during sampling. The Converse County designated noxious weed cheatgrass was encountered in the area during sampling.

3.5.5.1.5 Upland Grassland Rough Breaks Complex

Cover

The Upland Grassland Rough Breaks Complex plant community comprised approximately 4,045.70 of the 19,888.10 acres of the License Area (20.34 percent). Twenty-five cover transects were sampled for this community. Absolute total vegetation cover was 44.96 percent. Absolute bare soil and litter/rock percentages were 36.64 percent and 17.92 percent, respectively. Absolute total ground cover was 63.36 percent. Blue grama provided the highest absolute vegetation cover at 14.44 percent, while cheatgrass provided the next highest relative vegetation cover at 12.68 percent. Refer to Table 3.5-8 below for the absolute cover values.

Table 3.5-8: 2008 Absolute Cover for the Upland Grassland Rough Breaks Complex Vegetation Community

Vegetation Parameter	Mean
Absolute Total Vegetation Cover (percent)	44.96
Absolute Total Cover (percent)	63.36

Sample Adequacy

There were 25 samples taken in the Upland Grassland Rough Breaks Complex plant community. The sample adequacy formula outlined in WDEQ-LQD Guideline 2 was utilized to determine the minimum required size of the sample population. The Upland Grassland Rough Breaks Complex met sample adequacy guidelines. Refer to Table 3.5-9 below for sample adequacy values.

Table 3.5-9: Summary of Sample Adequacy Calculations for Percent Vegetation Cover in the Upland Grassland Rough Breaks Complex

	Mean	Standard Deviation	Calculated Sample Adequacy Number*	Actual Sample Number	Z-Value	Confidence Level Achieved
Mapping Unit						
Upland Grassland Rough Breaks Complex						
Total Vegetation Cover	44.96	10.17	16.77	25.00	1.56	94.06
Total Ground Cover	63.36	14.09	16.20	25.00	1.59	94.41

*Based on WDEQ Sample Adequacy Formula Guideline 2.

Species Composition and Diversity

Species composition for the Upland Grassland Rough Breaks Complex plant community was dominated by native and introduced cool season perennial grasses with 37.38 percent relative cover, followed by annual grasses at 15.15 percent relative cover. Warm season perennial grasses had 14.44 percent relative cover. Perennial forbs had 11.11 percent relative cover and annual forbs had 10.21 percent relative cover. Subshrubs had a total 1.06 percent relative cover, while full shrubs had 5.81 percent relative cover. Succulents had 3.52 percent relative cover. A total of 69 different species were found in the Upland Grassland Rough Breaks plant community. Twelve of these species were cool season perennial grasses and grasslike plants. Warm season perennial grasses, biennial forbs, succulents, and lichens had one specie each. Eleven annual forb and 28 perennial forb species were present. Full shrubs had a total of five species while sub/half shrubs had six

species. The annual grasses for this area were dominated by cheatgrass, sixweeks fescue, and Japanese brome. The cool season perennial grasses were dominated by western wheatgrass, needleandthread, threadleaf sedge, and Sandberg bluegrass. Blue grama was the dominant warm season perennial grass. Perennial forbs were dominated by Hood's phlox, scarlet globemallow and *Thermopsis rhombifolia* (golden banner). Annual forbs included desert alyssum, bluebur stickseed, and Pursh's plantain. Present shrubs and subshrubs were big sagebrush, *Rosa woodsii* (Wood's rose), fringed sagewort, Louisiana sagewort, *Atriplex gardneri* (Gardner saltbush), and *Yucca glauca* (small soapweed). Also present were lichen species and plains prickly pear. For a complete list of species within the Upland Grassland Rough Breaks community refer to Addendum 3.5-A. Also refer to Table 3.5-10 below for relative Upland Grassland Rough Breaks Complex cover summary and to Addendum 3.5-B for a complete Upland Grassland Rough Breaks Complex cover summary.

Table 3.5-10: Vegetation Cover Sampling Data Summary of Species by Lifeform for the Upland Grassland Rough Breaks Complex Community

	Vegetation Cover	
	Absolute (percent)	Relative (percent)
Annual Grasses	6.88	15.15
Native Cool Season Grasses	16.56	36.45
Introduced Cool Season Grasses	0.56	1.23
Warm Season Grasses	6.56	14.44
Annual Forbs	4.64	10.21
Perennial Forbs	5.04	11.11
Perennial Shrubs	2.64	5.81
Perennial Sub-Shrubs	0.48	1.06
Succulents	1.60	3.52

Shrub Density

The Upland Grassland Rough Breaks Complex community supported an average of 1,240.49 shrubs per acre or 0.31 shrubs/m^2. The following full and half/sub-shrub species were found: big sagebrush, *Atriplex canescens* (fourwing saltbush), *Chrysothamnus* species (rabbitbrush), fringed sagewort, birdsfoot sagewort and small soapweed. Refer to Addendum 3.5-C for a complete Upland Grassland Rough Breaks density summary.

Other Data

There were no federally listed threatened or endangered species found during sampling. The Converse County designated noxious weeds *Cirsium undulatum* (wavyleaf thistle) and cheatgrass were encountered in the area during sampling.

3.5.5.1.6 Lowland Grassland

Cover

The Lowland Grassland plant community comprised 1,265.30 of the 19,888.10 acres of the License Area (6.36 percent). Twenty-five cover transects were sampled for this community. Absolute total vegetation cover was 70.16 percent. Absolute bare soil and litter/rock percentages were 16.72 percent and 13.04 percent, respectively. Absolute total ground cover was 83.28 percent. Western wheatgrass provided the highest relative vegetation cover at 24.37 percent, while cheatgrass provided the next highest relative vegetation cover at 10.14 percent. Refer to Table 3.5-11 below for the absolute cover values.

Table 3.5-11: 2008 Absolute Cover for the Lowland Grassland Vegetation Community

Vegetation Parameter	Mean
Absolute Total Vegetation Cover (percent)	70.16
Absolute Total Cover (percent)	83.28

Sample Adequacy

There were 25 samples taken in the Lowland Grassland plant community. The sample adequacy formula outlined in WDEQ-LQD Guideline 2 was utilized to determine the minimum required size of the sample population. The Lowland Grassland met sample adequacy guidelines. Refer to Table 3.5-12 below for sample adequacy values.

Table 3.5-12: Summary of Sample Adequacy Calculations for Percent Vegetation Cover in the Lowland Grassland

	Mean	Standard Deviation	Calculated Sample Adequacy Number*	Actual Sample Number	Z-Value	Confidence Level Achieved
Mapping Unit						
Lowland Grassland						
Total Vegetation Cover	70.16	14.59	14.17	25.00	1.70	95.54
Total Ground Cover	83.28	8.75	3.62	25.00	3.37	99.96

*Based on WDEQ Sample Adequacy Formula Guideline 2.

Species Composition and Diversity

Species composition for the Lowland Grassland plant community was dominated by native and introduced cool season perennial grasses with 50.81 percent relative cover, followed by annual grasses with 18.00 percent relative cover. Warm season perennial grasses had 7.62 percent relative cover. Annual forbs had 9.01 percent relative cover, while perennial forbs had 6.94 percent relative cover. Full and sub-shrubs had a total 7.18 percent relative cover. Succulents had 0.34 percent relative cover. A total of 89 different species were found within the Lowland Grassland plant community. Twenty-three species were cool season perennial grass and grasslike plants. There were seven warm season perennial grasses and four annual grass species. There were thirteen annual forbs, two biennial forbs, and 29 perennial forb species. There were four full shrubs and five sub/half shrub species. Lichens and succulents had one specie each. The annual grasses for this area were dominated by cheatgrass and, Japanese brome. The cool season perennial grasses were dominated by western wheatgrass, Sandberg bluegrass, *Juncus balticus* (Baltic rush), *Nassella viridula* (green needlegrass), *Agropyron cristatum* (crested wheatgrass) and threadleaf sedge. The warm season perennial grasses were dominated by blue grama and *Sporobolus airoides* (alkali sacaton). Perennial forbs were dominated by American vetch. Annual and biennial forbs included desert alyssum, and Pursh's plantain. Present shrubs/subshrubs were big sagebrush, Woods rose, *Symphoricarpos occidentalis* (western snowberry), fringed sagewort and Louisiana sagewort. Also present were lichen species and plains prickly pear. For a complete list of species within the Lowland Grassland community refer to Addendum 3.5-A. Also refer to Table 3.5-13 below for relative Lowland Grassland cover summary and to Addendum 3.5-B for a Lowland Grassland complete cover summary.

Table 3.5-13: Vegetation Cover Sampling Data Summary of Species by Lifeform for the Lowland Grassland Community

	Vegetation Cover	
	Absolute (percent)	Relative (percent)
Annual Grasses	12.64	18.00
Native Cool Season Grasses	32.64	46.48
Introduced Cool Season Grasses	3.04	4.33
Warm Season Grasses	5.36	7.62
Annual Forbs	6.32	9.01
Perennial Forbs	4.88	6.94
Perennial Shrubs	4.24	6.04
Perennial Sub-Shrubs	0.80	1.14
Succulents	0.24	0.34

Shrub Density

The Lowland Grassland community supported an average of 4,816.19 shrubs per acre or 1.19shrubs/m^2. The following full and half/sub-shrub species were found: silver sagebrush, big sagebrush, Woods rose, western snowberry, fringed sagewort, Louisiana sagewort, broom snakeweed, and winterfat. Refer to Addendum 3.5-C for a complete Lowland Grassland density summary.

Other Data

There were no federally listed threatened or endangered species found during sampling. The Converse County designated noxious weed cheatgrass was encountered in the area during sampling.

3.5.5.1.7 Silver Sagebrush Shrubland

Cover

The Silver Sagebrush Shrubland plant community comprised 309.90 of the 19,888.10 acres of the License Area (1.56 percent). Twenty-five cover transects were sampled for this community. Absolute total vegetation cover was 64.80 percent. Absolute bare soil and litter/rock percentages were 13.36 percent and 20.88 percent, respectively. Absolute total ground cover was 86.64 percent. Cheatgrass provided the highest relative vegetation cover at 28.83 percent, while silver sagebrush provided the next highest relative vegetation cover at 19.34 percent. Refer to Table 3.5-14 below for the absolute cover values.

Table 3.5-14: 2008 Absolute Cover for the Silver Sagebrush Shrubland Vegetation Community

Vegetation Parameter	Mean
Absolute Total Vegetation Cover (percent)	64.80
Absolute Total Cover (percent)	86.64

Sample Adequacy

There were 25 samples taken in the Silver Sagebrush Shrubland plant community. The sample adequacy formula outlined in WDEQ-LQD Guideline 2 was utilized to determine the minimum required size of the sample population. The Silver Sagebrush Shrubland met sample adequacy guidelines. Refer to Table 3.5-15 below for sample adequacy values.

Table 3.5-15: Summary of Sample Adequacy Calculations for Percent Vegetation Cover in the Silver Sagebrush Shrubland

	Mean	Standard Deviation	Calculated Sample Adequacy Number*	Actual Sample Number	Z-Value	Confidence Level Achieved
Mapping Unit						
Silver Sagebrush Shrubland						
Total Vegetation Cover	64.80	6.83	3.64	25.00	3.35	99.96
Total Ground Cover	86.64	5.65	1.39	25.00	5.42	100.00

*Based on WDEQ Sample Adequacy Formula Guideline 2.

Species Composition

Species composition for the Silver Sagebrush Shrubland plant community was dominated by annual grasses with 36.98 percent relative cover, followed by full shrubs with 22.38 percent relative cover. Native and introduced cool season perennial grasses had 17.27 percent relative cover. Annual and perennial forbs had 8.50 percent, and 0.96 percent relative cover, respectively. Sub-shrubs had a total 0.12 percent relative cover. Warm season perennial grasses had 4.37 percent relative cover. Succulents had 7.91 percent relative cover. A total of 67 different species were found within the Silver Sagebrush Shrubland plant community. Twelve cool season perennial grass and grasslike species were present. Warm season perennial grasses, annual grasses, and sub/half shrubs had four species each. There was a total of 16 annual forb and 22 perennial forb species present. Three full shrub species were present. Biennial forbs, succulents, and lichens had

one specie each. The annual grasses for this area were dominated by cheatgrass and sixweeks fescue. The cool season perennial grasses were dominated by western wheatgrass, needleandthread, and *Bromus inermis* (smooth brome). Blue grama was the dominant warm season perennial grass. Perennial forbs were dominated by American vetch and scarlet globemallow. Annual and biennial forbs included desert alyssum, and *Descurania sophia* (flixweed). Present shrubs/subshrubs were silver sagebrush, *Chrysothamnus viscidflorus* (sticky-leaved rabbitbrush), and winterfat. Also present were lichen species and plains prickly pear. For a complete list of species within the Silver Sagebrush Shrubland community refer to Addendum 3.5-A. Also refer to Table 3.5-16 below for relative Silver Sagebrush Shrubland cover summary and to Addendum 3.5-B for a Silver Sagebrush Shrubland complete cover summary.

Table 3.5-16: Vegetation Cover Sampling Data Summary of Species by Lifeform for the Silver Sagebrush Shrubland Community

	Vegetation Cover	
	Absolute (percent)	Relative (percent)
Annual Grasses	24.32	36.98
Native Cool Season Grasses	9.60	14.60
Introduced Perennial Grasses	1.76	2.67
Warm Season Grasses	2.88	4.37
Annual Forbs	5.60	8.50
Perennial Forbs	0.64	0.96
Perennial Shrubs	14.72	22.38
Perennial Sub-Shrubs	0.08	0.12
Succulents	5.20	7.91

Shrub Density

The Silver Sagebrush Shrubland community supported an average of 6,150.61 shrubs per acre or 1.52 shrubs/m^2. The following full and half/sub-shrub species were found: silver sagebrush, big sagebrush, sticky-leaved rabbitbrush, fringed sagewort, Gardner saltbush, winterfat and *Linanthus pungens* (granite prickly gilia). Refer to Addendum 3.5-C for a complete Silver Sagebrush Shrubland density summary.

Other Data

There were no federally listed threatened or endangered species found during sampling. The Converse County designated noxious weed cheatgrass was encountered in the area during sampling.

3.5.5.1.8 Crested Wheatgrass Field

Cover

The Crested Wheatgrass Field plant community comprised 307.40 of the 19,888.10 acres of the proposed project area (1.55 percent). Twenty-five cover transects were sampled for this community. Absolute total vegetation cover was 51.84 percent. Absolute bare soil and litter/rock percentages were 23.92 percent and 23.68 percent, respectively. Absolute total ground cover was 76.08 percent. Crested wheatgrass provided the highest relative vegetation cover at 64.12 percent, while desert alyssum provided the next highest relative vegetation cover at 9.31 percent. Refer to Table 3.5-17 below for the absolute cover values.

Table 3.5-17: 2008 Absolute Cover for the Crested Wheatgrass Field Vegetation Community

Vegetation Parameter	Mean
Absolute Total Vegetation Cover (percent)	51.84
Absolute Total Cover (percent)	76.08

Sample Adequacy

There were 25 samples taken in the Crested Wheatgrass plant community. The sample adequacy formula outlined in WDEQ-LQD Guideline 2 was utilized to determine the minimum required size of the sample population. The Crested Wheatgrass met sample adequacy guidelines. Refer to Table 3.5-18 below for sample adequacy values.

Table 3.5-18: Summary of Sample Adequacy Calculations for Percent Vegetation Cover in the Crested Wheatgrass Field

	Mean	Standard Deviation	Calculated Sample Adequacy Number*	Actual Sample Number	Z-Value	Confidence Level Achieved
Mapping Unit						
Crested Wheatgrass						
Total Vegetation Cover	51.84	7.14	6.22	25.00	2.57	99.49
Total Ground Cover	76.08	5.87	1.95	25.00	4.58	100.00

*Based on WDEQ Sample Adequacy Formula Guideline 2.

Species Composition and Diversity

Species composition for the Crested Wheatgrass plant community was dominated by native and introduced cool season perennial grasses with 68.25 percent relative cover, followed by annual forbs with 11.60 percent relative cover. Annual grasses had 4.74 percent relative cover. Perennial forbs had 8.10 percent relative cover. Full and sub-shrubs had a total 1.68 percent relative cover. Succulents had 0.46 percent relative cover. Warm season perennial grasses (blue grama) had 4.13 percent relative cover. A total of 59 different species were found within the Crested Wheatgrass Field plant community. Cool season perennial grasses and grasslikes as well as half/sub shrubs had six species each. Warm season perennial grasses, annual grasses, biennial forbs, and succulents had two species each. Annual forbs had eight species while perennial forbs had 27 species. Full shrubs had three species and one lichen species was present. The annual grasses for this area were dominated by cheatgrass and sixweeks fescue. The cool season perennial grasses were dominated by crested wheatgrass and needleandthread. Perennial forbs were dominated by *Medicago sativa* (alfalfa medic), and *Psoralea tenuiflora* (slimflower scurfpea). Annual and biennial forbs included desert alyssum, and Pursh's plantain. Present shrubs/subshrubs were big sagebrush, and fringed sagewort. Also present were lichen species and plains prickly pear. For a complete list of species within the Crested Wheatgrass community refer to Addendum 3.5-A. Also refer to Table 3.5-19 for relative Crested Wheatgrass cover summary and to Addendum 3.5-B for a complete Crested Wheatgrass cover summary.

Table 3.5-19: Vegetation Cover Sampling Data Summary of Species by Lifeform for the Crested Wheatgrass Community

	Vegetation Cover	
	Absolute (percent)	Relative (percent)
Annual Grasses	2.48	4.74
Native Cool Season Grasses	2.16	4.13
Introduced Cool Season Grasses	33.60	64.12
Warm Season Grasses	2.16	4.13
Annual Forbs	6.08	11.60
Perennial Forbs	4.24	8.10
Perennial Shrubs	0.80	1.53
Perennial Sub-Shrubs	0.08	0.15
Succulents	0.24	0.46

Shrub Density

The Crested Wheatgrass community supported an average of 806.48 shrubs per acre or 0.20 shrubs/m^2. The following full and half/sub-shrub species were found: big sagebrush, sticky-leaved rabbitbrush, *Ericameria nauseosa* (rubber rabbitbrush), fringed sagewort, birdsfoot sagewort, winterfat, and granite prickly gilia. Refer to Addendum 3.5-C for a complete Crested Wheatgrass Field density summary.

Other Data

There were no federally listed threatened or endangered species found during sampling. The Converse County designated noxious weeds *Grindelia squarrosa* (curlycup gumweed) and cheatgrass were encountered in the area during sampling.

3.5.5.1.9 Vegetation Survey Discussion

The proposed 19,888.10 acre project area consists of six vegetation communities: Upland Grassland, Big Sagebrush Shrubland, Upland Grassland Rough Breaks Complex, Lowland Grassland, Silver Sagebrush Shrubland and Crested Wheatgrass. Each community was investigated for baseline vegetation information in support of an NRC Materials License amendment application and a Wyoming Non-Coal Mine Permit Application.

No threatened or endangered species were encountered within the proposed project area. Refer to Addendum 3.5-E for a complete report on the Ute Ladies' Tresses' orchid (*Spiranthes diluvialis*) reconnaissance survey. There was the presence of three Converse

County designated weeds, cheatgrass, curlycup gumweed, and wavyleaf thistle in the License Area.

3.5.5.2 Wetlands

All figures and tables for this section can be found in Addendum 3.5-F through J.

3.5.5.2.1 Introduction

The following section discusses wetland delineations for the proposed project area. The proposed project area is located northeast of Glenrock, Wyoming within Converse County as shown on Figure 3.5-1, Addendum 3.5-F. The site covers approximately 31 sections (19,888 acres) which are described as follows:

- T34N, R74W – All of Sections 12, 13, 14, 23, 24 and the east half of Section 22.
- T34N, R73W – All of sections 3, 4, 5, 7, 8, 9, 10, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 26, 27, 34, 35, the west half of the west half of Section 2, the south half of Section 6, the west half of the west half of Section 11, the south half of Section 24, the west half of Section 25, the west half of the east half of Section 25, the northeast quarter of the northeast quarter of Section 25, the east half of Section 28, the west half of Section 36, and the west half of the east half of Section 36.
- T34N, R72W – The southwest quarter of Section 19 and the north half of the northwest quarter of Section 30.
- T33N, R73W – The northwest quarter of the northeast quarter of Section 1, the north half of the northwest quarter of Section 1, the north half of the north half of Section 2, and the north half of the north half of Section 3.

Figure 3.5-2 identifies the general wetland/waterbody location on a color infrared (CIR) map with soil types and Figures 3.5-3 through Figure 3.5-33 identify areas of wetland concentrations. All wetlands maps referenced in this section are presented in Addendum 3.5-F.

Construction, operation, or reclamation activities, which cause disturbance or impacts to jurisdictional wetlands on the proposed project, will be performed in accordance with appropriate Nationwide Permits (NWP), if applicable:

- NWP 44 non-coal mining activities, which requires Pre-construction Notification (PCN) for all activities.
- NWP 12 utility line activities, which requires a PCN for an area where a section 10 permit is required (utility installation in navigable waters), when a utility line in waters of the U.S. exceeds 500 feet, when a utility line is placed within a

jurisdictional area and it runs parallel to a stream bed that is within that jurisdictional area, when more than 0.1 acre will be impacted, or when permanent access roads are constructed in waters of the U.S. with impervious materials.

- NWP 14 linear transportation projects, which requires a PCN when more than 0.1 acre will be impacted or if there is a discharge in a special aquatic site, including wetlands.

NWP 44, NWP 12, and NWP 14 have an acreage impact limit of one half acre for waters of the United States (e.g. jurisdictional). Impacts to Other Waters of the United States (OWUS) are not considered under the acreage limit.

3.5.5.2.2 Methodology

The wetland survey was conducted within the entire proposed project area in accordance with the Interim Regional Supplement to the U.S. Corps of Engineers Wetland Delineation Manual: Great Plains Region (USACE, 2008). Identification of potential wetlands was based on visual assessment of vegetation and hydrology indicators, as well as intrusive soil sampling to determine the presence of wetland criteria indicators. Hydrology and soils were evaluated whenever a plant community type met hydrophytic vegetation parameters based on the Dominance Test and Prevalence Index (as defined by the USACE Great Plains Regional Supplement), or whenever indicators suggested the potential presence of a seasonal wetland area under normal circumstances. Per the Great Plains Interim Regional Supplement, for wetland delineation purposes, an area is considered to be vegetated if it has 5 percent or more total plant cover at the peak of the growing season.

Prior to the field investigation, potential wetland areas were identified via review of National Wetlands Inventory (NWI) mapping, computerized infrared remote (CIR) imagery, and U.S. Geological Survey (USGS) digital raster graphic (DRG) images as detailed below:

- 1981 United States Fish and Wildlife Service Digital NWI mapping
- 2001/2002 CIR imagery for the Careyhurst Quadrangle
- 2001/2002 CIR imagery for the Gilbert Lake Quadrangle
- 2001/2002 CIR imagery for the Leuenberger Ranch Quadrangle
- 2001/2002 CIR imagery for the Orpha Quadrangle
- 1977 Careyhurst, Wyoming, DRG-Enhanced Quadrangle Map
- 1960 Gilbert Lake, Wyoming, DRG-Enhanced Quadrangle Map
- 1960 Leuenberger Ranch, Wyoming, DRG-Enhanced Quadrangle Map
- 1978 Orpha, Wyoming, DRG-Enhanced Quadrangle Map

Each drainage on the site was investigated either on foot or by all-terrain-vehicle. Particular attention was given to drainages, creeks, engineered areas (e.g. windmills), areas of closed topography, and wetter areas identified by CIR imagery, NWI mapping, and USGS topographical maps. Wetland boundaries were determined based on the presence of hydrophytic vegetation, hydric soils, and primary and/or secondary hydrologic indicators. Vegetation, soil, and hydrology were examined at wetland sampling points using United States Army Corps of Engineers (USACE) protocol. Water bodies were delineated by the presence of an ordinary high water mark or by the lack of vegetation. Data points and wetland and waterbody boundaries were delineated and surveyed by TREC, Inc. using a resource grade Global Position System (GPS) unit in NAD 1983 UTM Zone 13. The site-specific parameters recorded at each wetland data collection point were described on the Great Plains Region Wetland Determination Data Forms and are provided in Addendum 3.5-J.

Natural Resources Conservation Service (NRCS) soils mapping for Converse County, Wyoming was reviewed for general soils information. Vegetation indicator status was derived from the National List of Plant Species that Occur in Wetlands Region 4 (USDI, 1988 and updated supplement 1993).

3.5.5.2.3 Results

Wetlands and water bodies within the 19,888 acre site were delineated June 2 through the 12 and August 5 through 10, 2008. The majority of the wetlands and water bodies identified were small, disconnected depressions within ephemeral drainages.

Wetlands identified included groundwater slope wetlands, depressions within ephemeral and intermittent drainages, diked ephemeral drainages, or isolated depressions. All of the wetlands within the site are classified as Palustrine Emergent according to the Cowardin classification system (Cowardin, et al, 1979). Many of the wetlands also have an open water component and are therefore also classified as Palustrine Unconsolidated Bottom. As a general rule, one data collection point was used for a series of small disconnected wetlands within the same drainage. Approximately 59.6 acres of wetland were identified (233 individual wetlands).

Water bodies identified were either depressions within ephemeral drainages, behind dikes in ephemeral drainages, or isolated depressions. None of the water bodies contained flowing water. Approximately 29.3 acres of water bodies were identified (195 individual water bodies).

The wetlands and water bodies are summarized in Addendum 3.5-G. The boundaries of the wetlands and water bodies are shown on Figure 3.5-2. Figure 3.5-2 also provides a naming scheme for the un-named tributaries which are shown in greater detail on Figures

3.5-3 through 3.5-33. Wetland species identified at the proposed project area are listed in Addendum 3.5-H. Representative photographs are provided in Addendum 3.5-I.

3.5.5.2.4 Discussion

A general description of the vegetation, soils, and hydrology for each of the three major drainages (Little Sand Creek, Running Dutchman Ditch, Sage Creek) is given below.

Little Sand Creek

Little Sand Creek is on the west side of the proposed project area and flows generally north to south. The portion of the drainage within the project limits is located in T34N, R74W Sections 12 through 14, 22 and 23. There are four unnamed, ephemeral tributaries to Little Sand Creek which contain water bodies and/or wetlands. Little Sand Creek is an intermittent "creek" characterized by areas of wetlands with open water features periodically present intermixed with areas of a more defined bed and bank with a sandy bottom. No flowing surface water was present, or evidence of flow, in this drainage. Within the entire Little Sand Creek drainage area, 21 wetlands and 16 water bodies were identified. Within the main Little Sand Creek drainage, 20 wetlands (WL-1a through WL-1o and WL-3a through WL-3c) were identified as well as five water bodies (WB-4 through WB-8). Because Little Sand Creek connects to the North Platte River, all of the wetlands and water bodies within this drainage are likely jurisdictional, with the exception of WB-8 which is isolated.

Within the ephemeral tributaries to Little Sand Creek, one wetland and eleven water bodies were identified. These wetlands and water bodies are likely non-jurisdictional because they are either disconnected depressions within ephemeral drainages, artificially ponded areas that are diked and therefore do not contribute to the drainage, or isolated features.

The wetland vegetation within Little Sand Creek (WL-3a, b & c) was more diverse than that within the ephemeral tributaries to Little Sand Creek. Wetlands within Little Sand Creek contained water sedge (*Carex aquatilis*, OBL), Nebraska sedge (*Carex nebrascensis*, OBL), foxtail barley (*Hordeum jubatum*, FACW), common rush (*Juncus effusus*, OBL), slimstem reedgrass (*Calamagrostis neglecta*, OBL), three-square bulrush (*Scirpus americanus*, OBL) and soft-stem bulrush (*Scirpus validus*, OBL). Wetland 1 (WL-1), which is also within Little Sand Creek, was primarily vegetated with creeping spikerush (*Eleocharis palustris*, OBL). Wetland 2 (WL-2), which is within an ephemeral tributary, was vegetated with Baltic rush (*Juncus balticus*, OBL), water sedge (*Carex aquatilis*, OBL), and a Poa species. A complete list of wetland species identified within the proposed Ludeman Uranium ISR Project Area, including the indicator status, is provided in Addendum 3.5-H.

The soil types within the Little Sand Creek drainage are described below and a Soils Map is provided as Figure 3.5-34 which illustrates the location of the wetlands and water bodies in relation to the NRCS mapped soil types. The soils that contain wetlands/water bodies within the Little Sand Creek drainage are:

164 – Haverdad loam, wet, 0 to 3 percent slopes
172 – Hiland-Bowbac fine sandy loams, 0 to 6 percent slopes
173 – Hiland-Bowbac fine sandy loams, 6 to 15 percent slopes
187 – Kishona-Cambria loams, 0 to 6 percent slopes
189 – Kishona-Cambria-Theedle loams, 3 to 20 percent slopes
230- Shingle-Badland-Samday complex, 10 to 30 percent slopes
250 – Theedle-Kishona loams, 6 to 15 percent slopes
251 – Theedle-Kishona-Shingle loams, 3 to 30 percent slopes
269 – Worf –Shingle-Taluce complex, 3 to 30 percent slopes

None of the soils that contain wetlands/water bodies within the Little Sand Creek drainage are listed as hydric by the NRCS for southern Converse County in Wyoming. The soils identified in the field investigation were generally a loamy, mucky mineral with mottles.

Wetland hydrology was determined to exist in the wetlands by the presence of surface water and a flow pattern, as defined by the existence of an ordinary high water mark, in a surface water drainage feature. Wetlands delineated in June generally had primary indicators present such as standing water or soil saturation within the top 12 inches. Primary indicators were no longer present for the majority of those wetlands delineated in August. Therefore, secondary indicators such as the drainage pattern and FAC-Neutral test were used as indicators of wetland hydrology.

Running Dutchman Ditch

Running Dutchman Ditch is located just south of the southern project boundary and flows generally from west to east. There are five unnamed, ephemeral tributaries to Running Dutchman Ditch which contain water bodies and/or wetlands that connect to Running Dutchman Ditch. The portion of the drainage within the proposed project boundary is located in T34N, R73W Sections 19, 20, 27, 28, 34 and 35, and in T33N, R73W Sections 2 and 3. The tributaries to Running Dutchman Ditch are characterized as steep, narrow, gullied drainages with depressions in the bottom of the drainage which contain either wetlands or water bodies. Within the Running Dutchman Ditch drainage, three wetlands and 50 water bodies were identified. The wetlands and water bodies within the Running Dutchman Ditch drainage area are likely non-jurisdictional, as they are located within ephemeral drainages and are either erosional features characterized by low volume,

infrequent, and short duration flow or they are isolated depressions. Wetland 5 (WL-5) is an isolated depression as are WB-63 and WB-64. Waterbody 17 (WB-17) is an isolated, excavated depression at a windmill.

One wetland formed on the downstream side of a dike (WL-4). WL-4 contained the most diverse vegetation within the Running Dutchman Ditch drainage area. The vegetation within WL-4 consisted of foxtail barley (*Hordeum jubatum*, FACW), three-square bulrush (*Scirpus americanus*, OBL), narrow-leaf dock (*Rumex stenophyllus*, FACW+), blue-bunch wheatgrass (*Agropyron spicatum*, FACU-), and creeping thistle (*Cirsium arvense*, FACU). The vegetation within the isolated wetland (WL-5) consisted of creeping spikerush (*Eleocharis palustris*, OBL) and western wheatgrass (*Agropyron smithii,* FACU). Wetland 6 (WL-6) is located behind a dike in the drainage. The vegetation within WL-6 consisted of foxtail barley, creeping spikerush, rattlesnake brome (*Bromus briziformis*, NL), and curly-cup gumweed (*Grindelia squarrosa*, UL). A complete list of wetland species identified within the proposed project area, including the indicator status, is provided in Addendum 3.5-H.

The soil types within the Running Dutchman Ditch drainage are described below and a Soils Map is provided as Figure 3.5-34 which illustrates the location of the wetlands and water bodies in relation to the NRCS mapped soil types. The soils that contain wetlands/water bodies within the Running Dutchman Ditch drainage are:

187 – Kishona-Cambria loams, 0 to 6 percent slopes
189 – Kishona-Cambria-Theedle loams, 3 to 20 percent slopes
244 - Taluce-Turnercrest-Keeline fine sandy loams, 3 to 20 percent slopes.
251 – Theedle-Kishona-Shingle loams, 3 to 30 percent slopes.
263 – Ustic Torriorthents, gullied, 3 to 45 percent slopes.

Soil map unit 263 is listed as hydric by the NRCS for southern Converse County in Wyoming and is usually found in drainageways. Water bodies 20 and 21 (WB-20 and WB-21) lie within the area mapped as having hydric soils. However, neither area contained more than five percent cover by hydrophytic vegetation. Therefore, the areas were mapped as water bodies. See Figure 3.5-6 for the location of WB-20 and -21. The soils identified in wetlands during the field investigation were generally a loamy, mucky mineral with mottles.

Wetland hydrology was determined to exist in the wetlands by the presence of surface water and a flow pattern, as defined by the existence of an ordinary high water mark, in a surface water drainage feature. Wetlands delineated in June generally had primary indicators present such as standing water or soil saturation within the top 12 inches. Primary indicators were no longer present for the majority of those wetlands delineated in

August therefore secondary indicators such as the drainage pattern and FAC-Neutral test were used as indicators of wetland hydrology.

Sage Creek

Sage Creek is on the east side of the proposed project area and flows generally from north to south. The majority of the wetlands and water bodies identified in the proposed project area are within the Sage Creek drainage area. The portion of the drainage within the proposed project limits is located in T34N, R72W Sections 19 and 30, and in T34N, R73W Sections 2 through 10, 14 through 23, 25, 26, 35 and 36, and Section 12 of T34N, R74W. Sage Creek is an intermittent "creek" characterized by areas of wetlands with open water features periodically present intermixed with areas having a wide, sandy bottom varying in width and poorly defined in some areas. The delineators were able to "ford" Sage Creek during the wet season without getting wet. No flowing surface water was present, or evidence of flow, in this drainage. There are seven unnamed, ephemeral tributaries to Sage Creek where water bodies and/or wetlands were identified. The wetlands or water bodies identified within the tributaries were depressions within the drainage or behind dikes along the drainage. Within the Sage Creek drainage, 209 wetlands and 129 water bodies were identified. Additional information is provided on Sage Creek and each of the ephemeral tributaries due to the large number of wetlands/water bodies in the Sage Creek drainage area.

Sage Creek is located within Sections 2, 14, 23, 25, 26 and 36 of T34N, R73W. The portion of Sage Creek within the proposed project area, which does not include the unnamed tributaries, contains 37 wetlands and two water bodies (see Figures 3.5-30 through 3.5-33). The wetlands identified along Sage Creek were either groundwater slope wetlands or depressions within the creek bed. None of the wetlands are isolated. Therefore, they are likely jurisdictional. The water bodies are all also depressions within the drainage and are likely jurisdictional. WB-134 is an exception. It is a depression at a windmill, is isolated, and therefore likely non-jurisdictional.

Tributary One to Sage Creek is within Sections 5 and 6 of T34N, R73W and contains 10 wetlands (see Figure 3.5-11). Two of the wetlands are in natural topographic depressions and are isolated (WL-7 and -8). WL-7 is just less than five acres and has some areas of open water. WL-8 is approximately 1,400 square feet and was dry at the time of the delineation. The remainder of the wetlands are disconnected depressions within an ephemeral drainage. All of the wetlands and water bodies are likely non-jurisdictional.

Tributary Two to Sage Creek is located within Section 3 of T34N, R73W and contains 2 wetlands (see Figure 3.5-12). One is a depression within a drainage (WL-12) and the other is an isolated pond at a solar powered water well (WL-13). All of the wetlands and water bodies are likely non-jurisdictional.

Tributary Three to Sage Creek is located within Sections 3 and 4 of T34N, R73W and contains 3 wetlands and 13 water bodies (see Figure 3.5-13). One of the wetlands is in a natural depression and is isolated (WL-10). WL-10 is approximately 1/2 acres in size. The remaining wetlands and water bodies are either depressions in an ephemeral drainage or diked water bodies. All of the wetlands and water bodies are likely non-jurisdictional.

Tributary Four to Sage Creek is a large drainage area with several branches. The main drainage is within Sections 9, 16, and 20 through 23 of T34N, R73W. Tributary 4 contains 71 wetlands and 31 water bodies (see Figures 3.5-14 through 3.5-18), which does not include the branches off of Tributary Four. One of the wetlands is in a natural depression and is isolated (WL-16). WL-16 is approximately 1.3 acres in size. Two of the water bodies are isolated (WB-82 and -89). The remainder of the wetlands and water bodies are disconnected depressions with an ephemeral drainage or diked ephemeral drainages. All of the wetlands and water bodies are likely non-jurisdictional.

Tributary Four to Sage Creek – North Branch is within located Sections 8 and 9 of T34N, R73W and contains 19 wetlands and two water bodies (see Figures 3.5-19 and 3.5-20). The wetlands identified were all discontinuous depressions within the ephemeral drainage. The water bodies are all depressions within the drainage except for WB-80 which is an isolated depression. All of the wetlands and water bodies are likely non-jurisdictional.

Tributary Four to Sage Creek – North West Branch is located within Sections 7, 17 and 18 of T34N, R73W and Section 12 of T34N, R74W and contains 16 wetlands and six water bodies (see Figures 3.5-21 and 3.5-22). One of the wetlands is in a depression at a solar powered water well and is isolated (WL-20). WL-20 is approximately 1,300 square feet in size. Two of the water bodies are isolated (WB-95 and -96). The remainder of the wetlands and water bodies are disconnected depressions with an ephemeral drainage or diked ephemeral drainages. All of the wetlands and water bodies are likely non-jurisdictional.

Tributary Four to Sage Creek – West Branch is located within Sections 19 and 20 of T34N, R73W and contains two wetlands and five water bodies (see Figures 3.5-25 and 3.5-26). The wetlands identified were all discontinuous depressions within the drainage. The water bodies are either depressions in a drainage or diked water bodies. All of the wetlands and water bodies are likely non-jurisdictional.

Tributary Four to Sage Creek – South Branch is located within Sections 21 and 22 of T34N, R73W and contains 32 wetlands and eight water bodies (see Figures 3.5-23 and 3.5-24). The wetlands identified were all discontinuous depressions within the ephemeral drainage. The water bodies are all depressions within the drainage except for WB-103 which is an isolated depression. All of the wetlands and water bodies are likely non-jurisdictional.

Tributary Five to Sage Creek is located within Sections 10, 14, and 15 of T34N, R73W and contains six wetlands and two water bodies (see Figure 3.5-27). The wetlands identified were all discontinuous depressions within the drainage. The water bodies are either depressions in a drainage or diked water bodies. All of the wetlands and water bodies are likely non-jurisdictional.

Tributary Six to Sage Creek is located within Sections 23 and 26 of T34N, R73W and contains four wetlands and 56 water bodies (see Figure 3.5-28). The wetlands identified were all discontinuous depressions within the ephemeral drainage except for WL-38a which is behind a dike in a drainage. The water bodies are all discontinuous depressions in an ephemeral drainage. All of the wetlands and water bodies are likely non-jurisdictional.

Tributary Seven to Sage Creek is located within Sections 19 and 30 of T34N, R72W and contains seven wetlands and four water bodies (see Figure 3.5-29). The wetlands identified were all discontinuous depressions within the drainage except for one wetland behind a dike in a drainage (Gilbert Lake), and WL-42 which is an isolated depression. WL-42 is approximately one-half acre in size. The water bodies are all discontinuous depressions in an ephemeral drainage. All of the wetlands and water bodies are likely non-jurisdictional.

The wetland vegetation within Sage Creek was more diverse than that found in the tributaries that flow to Sage Creek. The wetlands within Sage Creek (WL-14, WL-37a through dd, WL-38, WL-39, and WL-40) contained water sedge (*Carex aquatilis*, OBL), wooly sedge (*Carex lanuginosa*, OBL), creeping spikerush (*Eleocharis palustris*, OBL), field horsetail (*Equisetum arvense*, FAC) smooth scouring rush (*Equisetum laevigatum*, FAC), foxtail barley (*Hordeum jubatum*, FACW), field mint (*Mentha arvensis*, FACW), alkali muhly (*Muhlenbergia asperifolia*, FACW), rabbitfoot grass (Polypogon monspeliensis, OBL), silverweed (*Potentilla anserina*, OBL), narrow-leaf dock (*Rumex stenophyllus*, FACW+), three-square bulrush (*Scirpus americanus*, OBL), soft-stem bulrush (*Scirpus validus*, OBL), alkali cordgrass (*Spartina gracillis*, FACW), and common dandelion (*Taraxacum officinale*, FACU). The wetland vegetation within the tributaries varied however the depressions within drainages were often vegetated solely with creeping spikerush (*Eleocharis palustris*, OBL) or a combination of creeping spike rush, foxtail barley, western wheat grass (*Agropyron smithii*, FACU), and skeletonleaf bursage (*Ambrosia tomentosa*, NL). A complete list of wetland species identified within the proposed project area, including the indicator status, is provided in Addendum 3.5-H.

The soil types within the Sage Creek drainage are described below and a Soils Map is provided as Figure 3.5-34 which illustrates the location of the wetlands and water bodies in relation to the NRCS mapped soil types. The soils that contain wetlands/water bodies within the Sage Creek drainage are:

127 – Clarkelen-Draknab complex, wet, 0 to 3 percent slopes
129 – Clarkelen-Haverdad-Bigwinder complex, 0 to 3 percent slopes
141 – Dwyer-Orpha loamy sands, 3 to 15 percent slopes
152 – Forkwood-Cambria loams, 0 to 6 percent slopes
172 – Hiland-Bowbac fine sandy loams, 0 to 6 percent slopes
175 – Hiland-Bowbac complex, 6 to 15 percent slopes
187– Kishona-Cambria loams, 0 to 6 percent slopes
189 – Kishona-Cambria-Theedle loams, 3 to 20 percent slopes
230- Shingle-Badland-Samday complex, 10 to 30 percent slopes
233- Shingle-Taluce-Badland complex, 10 to 40 percent slopes
246 - Tassel-Tullock-Vonalee association, 6 to 30 percent slopes.
251 – Theedle-Kishona-Shingle loams, 3 to 30 percent slopes
257 – Ulm-Bidman complex, 0 to 6 percent slopes.
258 – Ulm-Forkwood loams, 0 to 6 percent slopes.
263 – Ustic Torriorthents, gullied, 3 to 45 percent slopes.
269 – Worf –Shingle-Taluce complex, 3 to 30 percent slopes

Soil map units 129 and 263 are listed as hydric by the NRCS for southern Converse County in Wyoming. Soil map unit 129 is usually found in stream terraces and 263 is usually found in drainageways. Thirty-two of the wetlands fall within map unit 129 or 263 as do 4 of the water bodies. The soils identified in the field investigation were generally a loamy, mucky mineral. There were three wetlands with sandy mucky mineral soils (WL-9, WL-25, and WL-41). The soil in WL-33 was identified as being a depleted dark surface, the soil in WL-38 was identified as mucky peat or peat, and the soil in WL-40 was identified as a histosol.

Wetland hydrology was determined to exist in the wetlands by the presence of surface water and a flow pattern, as defined by the existence of an ordinary high water mark, in a surface water drainage feature. Wetlands delineated in June generally had primary indicators present such as standing water or soil saturation within the top 12 inches. Primary indicators were no longer present for the majority of those wetlands delineated in August. Therefore, secondary indicators such as the drainage pattern and FAC-Neutral test were used as indicators of wetland hydrology.

3.5.5.2.5 Impact Analysis

The proposed project has seven planned wellfields and three Satellite facilities. Other recovery infrastructure locations have not yet been finalized such as the offices and header houses.

Wetlands will not be impacted by the construction of the Satellite facilities or associated support facilities. Wetlands or surface water channels may be impacted by the construction of wellfields. Approximately 6.6 acres of wetlands or water bodies fall within the boundaries of the ore bodies. Of those, approximately 1.8 acres are potentially jurisdictional. The actual acreage of impacted wetlands and water bodies will be determined when the final design for the wellfields is complete. Final determination of jurisdictional decision lies with the USACE.

3.5.5.2.6 Conclusion

The investigation identified approximately 59.64 acres of wetlands which represents emergent depressional wetlands associated with surface water drainage features, or emergent isolated depressions. Approximately 0.3 percent of the 19,888-acre proposed project meets the wetland criteria. The investigation identified approximately 29.31 acres of water bodies within the 19,888 acre site which is approximately 0.15 percent of the site. The wetlands and water bodies are summarized and provided in Addendum 3.5-G.

The summary found in Addendum 3.5-G also includes the wetland classification using the Cowardin classification system as well as the acreage, and likelihood of regulation under the Section 404 of the Clean Water Act for each wetland area.

Based upon published guidance, those wetlands and water bodies within intermittent waterways are likely jurisdictional and those wetlands and water bodies within ephemeral drainages are likely non-jurisdictional. Isolated features are also likely non-jurisdictional. Those features which are likely jurisdictional include 43 wetlands and four water bodies which represent 29.046 acres of the proposed project area.

The USACE and EPA reserve the right to determine jurisdiction on a case-by-case basis (FR Vol. 51 No. 219). Jurisdiction will ultimately be decided by the USACE relative to each of the wetlands identified within the proposed project. The full proposed project Wetlands report was received by the Cheyenne office of the USACE on December 5, 2008.

3.5.5.3 Wildlife

3.5.5.3.1 Introduction

ICF Jones & Stokes (formerly Thunderbird Wildlife Consulting) was contracted to conduct wildlife baseline investigations in the proposed license area and surrounding lands during 2008.

The objective of the baseline study was to collect both quantitative and qualitative data on vertebrate occurrence, abundance, diversity, and general habitat affinity in the proposed project area. This included identification of habitats that could support Threatened and Endangered (T&E) species and other high value or unusual wildlife habitats. Some wildlife surveys were expanded to include a larger perimeter around the area, referred to as the Ludeman survey area. Prior to field work, the Wyoming Game and Fish Department (WGFD), Bureau of Land Management (BLM), and U.S. Fish and Wildlife Service (USFWS) were contacted to obtain existing databases for the proposed project area and determine whether any special species or habitats were known to occur there, and the type of surveys that would be required for the baseline inventory. All existing data was reviewed prior to beginning field surveys.

During the 2008 baseline study, specific surveys were conducted for bald eagle (*Haliaeetus leucocephalus*) winter roosts, nesting raptors, upland game bird leks, prairie dog (*Cynomys* spp.) colonies, and T&E species. In addition, a list of all observed BLM Sensitive Species and USFWS Migratory Bird Species of Management Concern in Wyoming (non-coal) was maintained during every site visit, as well as a list of all other vertebrate species encountered during each survey. Most of those surveys included the proposed license area and a surrounding one-mile perimeter. Maps illustrating big game range delineations in the proposed project area were generated, as requested by the WGFD, but no big game surveys were required for this project.

The survey types and methods used for the proposed project were in compliance with applicable sections of WDEQ-LQD Non-coal Chapters 2, 3, and 11; Guidelines 4 and 5; and the Draft In-Situ Mining Permit Application Requirements Handbook (March 2007 update). The suite of baseline wildlife surveys was approved by the WGFD (Habitat Protection Supervisor, letter dated April 7, 2008). The USFWS Ecological Services Office (ESO) in Cheyenne, Wyoming, has not typically provided project-specific guidance in recent years, but instead refers project applicants to the list of T&E species for each Wyoming county, as posted on their website. Data files and confirmation of BLM species of concern were obtained from a biologist in the BLM Casper Field Office (S. Gray, verbal communication and data files, received February 15, 2008). The wildlife survey requirements for the proposed project were based on the nature of the expected disturbance and the lack of any unique, critical, or previously un-sampled wildlife

habitats in or near the proposed project area. The survey requirements were also in keeping with those applied to baseline studies completed at other ISR properties on private and federal surface in Wyoming in recent years.

The wildlife baseline survey area, methods, and results for the proposed project are described below, with information presented by animal group.

3.5.5.3.2 Survey Area Description

The proposed project is located approximately 14.0 miles northeast of Glenrock in western Converse County, Wyoming. The proposed License Area encompasses approximately 19,888 acres, and includes all or portions of the following Townships (T) and Ranges (R) (Figure 3.5-35):

- T34North (N) R74West (W) –Sections 12-14 and 22-24;
- T34N R73W – Sections 2-11, 14-28, and 34-36;
- T34N R72W – Sections 19 and 30; and
- T33N R73W – Sections 1-3.

Ludeman Project

Figure 3.5-35: Wildlife Features

Universal Transverse Mercator, 1983 NAD Zone 13	Source: G:/Mines/Uranium One /Lud-Peterson/2008 Report.mxd
Date: 03/10/2009	Created by: JM Edited by: TL

ICF Jones & Stokes

N

North 95

T35N:R74W | T35N:R73W | T35N:R73W | T35N:R72W

T34N:R74W | T34N:R73W | T34N:R73W | T34N:R72W

T34N:R74W | T34N:R73W | T34N:R73W | T34N:R72W

T33N:R74W | T33N:R73W | T33N:R73W | T33N:R72W

5138 (2 nests)

347421

347422

5172

5162

5255

337310

337310

337311

PLATTE RIVER

NORTH PLATTE RIVER

Scale 1:56,000

Legend

- Ludeman Project Area
- 1.0 Mile Survey Area
- Sage-grouse Lek
- Prairie Dog Colony

Raptor Nests: Species

- Red-tailed Hawk
- Ferruginous Hawk
- Unknown Raptor
- Golden Eagle/Red-tailed Hawk
- Great Horned Owl
- Great Horned Owl/Red-tailed Hawk
- D-N in 2008
- Potential nest location

337310 - Indicates current CFO BLM nest record
5130 - Indicates long-term BLM nest record

The proposed project area is within the Grama-Needlegrass-Wheatgrass section of the Northwestern Great Plains Ecoregion of Omernik (Environmental Protection Agency 1993). Annual precipitation in the vicinity is approximately 15 inches, 75 percent of which falls from April through September. Topography within the proposed project area and surrounding perimeter is gently rolling in the eastern half, with more varied relief in the western half. Scattered areas of steeper terrain occur in the northeastern and western portions of the license area and perimeter. Elevation within the overall proposed Ludeman Project survey area ranges from approximately 4,880 feet above sea level along the North Platte River to 5,480 feet above sea level in the northwestern hills.

The North Platte River and its major tributaries drain the entire proposed project area (Figure 3.5-35). The main river channel flows from west to east approximately 0.75 to 3 miles south of the proposed project area. Two primary tributaries intersect the outer edges of the proposed project area: Little Sand Creek in the western portion and Sage Creek in the eastern portion. Two man-made irrigation ditches also pass through the survey area: Gilbert Ditch in the east and the Running Dutchman Ditch in the south. Flow within Little Sand Creek and Sage Creek is categorized as intermittent, while the North Platte River is perennial. Numerous ephemeral drainages are also present in the area. Several stock tanks and reservoirs occur in the proposed project area, though many were dry during the baseline survey period. The largest water body is Gilbert Lake, located at the extreme eastern extent of the proposed project area. The lake held water throughout the 2008 baseline study period.

The vast majority of the proposed project area is privately owned, with scattered sections and partial sections managed by the State of Wyoming or an electric utility. The BLM manages portions of Sections 3, 5, and 6, T34N, R73W along the northern boundary between the proposed project area and one-mile perimeter, and part of Section 19, T34N, R72W at the extreme eastern edge of the proposed project area. Traditionally, this semi-arid rangeland has been used for year-round livestock grazing (cattle and sheep) and some dry land hay production. Other land uses in the area include energy development (including limited oil and gas production), electric utility projects, and hunting. Two new wind projects are being developed in the general region, but both are several miles from the proposed project area.

3.5.5.3.3 Methods

The baseline wildlife surveys followed standard survey requirements and protocols used by the WGFD, USFWS, and BLM, as well as the non-coal permitting guidelines issued by the WDEQ-LQD. Procedures and schedules recommended in the Handbook of Biological Techniques (WGFD 1982) were reviewed, and those in keeping with project-specific guidance from the WGFD were followed. The survey period extended from early February through early September 2008. Biologists used binoculars and spotting scopes

to make observations. Standard field guides and references (Stebbins 1966, Baxter and Stone 1985, Clark and Stromberg 1987, Peterson 1990, Stokes and Stokes 1996, and Cerovski et. al. 2004) were used to identify animals and their sign. Those resources, as well as the USFWS Migratory Bird Species of Management Concern (non-coal) and the BLM Vertebrate Sensitive Species lists were used to generate a potential species list for the area. Species' habitat requirements and availability were considered when the species list was developed.

Habitat Assessments

For the purposes of the wildlife baseline studies, habitats within the proposed project area were assessed in the field and classified using broad categories (e.g., grassland, sagebrush, etc.). The license area was also evaluated for the presence of any unusual or high value wildlife habitat features. Detailed vegetative data, including maps and photographs, were collected during the baseline vegetation assessment (see Section 3.5.5.1 Vegetation of the Ludeman Project USNRC Environmental Report).

Raptors

The raptor survey area included the proposed project area and accessible portions of the one-mile perimeter. As described above, biologists reviewed current BLM and WGFD databases for previously known raptor nests prior to entering the field. Searches for additional nest sites were conducted from February through early September 2008, either as targeted surveys or concurrent with other field work. Raptor use of the survey area was documented through both comprehensive nest searches and monitoring, and opportunistic observations, especially during the non-breeding season for the latter efforts.

Aerial surveys for bald eagle winter roosts and nests were conducted over the entire survey area in February 2008; details of those surveys are provided in the *Sensitive Species* section of this report, below. Ground surveys for raptor nests covered all accessible portions (about 74 percent) of the proposed project survey area from early spring through late summer. An early September raptor nest flight was conducted to cover those areas where ground access was denied by the landowner; biologists also watched for raptor nests during all other flights over the survey area.

During all field work, guidelines recommended by Grier and Fyfe (1987) were followed to prevent nest abandonment, damage to eggs, or injury to young. Searches for nesting raptors and productivity checks were conducted from February through early August 2008 to accommodate the nesting habits of the species present in the area. Early in the season, nest monitoring and searches were conducted primarily from vehicles using spotting scopes. Nests were located by slowly driving throughout the survey area and frequently stopping to examine typical nesting habitat. Rough breaks and trees were searched on foot. The occasional pedestrian surveys were carefully conducted to avoid

disturbing active ground nests. While in the field, biologists also continually watched for adult raptors. Areas where individuals or pairs were repeatedly seen were thoroughly searched for nests. All previously identified nests within accessible portions of the proposed project survey area were checked for activity at least once during the 2008 breeding season. All active nests were monitored until the pair's breeding attempt failed or young fledged.

Nest locations were obtained using hand-held Garmin® Global Positioning System (GPS) receivers and were recorded in Universal Transverse Mercator (UTM) coordinates (Zone 13, NAD 83). Nest locations were then plotted on topographic maps. The status (active, inactive, alternate, etc.) and condition of all nests and production of young were recorded.

Upland Game Birds

No known greater sage-grouse (*Centrocercus urophasianus*) or sharp-tailed grouse (*Tympanuchus phasianellus*) leks were documented within the proposed project survey area (proposed project area and one-mile perimeter, defined by the WGFD) prior to baseline surveys in 2008. That area is dominated by upland grasslands, though some stands of big sagebrush (*Artemisia tridentata*) are also present throughout the area.

Searches for new grouse leks were conducted between mid-April and early May 2008, and employed both ground and aerial surveys. The ground efforts included all accessible portions of the proposed project survey area. Due to its large acreage, ground searches for new leks in that area were conducted each day from April 21-24, 2008. Searches began one-half-hour before sunrise and continued until one hour after sunrise. Searches for displaying grouse were conducted by slowly driving through the area, making frequent stops at vantage points to scan and listen for strutting birds. Personnel searched all accessible portions of the survey area, but concentrated their efforts in likely lek habitat (level to rolling habitats). One aerial search for new grouse leks was conducted on May 2, 2008. The survey was conducted between one-half hour before sunrise and one hour after sunrise, and included the entire Survey Area. All lek searches were conducted during favorable weather conditions (i.e., no precipitation, calm to light winds).

Sage-grouse use of the proposed project survey area during other seasons was tracked through opportunistic observations of birds and their sign while conducting other surveys. All upland game bird sightings were recorded, including the number of birds, sex and age (when possible), location (UTM and quarter-quarter section), habitat, and activity. Grouse sightings were also provided by other project contractors, including general locations of observations.

Threatened and Endangered Species

The USFWS has identified five federally listed vertebrate species that could occur in Converse County and require monitoring (USFWS 2008): the black-footed ferret (*Mustela nigripes*-Endangered), interior least tern (*Sternula antillarum*-Endangered), pallid sturgeon (*Scaphirhynchus albus*-Endangered), whooping crane (*Grus americana*-Endangered), and piping plover (*Charadrius melodus*-Threatened). Information regarding plant T&E species is provided in Section 3.5.5.1 Vegetation of the proposed project area USNRC Environmental Report.

The USFWS ESO in Cheyenne, Wyoming, issued a letter on February 2, 2004 announcing that surveys for black-footed ferrets are no longer required in black-tailed prairie dog (*Cynomys ludovicianus*) colonies throughout the state (file letter ES-61411/BFF/WY7746). The remaining four vertebrate T&E species are associated with the Platte River (USFWS 2008). The river does not flow through the proposed license area; it is located approximately 0.75 to 3 miles south of that boundary (Figure 3.5-35).

Due to the block clearance for black-footed ferrets in the proposed project survey area, and the lack of suitable habitat in the proposed project area (future area of project-related surface disturbance) for species associated with the North Platte River, specific surveys targeting vertebrate T&E species were not required or conducted for this project. Nevertheless, biologists watched for all federally listed vertebrate species (including endangered, threatened, petitioned, and candidate species) and habitats that could support them while conducting other surveys, with the intent to record all sightings, including notes on location, habitat, and activity.

Sensitive Species

In May 2002, the USFWS ESO in Cheyenne, Wyoming, released a revised *Non-coal Mine List of 77 Migratory Bird Species of Management Concern in Wyoming*. In addition, the BLM issued the *BLM Wyoming State Director's Sensitive Species List* in September 2002. Both lists were current through 2008, and were obtained and reviewed prior to commencing field surveys. Species that have been delisted or removed from the federal listing process under the Endangered Species Act automatically revert to Sensitive Species status for the BLM. Therefore, the black-tailed prairie dog, bald eagle, and mountain plover (*Charadrius montanus*) were added to the September 2002 Casper BLM Field Office Sensitive Species list for this project.

Searches for bald eagle winter roosts and potential nesting habitat were conducted in early 2008, and encompassed the proposed project area and a one-mile perimeter (survey area). Aerial surveys for roost sites were conducted on February 12, 19, and 27, 2008. Weather conditions on those days consisted of clear to partly cloudy skies and light winds. The searches were conducted by examining all trees within the proposed Ludeman

Project survey area using a high-wing, light plane (Cessna 182). Flight speed and altitude were approximately 80-85 miles per hour (mph), and 300-350 feet above ground level, respectively. All roost surveys were completed between one hour before and one-half hour after sunset, following current procedures outlined in the *Wildlife Survey Protocol for Coal Bed Methane Development* issued by the Buffalo BLM Field Office (February 2005); the USFWS defers to this document for recommended survey protocols for this species. Searches for nesting bald eagles were performed in conjunction with roost flights and surveys for other nesting raptor species.

Specific surveys for other avian species of concern were not required for the proposed project during 2008. However, biologists watched for all sensitive species (both BLM vertebrate species and USFWS migratory bird species of management concern) and habitats that could support them while conducting all aerial and ground surveys. All sightings were recorded, including notes on location, habitat, and activity. The survey area for species of concern other than raptors and sage-grouse included all accessible lands within the proposed project area and a one-half mile project area buffer.

Locations and boundaries of black-tailed prairie dog colonies within 1 mile of the proposed project area were recorded in UTM coordinates (Zone 13, NAD 83) using a hand-held GPS unit, and subsequently plotted on the proposed project area map (Figure 3.5-35). Surveys for mountain plovers were conducted in conjunction with searches for other targeted species, but followed current procedures outlined in the *Wildlife Survey Protocol for Coal Bed Methane Development* issued by the Buffalo BLM Field Office.

Other Animals

No quantitative surveys for big game, lagomorphs, breeding birds, waterfowl, small mammals, mammalian predators, furbearers, reptiles, amphibians, or fish were required or conducted specifically for the proposed Ludeman Project wildlife baseline study. However, all sightings of non-target animals within the proposed project area and one-mile perimeter were recorded, and a species list maintained, during baseline surveys (February through September 2008) to document wildlife use of the proposed Ludeman Project survey area. WGFD big game range maps were used to determine which range delineations overlapped the survey area for future reclamation efforts.

3.5.5.3.4 Results and Discussion

Addendum 3.5-K presents summary tables for vertebrate BLM Sensitive Species (Table 3.5-20) and Migratory Bird Species of Management Concern in Wyoming (non-coal list) (Table 3.5-21) that could potentially reside in the proposed project area and nearby vicinity, or pass through during migration, with notations for those species that were observed within or near the proposed project area during 2008. Lists of other species that could potentially reside in or pass through the proposed project area are also included, along with notations indicating which species were observed during the 2008 baseline period (Addendum 3.5-K, Table 3.5-22).

Habitat Assessments

The proposed project area is dominated by two major wildlife habitat types: upland grasslands (62 percent) and sagebrush shrublands (30 percent). Those habitats correspond with similar plant communities defined during the baseline vegetation assessment (Table 3.5-23). Other habitat types, such as lowland grassland (6 percent) and disturbed areas (2 percent) were present in more limited extent and are not considered as separate "wildlife habitats" for this discussion. A distribution map and detailed descriptions of the composition and extent of all vegetative communities are provided in Section 3.5.5.1 Vegetation of the proposed Ludeman Project area Environmental Report USNRC.

Upland Grasslands

The upland grassland community is the most prevalent habitat type in the proposed project area, and is characterized by level to rolling terrain with limited shrub cover. Upland grasslands are comprised of both native and introduced cool- and warm-season species including, but not limited to, western wheatgrass (*Elymus smithii*), needle-and-thread (*Hesperopstipa comata*), blue grama (*Bouteloua gracilis*), cheatgrass (*Bromus tectorum*), Japanese brome (*Bromus japonicus*), and crested wheatgrass (*Agropyron cristatum*). The forb component is comprised of annual, biennial, and perennial species such as desert alyssum (*Alyssum desertorum*), Pursh's plantain.

Table 3.5-23: Wildlife habitats within the Proposed Project Area and Corresponding Vegetation Types (see Section 3.5.5.1 Vegetation)

Wildlife Habitat	Corresponding D8 Vegetation Types
Upland Grassland	Upland Grassland, Upland Grassland Rough Breaks Complex, Crested Wheatgrass Field
Sagebrush Shrubland	Big Sagebrush Shrubland, Silver Sagebrush Shrubland
Not Classified for Wildlife[1]	Lowland Grassland
Not Classified for Wildlife[1]	Disturbed

[1] Habitat too limited (≤ 6 percent) and similar to grasslands to categorize as a distinct wildlife habitat.

(*Plantago patagonica*), and scarlet globemallow (*Sphaeralcea coccinea*), among others. Shrubs and sub-shrubs such as big sagebrush and fringed sagewort (*Artemisia frigida*), respectively, have a limited presence in this habitat type. The plains prickly pear (*Opuntia polyacantha*) is scattered throughout grassland areas. Grasslands are used primarily for livestock grazing.

Sagebrush Shrublands

Sagebrush shrublands are most common in the western third of the proposed project area. Despite its name, this plant community is actually dominated by grass species (66 percent combined relative cover), whereas shrubs and sub-shrubs comprise only 15.8 percent relative cover. Forbs and succulents make up the remainder of the relative cover in this habitat type. Big sagebrush is the dominant shrub in this habitat type. Other shrubs and half/sub-shrub species include birdsfoot sagewort (*Artemisia pedatifida*), silver sagebrush (*Artemisia cana*), fringed sagewort, and winterfat (*Krascheninnikovia lanata*). Grass species include, but are not limited to, cheatgrass, Japanese brome, western wheatgrass, and blue grama. The forb component is similar to that of the upland grassland community; prickly pear cactus is also present. Sagebrush shrublands are also used primarily for livestock grazing.

Raptors

A search of the BLM raptor database revealed nine previously existing nests within the proposed project survey area (project area and one-mile perimeter) (Table 3.5-24, Figure 3.5-35); all nine were in cottonwood (*Populus* spp.) trees. Two BLM nests have identical numbers (337310), and are further distinguished in Table 3.5-24 with "E" (east) or "W" (west). Thirty-one additional nests were documented and 3 potential nests were recorded during ground and aerial searches of the survey area in 2008 (Figure 3.5-35). The potential nests were located during the final flight over the survey area in September

2008, with no additional time for ground-truthing. Those sites will be verified prior to actual surface disturbance in the proposed project area. Based on their proximity to one another, it is likely that some nests are within the same territory.

One of the previously identified BLM nests (337310-E, unknown species) was destroyed by natural causes prior to 2008 (Table 3.5-24, Figure 3.5-35). Another BLM nest (337311, unknown species) was not accessible as it was on an island within the North Platte River. A third BLM nest (5138) has a new, unnumbered nest in the same tree (Figure 3.5-35). Therefore, 38 of the 40 confirmed nests were known to be intact as of September 2008; the potential nests were not included in that tally. Thirty-two of the 38 intact nests were within the proposed project area and 6 were in the one-mile perimeter. Existing nests included:

30 ferruginous hawk (*Buteo regalis*) nests,

2 great horned owl (*Bubo virginianus*) nests,

1 red-tailed hawk (*Buteo jamaicensis)* nest,

2 golden eagle (*Aquila chrysaetos*)/red-tailed hawk nests,

1 great horned owl/red-tailed hawk nest, and

2 unknown raptor species nests.

Table 3.5-24 gives the locations of all nests, 2007 status of BLM nests (if available), and the status of all nests in 2008. Nest locations are illustrated on Figure 3.5-35.

Eight ferruginous hawk nests exhibited some level of activity in 2008 (Table 3.5-24). Seven pairs actively nested (laid eggs); six pairs fledged a total of nine young. One of those seven nests was found with new material and broken eggshells in the nest. That evidence and the absence of additional sign (feathers, droppings, prey remains) in the nest area indicated that no young fledged from the site. Another nest was discovered with fresh material and droppings nearby, but it did not appear that any eggs or young had been present; the nest was classified as tended. Seven of the eight active ferruginous hawk nests were located within the proposed project area.

Three of the nine previously identified BLM tree nests were occupied by red-tailed hawks in 2008. Two of those nests (5162 and 5172) were originally built by golden eagles (Table 3.5-24). The third BLM nest (5138) was successfully used by great horned owls in 2007. All three red-tailed hawk pairs successfully fledged a total of five young from the nests in 2008. A fourth BLM tree nest (337310-W) of unknown origin located near the North Platte River was monitored from a distance in 2008, and was determined to be inactive that year. Based on its size, structure, and location in the tree, the nest is presumed to be associated with red-tailed hawks and is labeled as such in Table 3.5-24.

Great horned owls also nested within the proposed project area in 2008. An owl was observed incubating on BLM nest 347422 (formerly listed as unknown species) located in the southwestern portion of the proposed project area in April. However, no owls or sign were seen at this location during subsequent checks, and two adult golden eagles were observed perched in the nest tree in July. Therefore, the owl nest was determined to have failed. No other great-horned owl activity was noted in the proposed project survey area in 2008. Great horned owls do not build their own nests, but instead often use nests of other raptor species. Consequently, the number of owls nesting in an area can be affected by the presence and availability of intact nests in their territories. The secretive nature of great horned owls may also result in searches overlooking some nesting pairs, which may result in undercounting.

Table 3.5-24: Raptor Nest Locations and Productivity in and within One Mile of the Proposed Project Area in **2007** (BLM nests) and **2008 (Has been redacted)**

Table 3.5-24: Continued **(Has been redacted)**

As indicated, none of the BLM tree nests previously identified with golden eagles were actively used by that species in 2008, though golden eagles were observed perched within and flying over the proposed project survey area on multiple occasions. The remaining BLM tree nests were not identified with a particular species, and were inactive in 2008 (Table 3.5-24).

Six additional raptor species were recorded in the proposed project survey area during 2008: the turkey vulture (*Cathartes aura*), bald eagle, Swainson's hawk (*Buteo swainsoni*), northern harrier (*Circus cyaneus*), short-eared owl (*Asio flammeus*), and burrowing owl (*Athene cunicularia)*. The bald eagle, Swainson's hawk, short-eared owl, and burrowing owl are discussed in greater detail in the *Sensitive Species* section, below. Turkey vultures were seen soaring over the eastern portion of the proposed project area in July and early August, and a vulture was documented soaring with a northern harrier over grassland in the north-central part of the proposed project area in late August. Northern harriers were also observed flying over the extreme eastern portion of the proposed project area and one-mile perimeter in late August. The northern harrier is a potential breeder in the area, but no nests were discovered in 2008. As with great horned owls, it is possible that northern harrier nests were overlooked during surveys. This ground-nesting species builds inconspicuous nests in tall vegetation, and ranges over a relatively large area when hunting. Consequently, locating nest sites often depends on chance discoveries or sightings of adults delivering prey to nest sites.

Upland Game Birds

The proposed project survey area is dominated by upland grasslands, but does contain marginal sage-grouse habitat in the western third of the area in the form of sagebrush shrublands and drainage bottoms (i.e., Lowland Grasslands); potential sharp-tailed grouse habitat is present throughout the area. No greater sage-grouse or sharp-tailed grouse leks were identified in BLM or WGFD databases within the WGFD prescribed one-mile survey area prior to field surveys in 2008, and no leks were found in that area during ground or aerial surveys conducted that year. The nearest known grouse lek is the North 95 sage-grouse lek, approximately 2.75 miles northwest of the proposed project area (Figure 3.5-35).

Few sage-grouse and no sharp-tailed grouse were observed in the proposed project survey area during numerous site visits conducted by ICF Jones & Stokes from February through early September 2008, and by other contracting personnel through early November of that year. Only three groups of sage-grouse were reported in the proposed project area during that period; none were documented in the surrounding one-mile perimeter. Four sage-grouse were seen in June in T34N, R74W, SW¼ SW¼ Section 12. Two sage-grouse were observed near Little Sand Creek in T34N, R74W, NW¼ NE¼ Section 22 in early October. Two sage-grouse were also recorded near a reservoir in T34N, R73W, NE¼ SW¼ Section 9 in early November. A small area of sage-grouse droppings was

encountered near the head of a sagebrush draw in the southwestern portion of the proposed project area, in T34N, R74W, NE¼ NW¼ Section 24 in late August. The droppings were scattered about as if in a foraging area rather than in distinct roost piles.

The mourning dove (*Zenaida macroura*) was the only other upland game bird that was observed in or near the proposed project area during 2008. Mourning doves were most often recorded along the North Platte River as it passes through the extreme southern portion of the one-mile perimeter. Doves were also documented in tree windbreaks at occupied ranches or in individual trees located throughout the proposed project area.

Sensitive Species

Addendum 3.5-K lists the BLM Casper Field Office vertebrate Sensitive Species (Table 3.5-20) and the non-coal list of 77 migratory bird species considered by the USFWS to be of current management concern in Wyoming (Table 3.5-21). Both tables also provide brief descriptions of each species' primary nesting habitat and records of their occurrence and status in the vicinity of the proposed project area during 2008.

BLM Sensitive Species

One mammal and four avian BLM Sensitive Species were observed within the proposed project area during baseline wildlife surveys completed in 2008 (Addendum 3.5-K, Table 3.5-20). As described above, one small (11 acres), occupied black-tailed prairie dog colony is present just beyond the southern edge of the proposed project boundary (Figure 3.5-35). Ferruginous hawks and sage-grouse were discussed in the previous *Raptors* and *Upland Game Bird* sections, respectively. Loggerhead shrikes (*Lanius ludovicianus*) were seen on several occasions during the summer in isolated trees throughout the License Area. No shrikes were observed within the one-half mile survey perimeter for this species, though individuals were recorded along the riparian corridor in the southern portion of the one-mile perimeter. Two adult burrowing owls were recorded in the eastern portion of the proposed project area in T34N, R73W, NW¼ SE¼ Section 23 during spring surveys in April. No nesting behavior or active nests for either species were recorded during the baseline surveys.

One mammal and three avian BLM Sensitive Species were documented in the proposed project survey area (one-half to one-mile perimeter, depending on the species). One swift fox (*Vulpes velox*) carcass was found along Wyoming State Highway 93 just east of the License Area in early August. The cause of death was due to a vehicle collision. Ferruginous hawks and loggerhead shrikes were already addressed in previous sections. The bald eagle is discussed below.

The final rule delisting the bald eagle was published in the Federal Register on July 9, 2007 (Federal Register: Vol. 72, No. 130, pg. 37345-37372 July 9, 2007). Delisting

became effective 30 days after publication of this rule, on August 8, 2007. However, this species will continue to be protected under both the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. The bald eagle is considered a breeder in portions of Converse County, Wyoming (Cerovski et al. 2004). In the proposed project survey area, nesting and winter roosting habitat for this species is primarily limited to the cottonwood corridor in the southeastern portion of the one-mile perimeter along the North Platte River.

Searches of the BLM database revealed no existing bald eagle winter roosts or nests in or within the proposed project survey area (project area and one-mile perimeter for this species). No new nests were discovered in that area during baseline surveys conducted in 2008, nor were any consistent roost sites identified. Three bald eagles were observed within the one-mile perimeter on one occasion each during 2008. One adult eagle was seen perched in a cottonwood tree along Little Sand Creek in T34N, R74W, NW¼ NW¼ Section 26 during the late February winter roost survey. An immature bald eagle was observed perched in a cottonwood along the North Platte River and a sub-adult eagle was recorded flying nearby in T33N, R73W, NW¼ NE¼ Section 10 during ground surveys conducted in early August 2008. The nearest known active bald eagle nest in 2008 was located near an occupied residence along the Running Dutchman Ditch in T33N, R73W, NE¼ NE¼ Section 5. The nest was not monitored during the wildlife baseline studies due to its location on inaccessible private lands beyond the required one-mile survey area for the proposed project.

Migratory Bird Species of Management Concern in Wyoming (non-coal)

Eleven USFWS avian species of concern were recorded within the proposed project survey area during 2008 (Addendum 3.5-K, Table 3.5-21). Six of those 11 species are categorized as Level I, which indicates a need for conservation action (i.e., having a monitoring and mitigation plan): the greater sage-grouse, ferruginous hawk, burrowing owl, bald eagle, Swainson's hawk, and short-eared owl. The remaining five species are considered Level II, for which continued monitoring is recommended: the lark bunting (*Calamospiza melanocorys*), grasshopper sparrow (*Ammodramus savannarum*), loggerhead shrike, vesper sparrow (*Pooecetes gramineus*), and lark sparrow (*Chondestes grammacus*). Note that some of these species are also included on the BLM Sensitive Species list.

Five of the six Level I species were recorded at least once each within the proposed project area; bald eagles were observed only in the one-mile perimeter. The greater sage-grouse, ferruginous hawk, burrowing owl, and bald eagle were discussed in the *Upland Game Birds*, *Raptors*, or *BLM Sensitive Species* sections, above. Three Swainson's hawks were observed within the License Area on the same day in early August. An adult was seen flying with an immature bird over grasslands in T34N, R73W, SW¼ NW¼ Section 17, and a juvenile was recorded flying in T34N, R73W, NW¼ NE¼ Section 7 near

Wyoming Highway 95. One short-eared owl was also observed perched on a fence post in sagebrush-grassland in T34N, R73W, NW¼ NW¼ Section 23 during early August surveys. No nesting activity for Swainson's hawks or short-eared owls was documented in the proposed project area or survey area during 2008.

Four of the five Level II species were documented within the proposed project area in 2008: the lark bunting, loggerhead shrike, vesper sparrow, and lark sparrow. Grasshopper sparrows were only observed in the one-half mile perimeter. Loggerhead shrikes were discussed in the *BLM Sensitive Species* section, above. Lark buntings and vesper sparrows were the most common Level II species recorded in the Ludeman Project survey area. Both species are relatively ubiquitous and were observed in most habitats in and near the proposed project area in 2008. Although actual nests were not encountered, the presence and behavior (singing, display flights) of birds throughout spring and summer suggest that both species nested in the area. The lark sparrow was documented once in the rougher terrain in the western portion of the proposed project area in July 2008. Grasshopper sparrows were recorded in areas of taller grass in the one-half mile perimeter during spring 2008. In the Great Plains Region, this species is typically associated with taller grassland vegetation (Vickery 1996).

The remaining species of concern were not documented in the vicinity of the proposed project area or survey area. Although they could migrate through the area, range and habitat considerations such as the lack of coniferous woodlands, limited riparian corridors, and large persistent bodies of water make it unlikely that most of those species would occur in the immediate vicinity of the proposed project. Suitable habitat for mountain plovers is present in some areas where sheep graze in the eastern portion of the survey area, but no plovers were observed during the baseline study period.

3.5.5.3.5 Other Animals

Big Game

Pronghorn (*Antilocapra americana*) and mule deer (*Odocoileus hemionus*) were the only two big game species observed within the proposed project area and two-mile perimeter (WGFD area of interest for big game). Both species were observed throughout the baseline survey period, though pronghorn were more prevalent. Those are also the only two big game species with range delineations that overlap the proposed project survey area. No crucial big game habitat is recognized by the WGFD in or within 2 miles of the proposed project area (Figures 3.5-36 and 3.5-37).

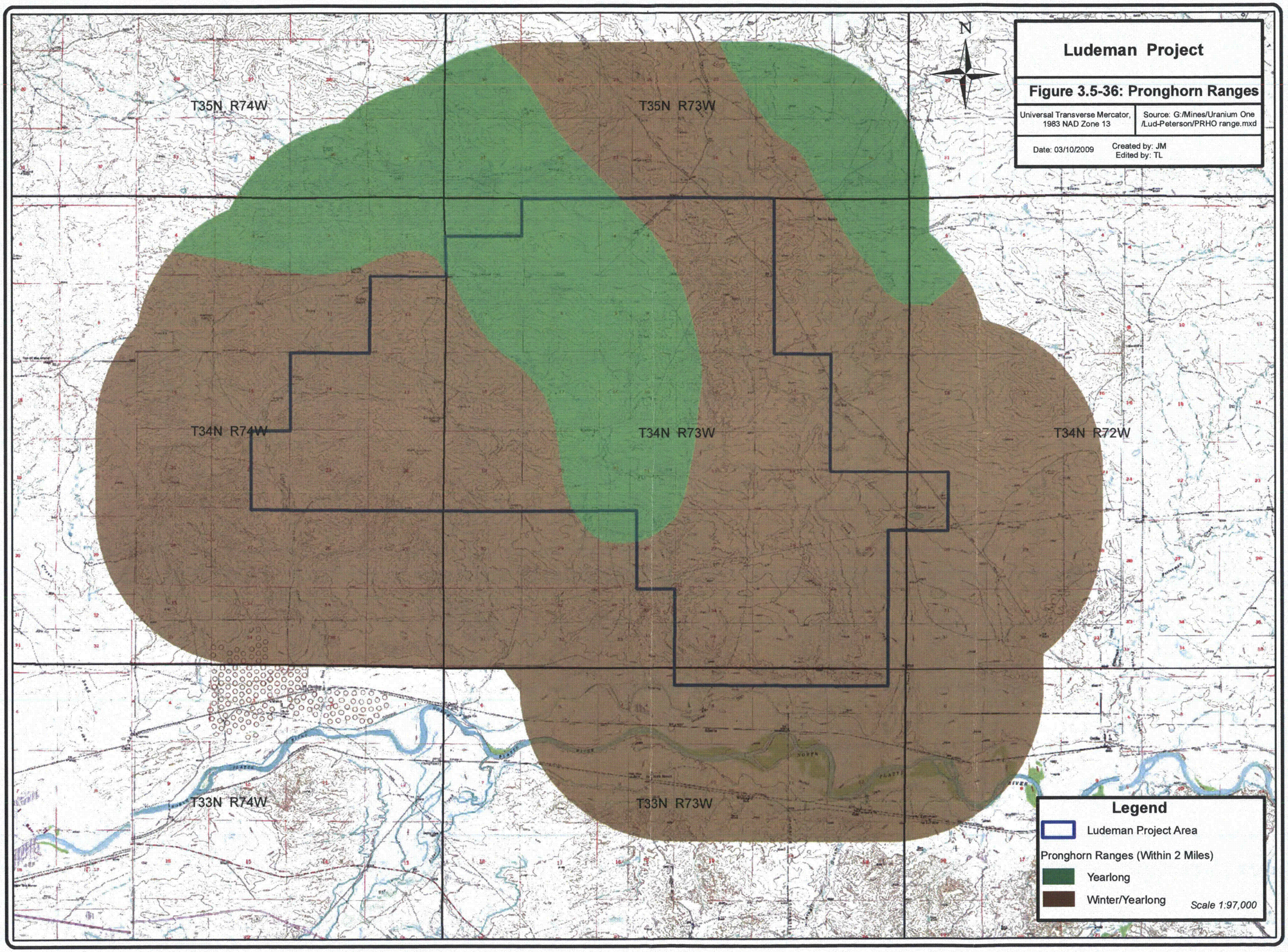
The WGFD has classified the majority (77 percent) of the pronghorn range as winter/yearlong (Figure 3.5-36). That range indicates that a population or a portion of a population of animals makes general use of this habitat on a year-round basis, with a

significant influx of additional animals from other seasonal ranges in the winter. The remaining 23 percent of the proposed project survey area is classified as yearlong pronghorn range, which means that a population or substantial portion of a population of animals makes general use of this habitat on a year-round basis, but may occasionally leave the area under severe conditions. The proposed project survey area is within the North Converse Pronghorn Herd Unit No. 748. In post-season 2007, WGFD estimated the pronghorn population in that Herd Unit to be 31,028. That was approximately 11percent above the management objective of 28,000 animals (WGFD 2008).

Ludeman Project

Figure 3.5-36: Pronghorn Ranges

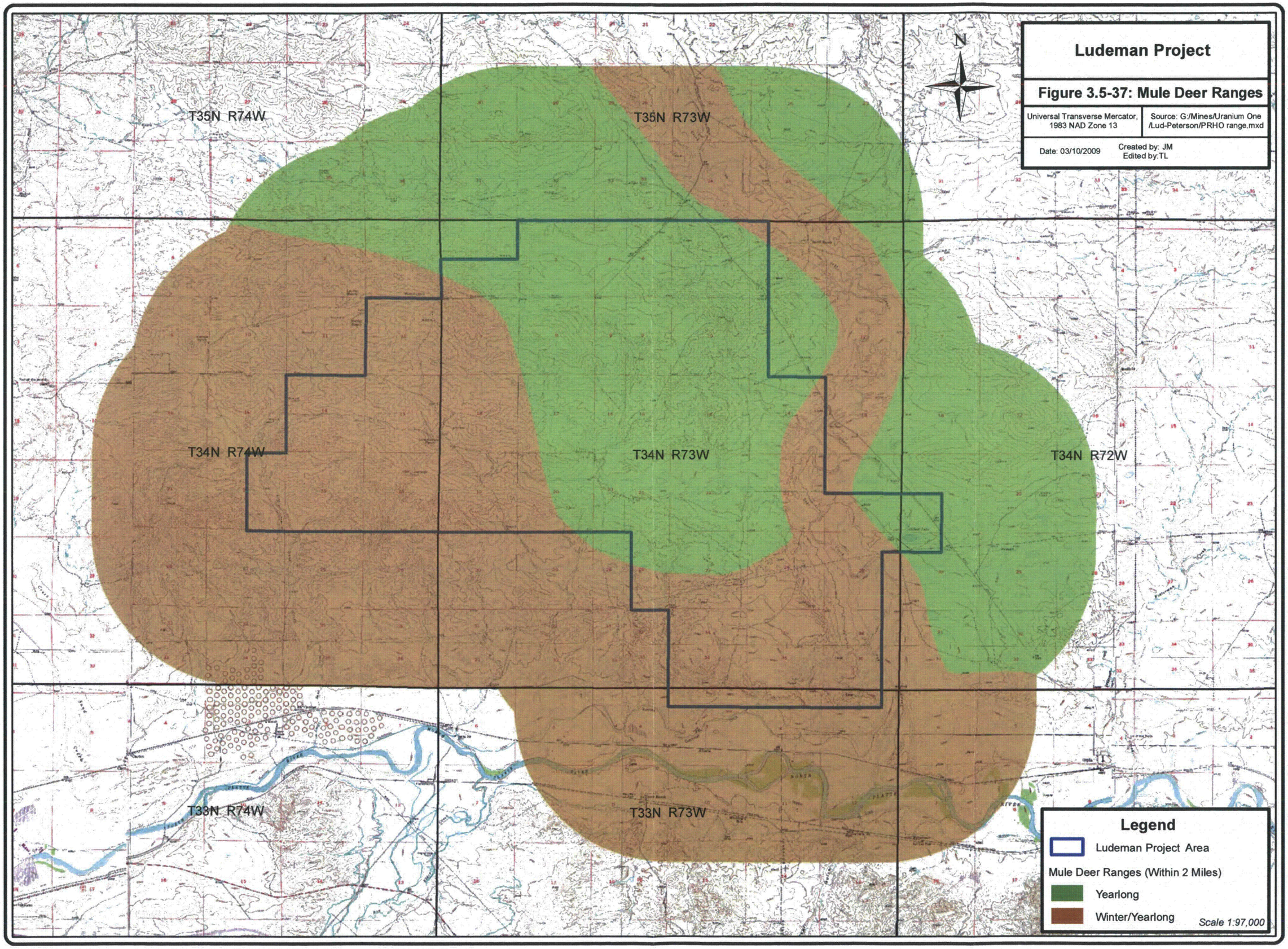
Universal Transverse Mercator, 1983 NAD Zone 13	Source: G:/Mines/Uranium One /Lud-Peterson/PRHO range.mxd
Date: 03/10/2009	Created by: JM Edited by: TL



Ludeman Project

Figure 3.5-37: Mule Deer Ranges

Universal Transverse Mercator, 1983 NAD Zone 13	Source: G:/Mines/Uranium One /Lud-Peterson/PRHO range.mxd
Date: 03/10/2009	Created by: JM Edited by:TL



The WGFD has classified 60 percent of the proposed project survey area as mule deer winter/yearlong range, with the remaining 40 percent as yearlong range (Figure 3.5-37). The survey area is within the North Converse Mule Deer Herd Unit No. 755. In post-season 2007, WGFD estimated the mule deer population in that Herd Unit to be 9,300, with a management objective of 9,100 animals (WGFD 2008).

Other Non-target Animals

Incidental sightings of animals not targeted by systematic surveys were recorded during all wildlife monitoring efforts in and within 1 mile of the proposed project area during 2008 (Addendum 3.5-K, Table 3.5-22). One coyote (*Canis latrans*) was observed within the proposed project area during a raptor nest aerial survey in early September. One badger (*Taxidea taxus*) carcass was discovered in the eastern one-mile perimeter on Wyoming State Highway 93 during the August surveys. A live badger was seen crossing that road in the perimeter during that same month. Cottontails (*Sylvilagus* spp.) and white-tailed jackrabbits (*Lepus townsendii*) were observed in various habitats within the proposed project area and surrounding perimeter throughout the baseline survey period.

Avian species recorded in the proposed project area included several common waterfowl, wading bird, and shorebird species, such as the mallard (*Anas platyrhynchos*), gadwall (*A. strepera*), green-winged teal (*A.* crecca), American wigeon (*A. Americana*), great blue heron (*Ardea herodias*), killdeer (*Charadrius vociferous*), and Wilson's phalarope (*Phalaropus tricolor*). The majority of these wetland birds were observed at Gilbert Lake in the extreme eastern portion of the proposed project area. The western kingbird (*Tyrannus verticalis*), Say's phoebe (*Sayornis saya*), common nighthawk (*Chordeiles minor*), and rock wren (*Salpinctes obsoletus*) were also seen within the proposed project area, as were other common species (Addendum 3.5-K, Table 3.5-22). The nighthawk, eastern kingbird (*Tyrannus tyrannus*), and other species were also documented in the surrounding perimeter.

The only amphibian that was encountered in the proposed project area was the boreal chorus frog (*Pseudacris triseriata*). One bullsnake (*Pituophis melanoleucas*) was observed in the western portion of the proposed project area in early August. Although they were not observed, dry land species such as the eastern shorthorned lizard (*Phrynosoma douglassi*) and prairie rattlesnake (*Crotalus viridis*) are likely to occur in the proposed project area. No fish were sampled or observed incidentally in the North Platte River during baseline studies for this project.

3.5.5.3.6 Conclusions

No current endangered, threatened, proposed, candidate, or petitioned vertebrate species reside in or rely on the proposed project area or one-mile survey area. No designated critical or crucial habitats for any species occur in the area, including big game. All of the BLM Sensitive Species and USFWS avian species of management concern that were documented in the proposed project area during the baseline study period are common in the region, either seasonally or year-round. Potential habitat for bald eagles is present, but is largely limited to the small reach of the North Platte River that flows through a limited portion of the one-mile Survey Area. No bald eagle nests or consistent winter roost sites were identified in or within 1 mile of the proposed project area; the most suitable habitat for those activities is located at the extreme southern edge or beyond the one-mile survey area.

Numerous raptor nests are present in the area, but most have been identified as those of ferruginous hawks. That species is known to build multiple nests within a given territory, so the number of active nests in any given year would likely be considerably less than the number of individual nest sites discovered during the baseline surveys. That was demonstrated in 2008, when only 8 of the 30 classified ferruginous hawk nest sites were active. All species documented as actively nesting within the survey area during 2008 are known to regularly nest elsewhere in the immediate vicinity and throughout the region.

No sage-grouse or sharp-tailed grouse leks are present within the one-mile Survey Area prescribed by the WGFD for this project. The nearest lek is a sage-grouse lek approximately 2.75 miles northwest of the proposed project area. Additionally, the relatively limited (approximately 16 percent, overall) occurrence and marginal quality of sagebrush shrublands, and the paucity of sage-grouse sightings and grouse sign within the proposed project area, indicate that this species is not abundant in that area; no sharp-tailed grouse were observed during the baseline survey period. Potential upland game bird brood habitat is present along the primary drainages in the area, but no grouse or young were recorded there during general wildlife surveys conducted across all seasons during 2008.

No perennial streams and only one sizeable reservoir occur in the proposed project area. Therefore, no fisheries and only limited waterfowl habitat would be affected by the proposed project. The only waterfowl, shorebird, and wetland-associated species observed in 2008 are common and widespread. The pronghorn and mule deer were the only big game species documented in the Survey Area during the baseline survey period; those and other mammalian species observed during 2008 are also common to the region.

Likewise, the habitats present within the proposed project area and survey area are common in central Wyoming. The proposed project area is dominated (62 percent) by

upland grassland habitats, with no unique or unusual habitats present. Sagebrush shrubland, a habitat of growing concern throughout the west, is limited in extent and marginal in quality within the proposed project area. Sagebrush stands are largely confined to the western third of the area. The shrublands themselves comprise only 16 percent of the total relative cover in the proposed project area; this habitat type is actually dominated (66 percent) by upland grassland species. Therefore, although they provide limited value to some species, the shrublands in the proposed project area would not support sagebrush obligates such as the greater sage-grouse or Brewer's sparrow (*Spizella breweri*) with any regularity. Lowland grassland (i.e., bottomland) and tree habitats, which often support considerable wildlife diversity, are also limited within the License Area. The greatest presence of either habitat occurs at Gilbert Lake (open water and wetlands) in the extreme eastern portion of the proposed project area, and along the North Platte River (open water, mud banks, and cottonwood corridors) as it flows through the extreme southern portion of the one-mile survey perimeter. The tree windbreaks that are present in the proposed project area are quite small and are located adjacent to occupied residences, which may reduce their value to those wildlife species that require a more secluded setting. The natural drainages within the proposed project area itself do not have persistent flow. However, Gilbert Lake and the two irrigation ditches within the Survey Area likely provide more reliable water sources throughout the year. The lone prairie dog colony in the area is extremely small and lies just beyond the southern edge of the proposed project area.

The proposed project area currently experiences various levels of regular human disturbance, depending on the time of year. The area is encircled by paved roads, with a railroad running along the Platte River at its southern extent. Additional disturbances in the area include active ranching and livestock herding, seasonal hunting, existing oil and gas activity, and occupied residences.

As described above, the proposed project area supports an array of common wildlife species, despite the relatively limited variety of habitat types and the presence of existing disturbances within the area. Given the physical and faunal characteristics of the area described above, no significant impacts to wildlife or their habitats are anticipated from ISR operations and reclaiming the proposed project area. Development will result in short-term habitat loss for some species, but careful reclamation efforts should allow for their eventual recovery.

3.5.5.4 Threatened and Endangered Species

No Threatened or Endangered vertebrate species have been documented in the proposed project survey area, and none were observed there during baseline wildlife surveys conducted in 2008. Likewise, no current (as of September 2008) candidate, petitioned, or proposed vertebrate species were recorded during recent or previous surveys. No T&E plant species were encountered during the baseline vegetation assessment, either. Details

describing survey results for the vegetation sampling are provided in Section 3.5.5.1 Vegetation of the proposed project USNRC Environmental Report.

As noted in the *Methods* section, the USFWS declared in February 2004 that surveys for black-footed ferrets are no longer required in black-tailed prairie dog colonies throughout Wyoming. No black-footed ferrets, or their sign, have ever been documented in the proposed project area or surrounding region, including during surveys completed for other species in 2008. The only potential habitat for this species in the survey area consists of one small, occupied prairie dog colony of approximately 11 acres located just beyond the southern project boundary (Figure 3.5-35). The colony itself would not be considered large enough (30 acres or more) to potentially support individual black-footed ferrets (Forrest et al. 1985), though it could be part of a larger complex of colonies outside the baseline survey area. Regardless, the proposed project survey area is beyond the focus area for ferret reintroduction efforts in Wyoming (USFS 2004, Grenier 2003).

The remaining four vertebrate T&E species are associated with the Platte River system (USFWS 2008), which flows at least 0.75 mile beyond the proposed project area. Information regarding those species' habitat needs and/or recovery efforts can be found in the USFWS recovery plans and/or on that agency's website (Canadian Wildlife Service and USFWS 2007; USFWS 1988, 1993, and 2008).

3.5.5.1 Aquatic Resources

Under natural conditions, aquatic habitat on and near the proposed project is limited by the ephemeral nature of surface waters in the analysis area. The lack of deep-water habitat and extensive and persistent sources of water precluded the presence of fish, and limits the abundance and diversity of other aquatic species. The collection of water for stock watering has enhanced the water supply within some of the drainages in the general analysis area. However, those enhanced areas are still relatively limited and/or isolated in nature and no perennial drainages are present in the general analysis area.

As described above, the only amphibian that was encountered in the proposed project area was the boreal chorus frog (*Pseudacris triseriata*). One bullsnake (*Pituophis melanoleucas*) was observed in the western portion of the proposed project area in early August. Although they were not observed, dry land species such as the eastern shorthorned lizard (*Phrynosoma douglassi*) and prairie rattlesnake (*Crotalus viridis*) are likely to occur in the proposed project area. No fish were sampled or observed incidentally in the North Platte River during baseline studies for this project.

ADDENDUM 3.5-A

VEGETATION SPECIES SUMMARY

Acronym	Current Nomenclature	Common Name	Upland Grassland	Big Sagebrush Shrubland	Upland Grassland/ Rough Breaks Complex	Lowland Grassland	Silver Sagebrush Shrubland	Crested Wheatgrass
Cool Season Perennial Grasses and Grasslike Plants								
ACHHYM	*Achnatherum hymenoides*	Indian ricegrass	X	X	X		X	
AGRCRI	*Agropyron cristatum*	Crested wheatgrass	X		X	X	X	X
BROINE	*Bromus inermis*	Smooth brome					X	
CARDOU	*Carex douglasii*	Douglas sedge				X	X	
CARFIL	*Carex filifolia*	Threadleaf Sedge	X	X	X	X		
CARNEB	*Carex nebrascensis*	Nebraska sedge				X		
CARPRA	*Carex praegracilis*	Silver sedge				X		
CARSTE	*Carex stenophylla*	Needleleaf Sedge				X		
ELEPAL	*Eleocharis palustris*	Common spikerush				X		
ELYHIS	*Elymus hispidus*	Intermediate wheatgrass				X	X	
ELYLAN	*Elymus lanceolatus*	Thickspike wheatgrass			X	X	X	
ELYSMI	*Elymus smithii*	Western wheatgrass	X	X	X	X	X	X
ELYSPI	*Elymus spicatus*	Bluebunch wheatgrass			X	X	X	X
ELYTRA	*Elymus trachycaulus*	Slender wheatgrass				X		
HESCOM	*Hesperostipa comata*	Needle and thread	X	X	X	X	X	X
HORJUB	*Hordeum jubatum*	Foxtail barley		X	X	X		
JUNBAL	*Juncus balticus*	Baltic rush				X		
KOEMAC	*Koeleria macrantha*	Prairie junegrass	X	X	X	X		X
NASVIR	*Nassella viridula*	Green needlegrass	X	X	X	X	X	
PHLPRA	*Phleum pratense*	Common timothy				X		
POACUS	*Poa cusickii*	Cusick bluegrass				X		
POAPRA	*Poa pratensis*	Kentucky bluegrass		X	X	X		
	Species obseved but not sampled							

Acronym	Current Nomenclature	Common Name	Upland Grassland	Big Sagebrush Shrubland	Upland Grassland/ Rough Breaks Complex	Lowland Grassland	Silver Sagebrush Shrubland	Crested Wheatgrass
Cool Season Perennial Grasses and Grasslike Plants (Continued)								
POASEC	*Poa secunda*	Sandberg bluegrass	X	X	X	X	X	X
POASPP	*Poa species*	Bluegrass					X	
SCHTAB	*Schoenoplectus tabernaemontani*	Softstem bulrush				X		
SCIACU	*Scirpus acutus*	Hardstem bulrush				X		
Warm Season Perennial Grasses								
ARIPUR	*Aristida purpurea*	Purple threeawn					X	X
BOUGRA	*Bouteloua gracilis*	Blue grama	X	X	X	X	X	X
CALLON	*Calamovilfa longifolia*	Prarie sandreed	X			X		
DISSTR	*Distichilis stricta*	Inland saltgrass				X		
PANVIR	*Panicum virgatum*	Switchgrass				X		
SPAPEC	*Spartina pectinata*	Prairie cordgrass				X		
SPOAIR	*Sporobolus airoides*	Alkali sacaton				X	X	
SPOCRY	*Sporobolus cryptandrus*	Sand dropseed	X			X	X	
Annual Grasses								
BROJAP	*Bromus japonicus*	Japanese brome	X	X	X	X	X	
BROTEC	*Bromus tectorum*	Cheatgrass	X	X	X	X	X	X
HORVUL	*Hordeum vulgare*	Sixrow barley				X	X	
VULOCT	*Vulpia octoflora*	Sixweeks fescue	X	X	X	X	X	X
Annual Forbs								
ALYALY	*Alyssum alyssoides*	Pale alyssum					X	
ALYDES	*Alyssum desertorum*	Desert alyssum	X	X	X	X	X	X
CAMMIC	*Camelina microcarpa*	Littleseed falseflax			X	X	X	X
CHEALB	*Chenopodium album*	Common lambsquarter	X		X		X	
	Species obseved but not sampled							

Acronym	Current Nomenclature	Common Name	Upland Grassland	Big Sagebrush Shrubland	Upland Grassland/ Rough Breaks Complex	Lowland Grassland	Silver Sagebrush Shrubland	Crested Wheatgrass
Annual Forbs (Continued)								
CHELEP	*Chenopodium leptophylum*	Narrowleaf goosefoot				X	X	X
CLESER	*Cleome serrulata*	Rocky Mountain bee plant					X	
COLLIN	*Collomia linearis*	Linearleaf collomia				X		
CRYMIN	*Cryptantha minima*	Little cryptantha				X	X	
CRYSPP	*Crypantha species*	Miners candle			X			
DESPIN	*Descurainia pinnata*	Tansey mustard			X	X	X	
DESSOP	*Descurainia sophia*	Flixweed	X		X	X	X	X
LAPRED	*Lappula redowskii*	Bluebur stickseed	X	X	X	X	X	X
LEPDEN	*Lepidium denisflorum*	Prairie pepperweed		X		X	X	X
MONNUT	*Monolepis nuttalliana*	Nuttall's povertyweed			X	X	X	X
OENSTR	*Oenothera stricta*	Chilean evening primrose				X		
PLAPAT	*Plantago patagonica*	Pursh's plantain	X	X	X	X	X	X
POLAVI	*Polygonum aviculare*	Prostrate knotweed			X		X	
SALTRA	*Salsola tragus*	Russian thistle			X		X	
SISALT	*Sisymbrium altissimum*	Tumble mustard					X	
THLARV	*Thlaspi arvense*	Field pennycress				X		
Annual/Biennial Forbs								
MELOFF	*Melilotus officinalis*	Yellow sweetclover				X		X
TRADUB	*Tragopogon dubius*	Goat's beard (Western salsify)		X	X	X	X	X
Perennial Forbs								
ACHMIL	*Achillea millefolium*	Western yarrow			X	X		
ALLTEX	*Allium textile*	Textile onion	X	X	X	X	X	X
	Species obseved but not sampled							

Acronym	Current Nomenclature	Common Name	Upland Grassland	Big Sagebrush Shrubland	Upland Grassland/ Rough Breaks Complex	Lowland Grassland	Silver Sagebrush Shrubland	Crested Wheatgrass
Perennial Forbs (Continued)								
ANTMIC	*Antennaria microphylla*	Littleleaf pussytoes			X	X		
ASTASC	*Aster ascendens*	Aster						X
ASTBIS	*Astragalus bisulcatus*	Twogrooved milkvetch			X	X	X	
ASTCRA	*Astragalus crassicarpus*	Groundplum milkvetch	X					
ASTMOL	*Astragalus mollisimus*	Woolly locoweed						X
ASTPEC	*Astragalus pectinatus*	Woolly locoweed			X			
ASTSPA	*Astragalus spatulatus*	Spoonleaf milkvetch			X			X
ASTSPP	*Astragalus species*	Milkvetch			X	X		X
CALNUT	*Calochortun nuttallii*	Sego lily	X	X	X			X
CAMROT	*Campanula rotundigolia*	Bluebell bellflower	X					
CARDRA	*Cardaria draba*	White-top				X		
CIRFLO	*Cirsium flodmanii*	Flodman thistle					X	X
CIRSPP	*Cirsium species*	Thistle	X			X	X	
CIRUND	*Cirsium undulatum*	Wavyleaf Thistle			X			
CONARV	*Convolvulus arvensis*	Field bindweed						X
CRERUN	*Crepis runcinata*	Fiddleaf hawksbeard				X		
CRYCEL	*Crypantha celosioides*	Buttecandle				X	X	
CRYCIN	*Cryptantha cinerea*	Minerscandle					X	
DELBIC	*Delphinium bicolor*	Little larkspur	X				X	
DELSPP	*Delphinium species*	Larkspur		X	X			
EQULAE	*Equisetum laevigatum*	Smooth horsetail				X	X	
EREHOO	*Eremogone hookeri*	Hooker sandwort				X	X	X
ERICAE	*Eriogonum caespitosum*	Matted buckwheat	X	X		X		
	Species obseved but not sampled							

Acronym	Current Nomenclature	Common Name	Upland Grassland	Big Sagebrush Shrubland	Upland Grassland/ Rough Breaks Complex	Lowland Grassland	Silver Sagebrush Shrubland	Crested Wheatgrass
Perennial Forbs (Continued)								
ERISPP	*Eriogonum species*	Wild buckwheat		X		X		X
GAUCOC	*Gaura coccinea*	Scarlet gaura	X	X	X	X	X	X
GLYLEP	*Glycyrrhiza lepidota*	American licorice				X		
GRISQU	*Grindelia squarrosa*	Curlycup gumweed						X
HAPMUL	*Haplopappus mulitcaulis*	Stemmy goldenweed			X			
HAPSPP	*Haplopappus species*	Goldenweed		X	X			
HETVIL	*Heterotheca villosa*	Golden aster			X			
LESLUD	*Lesquerella ludoviciana*	Foothill bladderpod					X	
LIAPUN	*Liatris punctata*	Dotted blazing star				X		
LOMFOE	*Lomatium foeniculaceum*	Biscuitroot	X	X	X	X		X
LUPARG	*Lupinus argenteus*	Silvery lupine			X			
LYGJUN	*Lygodesmia juncea*	Skeletonweed					X	X
MACGRI	*Machaeranthera grindeliodes*	Nuttall goldenweed	X			X		
MACTAN	*Machaeranthera tanacetifolia*	Tansy aster				X	X	
MAIDIL	*Maianthemum dilatatum*	False lily of the valley						X
MEDSAT	*Medicago sativa*	Alfafa medic						X
MUSDIV	*Musineon divaricatum*	Biscuitroot		X	X			
MUSSPP	*Musineon species*	Wildparsley				X		
OENCOR	*Oenothera coronopifolia*	Evening primrose				X		X
OENSPP	*Oenothera species*	Evening primrose		X	X			
OONMUL	*Oonopsis multicaulis*	Branched False Goldenweed						
OXYLAM	*Oxytropis lambertii*	Lambert locoweed (Crazyweed)						X
PLAERI	*Plantago eriopoda*	Redwoll plantain				X		
	Species obseved but not sampled							

Acronym	Current Nomenclature	Common Name	Upland Grassland	Big Sagebrush Shrubland	Upland Grassland/ Rough Breaks Complex	Lowland Grassland	Silver Sagebrush Shrubland	Crested Wheatgrass
Perennial Forbs (Continued)								
PEDESC	*Pediomelum esculentum*	Breadroot scurfpea					X	X
PEDSPP	*Pediomelum species*	Scurfpea				X		
PENALB	*Penstemon albidus*	White beardtongue		X	X		X	
PENPRO	*Penstemon procerus*	Littleflower penstemon	X					
PENSPP	*Penstemon species*	Penstemon					X	X
PHLHOO	*Phlox hoodii*	Hoods phlox	X	X	X	X		X
PHLLON	*Phlox longifolia*	Longleaf phlox		X	X		X	
PSOESC	*Psoralea esculenta*	Breadroot scurfpea		X	X			
PSOSPP	*Psoralea species*	Scurfpea			X			
PSOTEN	*Psoralea tenuiflora*	Slimflower scurfpea		X		X		X
RANCYM	*Ranunculus cymbalaria*	Shore buttercup				X		
SPHCOC	*Sphaeralcea coccinea*	Scarlet globemallow	X	X	X	X	X	X
TAROFF	*Taraxacum officinale*	Common dandelion			X	X	X	X
THERHO	*Thermopsis rhombifolia*	Golden banner			X			X
TRAOCC	*Tradescantia occidentalis*	Spiderwort					X	
VICAME	*Vicia americana*	American vetch	X	X	X	X	X	X
ZYGVEN	*Zygadenus venenosus*	Death camas			X		X	X
Perennial Shrubs								
ARTCAN	*Artemisia cana*	Silver sagebrush		X	X	X	X	
ARTTRI	*Artemisia tridentata*	Big sagebrush	X	X	X	X	X	X
ATRCAN	*Atriplex canescens*	Fourwing saltbrush			X			
CHRSPP	*Chrysothamnus species*	Rabbitbrush			X			
	Species obseved but not sampled							

Acronym	Current Nomenclature	Common Name	Upland Grassland	Big Sagebrush Shrubland	Upland Grassland/ Rough Breaks Complex	Lowland Grassland	Silver Sagebrush Shrubland	Crested Wheatgrass
Perennial Shrubs (Continued)								
CHRVIS	*Chrysothamnus viscidflorus*	Sticky-leaved Rabbitbrush					X	X
ERINAU	*Ericameria nauseosa*	Rubber rabbitbrush						X
ROSWOO	*Rosa woodsii*	Wood's rose			X	X		
SYMOCC	*Symphoricarpos occidentalis*	Western snowberry				X		
Perennial Half & Sub-Shrubs								
ARTFRI	*Artemisia frigida*	Fringed sagewort	X	X	X	X	X	X
ARTLUD	*Artemisia ludoviciana*	Louisiana sagewort	X		X	X		
ARTPED	*Artemisia pedatifida*	Birdsfoot sagewort		X	X			X
ATRGAR	*Atriplex gardneri*	Gardner saltbrush		X	X		X	X
GUTSAR	*Gutierrezia sarothrae*	Broom snakeweed	X			X		
KRALAN	*Krascheninnikovia lanata*	Winterfat		X	X	X	X	X
LINPUN	*Linanthus pungens*	Granite prickly gilia					X	X
LUPSER	*Lupinus sericeus*	Silky lupine	X					
YUCGLA	*Yucca glauca*	Small soapweed			X	X		X
Succulents								
CORVIV	*Coryphantha vivipara*	Pincushion cactus	X					X
OPUPOL	*Opuntia polyacantha*	Plains prickly pear	X	X	X	X	X	X
Lichen								
LICHEN	*Lichen*	Lichen	X	X	X	X	X	X
	Species obseved but not sampled							

ADDENDUM 3.5-B

VEGETATION COVER SUMMARIES

Ludeman
Report: Cover Summary

Site Id: Upland Grassland
Name:
Comm. Type/Form:
Sample Date: 7/1/2008

*() Represents Second Hit Data

Sample Method: Point Intercept
Sample Size: 50 Meter Transect
Number of Samples: 25
Report Date: 11/6/2008

Species	Cover (%) Mean Absolute *	Relative	Std. Dev. n - 1	Frequency (%) Absolute	Relative	I.V.	Rank
Annual Forbs							
Alyssum desertorum	10.48(0.96)	15.45	11.77	84.00	8.97	24.42	2
Collomia linearis	0.08	0.12	0.40	4.00	0.43	0.55	23
Descurainia sophia	0.08(0.08)	0.12	0.40	4.00	0.43	0.55	25
Lappula redowskii	0.08	0.12	0.40	4.00	0.43	0.55	26
Plantago patagonica	3.92(0.08)	5.78	5.28	68.00	7.26	13.04	6
Sub-Total	14.64	21.59					
Annual Grasses							
Bromus japonicus	0.32	0.47	1.25	8.00	0.85	1.32	19
Bromus tectorum	3.28(0.40)	4.83	7.91	24.00	2.56	7.39	11
Vulpia octoflora	1.60(0.16)	2.36	2.58	44.00	4.70	7.06	12
Sub-Total	5.20	7.66					
Cacti & Succulents							
Opuntia polyacantha	2.16(0.08)	3.18	1.99	64.00	6.84	10.02	9
Sub-Total	2.16	3.18					
Cool Season Perennial Grasses							
Carex filifolia	6.08(0.08)	8.96	7.67	68.00	7.26	16.22	5
Elymus smithii	12.56(0.16)	18.51	8.18	92.00	9.83	28.34	1
Hesperostipa comata	7.52(0.16)	11.08	9.12	68.00	7.26	18.34	3
Koeleria macrantha	0.48	0.71	1.33	16.00	1.71	2.42	16
Nassella viridula	0.16(0.08)	0.24	0.55	8.00	0.85	1.09	21
Poa secunda	2.16(0.48)	3.18	2.37	72.00	7.69	10.87	7
Sub-Total	28.96	42.68					
Full Shrubs							
Artemisia tridentata	0.56	0.83	1.78	12.00	1.28	2.11	17
Sub-Total	0.56	0.83					
Introduced Perennial Grasses							
Agropyron cristatum	0.48	0.71	2.40	4.00	0.43	1.14	20
Sub-Total	0.48	0.71					
Lower Plants							
Lichens	3.68(0.08)	5.42	5.79	40.00	4.27	9.69	10
Sub-Total	3.68	5.42					
Perennial Forbs							
Allium textile	0.08	0.12	0.40	4.00	0.43	0.55	22
Delphinium bicolor	0.08	0.12	0.40	4.00	0.43	0.55	24
Lomatium foeniculaceum	0.08	0.12	0.40	4.00	0.43	0.55	27
Machaeranthera grindelioides	0.08	0.12	0.40	4.00	0.43	0.55	29
Phlox hoodii	1.76	2.59	3.89	36.00	3.85	6.44	13
Sphaeralcea coccinea	2.56	3.77	2.55	60.00	6.41	10.18	8
Taraxacum officinale	0.00(0.08)	0.00	0.00	4.00	0.43	0.43	31
Vicia americana	0.72	1.06	1.62	20.00	2.14	3.20	14
Sub-Total	5.36	7.90					
Sub-Shrubs & Half-Shrubs							
Artemisia frigida	0.24	0.35	0.66	12.00	1.28	1.63	18
Lupinus sericeus	0.08	0.12	0.40	4.00	0.43	0.55	28
Sub-Total	0.32	0.47					
Warm Season Perennial Grasses							

Ludeman
Report: Cover Summary

Site Id: Upland Grassland
Name:
Comm. Type/Form:
Sample Date: 7/1/2008

*() Represents Second Hit Data

Sample Method: Point Intercept
Sample Size: 50 Meter Transect
Number of Samples: 25
Report Date: 11/6/2008

Species	Cover (%) Mean Absolute *	Relative	Std. Dev. n - 1	Frequency (%) Absolute	Relative	I.V.	Rank
Bouteloua gracilis	5.68(0.08)	8.37	4.27	80.00	8.55	16.92	4
Calamovilfa longifolia	0.72	1.06	1.81	16.00	1.71	2.77	15
Sporobolus cryptandrus	0.08	0.12	0.40	4.00	0.43	0.55	30
Sub-Total	6.48	9.55					
Total Stratified Vegetation Cover	67.04	0.64	11.03				
Total Non-Stratified Vegetation Cover	64.16	0.64	11.09				
LITTER/ROCK	14.40		7.59				
Total Ground Cover	82.24		6.67				
BARE SOIL	18.08		6.67				
Total Cover	97.00		0.00				
Species Abundance (No. of Species/Sample)	31.00						

Ludeman
Report: Cover Summary

Site Id: Big Sage Shrubland
Name:
Comm. Type/Form:
Sample Date: 6/30/2008

*() Represents Second Hit Data

Sample Method: Point Intercept
Sample Size: 50 Meter Transect
Number of Samples: 26
Report Date: 11/6/2008

Species	Cover (%) Mean Absolute *	Relative	Std. Dev. n - 1	Frequency (%) Absolute	Relative	I.V.	Rank
Annual Forbs							
Alyssum desertorum	3.92	6.43	5.50	57.69	6.79	13.22	8
Lappula redowskii	0.08	0.13	0.39	3.85	0.45	0.58	24
Plantago patagonica	0.23	0.38	0.65	11.54	1.36	1.74	19
Sub-Total	4.23	6.94					
Annual Grasses							
Bromus japonicus	0.23	0.38	1.18	3.85	0.45	0.83	20
Bromus tectorum	8.54	14.00	14.67	73.08	8.60	22.60	2
Vulpia octoflora	1.69	2.77	3.33	30.77	3.62	6.39	12
Sub-Total	10.46	17.15					
Cacti & Succulents							
Opuntia polyacantha	4.15(0.08)	6.81	4.00	73.08	8.60	15.41	6
Sub-Total	4.15	6.81					
Cool Season Perennial Grasses							
Carex filifolia	7.00	11.48	8.36	65.38	7.69	19.17	4
Elymus lanceolatus	0.08	0.13	0.39	3.85	0.45	0.58	23
Elymus smithii	4.46(0.08)	7.31	5.69	73.08	8.60	15.91	5
Hesperostipa comata	4.00	6.56	4.27	69.23	8.14	14.70	7
Hordeum jubatum	0.15	0.25	0.78	3.85	0.45	0.70	21
Koeleria macrantha	0.23	0.38	0.65	11.54	1.36	1.74	18
Nassella viridula	0.54	0.88	1.65	15.38	1.81	2.69	14
Poa secunda	2.46	4.04	5.19	23.08	2.71	6.75	10
Sub-Total	18.92	31.03					
Full Shrubs							
Artemisia tridentata	9.54	15.64	6.75	88.46	10.41	26.05	1
Sub-Total	9.54	15.64					
Introduced Perennial Grasses							
Agropyron cristatum	1.00	1.64	5.10	3.85	0.45	2.09	15
Poa pratensis	2.92	4.79	3.63	50.00	5.88	10.67	9
Sub-Total	3.92	6.43					
Lower Plants							
Lichens	1.31(0.08)	2.14	1.95	38.46	4.52	6.66	11
Sub-Total	1.31	2.14					
Perennial Forbs							
Allium textile	0.23	0.38	0.65	11.54	1.36	1.74	17
Musineon divaricatum	0.08	0.13	0.39	3.85	0.45	0.58	25
Phlox longifolia	0.08	0.13	0.39	3.85	0.45	0.58	26
Psoralea tenuiflora	0.08	0.13	0.39	3.85	0.45	0.58	27
Sphaeralcea coccinea	0.54	0.88	0.90	26.92	3.17	4.05	13
Vicia americana	0.31	0.50	0.93	11.54	1.36	1.86	16
Sub-Total	1.32	2.15					
Sub-Shrubs & Half-Shrubs							
Artemisia pedatifida	0.08	0.13	0.39	3.85	0.45	0.58	22
Sub-Total	0.08	0.13					
Warm Season Perennial Grasses							
Bouteloua gracilis	7.08	11.60	6.31	84.62	9.95	21.55	3

Ludeman
Report: Cover Summary

Site Id: Big Sage Shrubland
Name:
Comm. Type/Form:
Sample Date: 6/30/2008

*() Represents Second Hit Data

Sample Method: Point Intercept
Sample Size: 50 Meter Transect
Number of Samples: 26
Report Date: 11/6/2008

Species	Cover (%) Mean Absolute *	Relative	Std. Dev. n - 1	Frequency (%) Absolute	Relative	I.V.	Rank
Sub-Total	7.08	11.60					
Total Stratified Vegetation Cover	59.86	4.77	13.82				
Total Non-Stratified Vegetation Cover	59.70	4.77	13.90				
LITTER/ROCK	15.62		7.69				
Total Ground Cover	76.63		10.13				
BARE SOIL	23.38		10.13				
Total Cover	99.00		0.00				
Species Abundance (No. of Species/Sample)	27.00						

Ludeman
Report: Cover Summary

Site Id: UG/RB
Name:
Comm. Type/Form:
Sample Date: 7/3/2008

*() Represents Second Hit Data

Sample Method: Point Intercept
Sample Size: 50 Meter Transect
Number of Samples: 25
Report Date: 11/6/2008

Species	Cover (%) Mean Absolute *	Relative	Std. Dev. n - 1	Frequency (%) Absolute	Relative	I.V.	Rank
Annual Forbs							
Alyssum desertorum	2.80	6.16	5.03	44.00	4.85	11.01	7
Descurainia pinnata	0.08	0.18	0.40	4.00	0.44	0.62	41
Lappula redowskii	0.56	1.23	1.58	12.00	1.32	2.55	20
Monolepis nuttalliana	0.40	0.88	1.29	12.00	1.32	2.20	22
Plantago patagonica	0.56	1.23	1.08	24.00	2.64	3.87	14
Polygonum aviculare	0.08	0.18	0.40	4.00	0.44	0.62	43
Salsola tragus	0.16	0.35	0.80	4.00	0.44	0.79	33
Sub-Total	4.64	10.21					
Annual Grasses							
Bromus japonicus	0.64	1.41	1.38	20.00	2.20	3.61	15
Bromus tectorum	5.76(0.08)	12.68	7.51	60.00	6.61	19.29	3
Vulpia octoflora	0.48	1.06	1.33	16.00	1.76	2.82	18
Sub-Total	6.88	15.15					
Cacti & Succulents							
Opuntia polyacantha	1.60	3.52	2.38	44.00	4.85	8.37	8
Sub-Total	1.60	3.52					
Cool Season Perennial Grasses							
Achnatherum hymenoides	0.08	0.18	0.40	4.00	0.44	0.62	35
Carex filifolia	4.40	9.68	5.89	60.00	6.61	16.29	4
Elymus lanceolatus	0.64	1.41	1.50	20.00	2.20	3.61	16
Elymus smithii	5.04	11.09	4.66	80.00	8.81	19.90	2
Elymus spicatus	0.08	0.18	0.40	4.00	0.44	0.62	42
Hesperostipa comata	3.92	8.63	4.67	60.00	6.61	15.24	5
Koeleria macrantha	0.88	1.94	1.83	24.00	2.64	4.58	13
Nassella viridula	0.56	1.23	1.47	16.00	1.76	2.99	17
Poa secunda	0.96	2.11	2.24	24.00	2.64	4.75	12
Sub-Total	16.56	36.45					
Full Shrubs							
Artemisia tridentata	2.48	5.46	3.23	56.00	6.17	11.63	6
Rosa woodsii	0.16	0.35	0.80	4.00	0.44	0.79	32
Sub-Total	2.64	5.81					
Introduced Perennial Grasses							
Agropyron cristatum	0.32	0.70	1.11	8.00	0.88	1.58	25
Poa pratensis	0.24	0.53	0.88	8.00	0.88	1.41	26
Sub-Total	0.56	1.23					
Lower Plants							
Lichens	0.48	1.06	1.33	12.00	1.32	2.38	21
Sub-Total	0.48	1.06					
Perennial Forbs							
Achillea millefolium	0.08	0.18	0.40	4.00	0.44	0.62	34
Allium textile	0.08	0.18	0.40	4.00	0.44	0.62	36
Astragalus bisulcatus	0.08	0.18	0.40	4.00	0.44	0.62	38
Astragalus pectinatus	0.24	0.53	0.66	12.00	1.32	1.85	23
Astragalus spatulatus	0.08	0.18	0.40	4.00	0.44	0.62	39
Heterotheca villosa	0.16	0.35	0.80	4.00	0.44	0.79	30
Oonopsis multicaulis	0.16	0.35	0.80	4.00	0.44	0.79	31

Ludeman
Report: Cover Summary

Site Id: UG/RB
Name:
Comm. Type/Form:
Sample Date: 7/3/2008

*() Represents Second Hit Data

Sample Method: Point Intercept
Sample Size: 50 Meter Transect
Number of Samples: 25
Report Date: 11/6/2008

Species	Cover (%) Mean Absolute *	Relative	Std. Dev. n - 1	Frequency (%) Absolute	Relative	I.V.	Rank
Phlox hoodii	1.04	2.29	2.39	24.00	2.64	4.93	10
Phlox longifolia	0.24(0.08)	0.53	0.66	12.00	1.32	1.85	24
Psoralea esculenta	0.16	0.35	0.55	8.00	0.88	1.23	28
Sphaeralcea coccinea	1.20	2.64	1.41	48.00	5.29	7.93	9
Taraxacum officinale	0.08	0.18	0.40	4.00	0.44	0.62	44
Thermopsis rhombifolia	1.04	2.29	2.89	24.00	2.64	4.93	11
Vicia americana	0.40	0.88	1.00	16.00	1.76	2.64	19
Sub-Total	5.04	11.11					
Sub-Shrubs & Half-Shrubs							
Artemisia frigida	0.16	0.35	0.55	8.00	0.88	1.23	27
Artemisia ludoviciana	0.08	0.18	0.40	4.00	0.44	0.62	37
Atriplex gardneri	0.08	0.18	0.40	4.00	0.44	0.62	40
Yucca glauca	0.16	0.35	0.55	8.00	0.88	1.23	29
Sub-Total	0.48	1.06					
Warm Season Perennial Grasses							
Bouteloua gracilis	6.56	14.44	6.57	88.00	9.69	24.13	1
Sub-Total	6.56	14.44					
Total Stratified Vegetation Cover	45.12	0.49	10.33				
Total Non-Stratified Vegetation Cover	44.96	0.49	10.17				
LITTER/ROCK	17.92		10.90				
Total Ground Cover	63.36		14.09				
BARE SOIL	36.64		14.09				
Total Cover	100.00		0.00				
Species Abundance (No. of Species/Sample)	44.00						

Ludeman
Report: Cover Summary

Site Id: Lowland Grassland
Name:
Comm. Type/Form:
Sample Date: 7/1/2008

*() Represents Second Hit Data

Sample Method: Point Intercept
Sample Size: 50 Meter Transect
Number of Samples: 25
Report Date: 11/6/2008

Species	Cover (%) Mean Absolute *	Relative	Std. Dev. n - 1	Frequency (%) Absolute	Relative	I.V.	Rank
Annual Forbs							
Alyssum desertorum	3.92(0.16)	5.58	6.15	48.00	4.98	10.56	5
Collomia linearis	0.16	0.23	0.55	8.00	0.83	1.06	37
Cryptantha minima	0.08	0.11	0.40	4.00	0.41	0.52	47
Descurainia pinnata	0.16	0.23	0.80	4.00	0.41	0.64	40
Lappula redowskii	0.32	0.46	1.25	8.00	0.83	1.29	32
Melilotus officinalis	0.16	0.23	0.80	4.00	0.41	0.64	41
Monolepis nuttalliana	0.16	0.23	0.80	4.00	0.41	0.64	42
Plantago patagonica	1.36	1.94	2.43	32.00	3.32	5.26	11
Sub-Total	6.32	9.01					
Annual Grasses							
Bromus japonicus	4.88(0.08)	6.95	5.75	48.00	4.98	11.93	3
Bromus tectorum	7.12(0.08)	10.14	13.10	64.00	6.64	16.78	2
Vulpia octoflora	0.64	0.91	1.98	12.00	1.24	2.15	25
Sub-Total	12.64	18.00					
Cacti & Succulents							
Opuntia polyacantha	0.24	0.34	1.20	4.00	0.41	0.75	39
Sub-Total	0.24	0.34					
Cool Season Perennial Grasses							
Carex douglasii	0.24	0.34	0.88	8.00	0.83	1.17	34
Carex filifolia	2.08	2.96	3.63	36.00	3.73	6.69	8
Carex nebrascensis	0.32	0.46	1.60	4.00	0.41	0.87	38
Carex praegracilis	0.32	0.46	1.25	8.00	0.83	1.29	31
Carex stenophylla	0.08	0.11	0.40	4.00	0.41	0.52	45
Elymus lanceolatus	0.08	0.11	0.40	4.00	0.41	0.52	48
Elymus smithii	17.12(0.48)	24.37	15.58	84.00	8.71	33.08	1
Elymus spicatus	0.80	1.14	3.00	8.00	0.83	1.97	27
Elymus trachycaulus	0.24	0.34	0.88	8.00	0.83	1.17	35
Hesperostipa comata	1.36	1.94	1.89	40.00	4.15	6.09	9
Hordeum jubatum	0.64(0.08)	0.91	1.38	20.00	2.07	2.98	20
Juncus balticus	2.24	3.19	7.06	16.00	1.66	4.85	13
Koeleria macrantha	0.64	0.91	1.25	24.00	2.49	3.40	18
Nassella viridula	2.16	3.08	5.62	20.00	2.07	5.15	12
Poa cusickii	0.96	1.37	3.52	8.00	0.83	2.20	24
Poa secunda	3.20(0.16)	4.56	3.61	60.00	6.22	10.78	4
Scirpus acutus	0.16(0.08)	0.23	0.80	4.00	0.41	0.64	43
Sub-Total	32.64	46.48					
Full Shrubs							
Artemisia tridentata	1.20	1.71	2.38	28.00	2.90	4.61	14
Rosa woodsii	0.40	0.57	1.63	8.00	0.83	1.40	29
Symphoricarpos occidentalis	2.64	3.76	6.60	20.00	2.07	5.83	10
Sub-Total	4.24	6.04					
Introduced Perennial Grasses							
Agropyron cristatum	1.44	2.05	4.45	12.00	1.24	3.29	19
Phleum pratense	0.96(0.16)	1.37	4.80	4.00	0.41	1.78	28
Poa pratensis	0.64	0.91	2.06	16.00	1.66	2.57	22
Sub-Total	3.04	4.33					
Lower Plants							

Ludeman
Report: Cover Summary

Site Id: Lowland Grassland
Name:
Comm. Type/Form:
Sample Date: 7/1/2008

*() Represents Second Hit Data

Sample Method: Point Intercept
Sample Size: 50 Meter Transect
Number of Samples: 25
Report Date: 11/6/2008

Species	Cover (%) Mean Absolute *	Relative	Std. Dev. n - 1	Frequency (%) Absolute	Relative	I.V.	Rank
Lichens	0.08	0.11	0.40	4.00	0.41	0.52	51
Sub-Total	0.08	0.11					
Perennial Forbs							
Achillea millefolium	0.64(0.08)	0.91	1.38	28.00	2.90	3.81	16
Antennaria microphylla	0.16	0.23	0.55	8.00	0.83	1.06	36
Crepis runcinata	0.08	0.11	0.40	4.00	0.41	0.52	46
Echinacea angustifolia	0.00(0.08)	0.00	0.00	4.00	0.41	0.41	57
Equisetum laevigatum	0.32(0.24)	0.46	0.95	16.00	1.66	2.12	26
Gaura coccinea	0.08	0.11	0.40	4.00	0.41	0.52	49
Liatris punctata	0.08	0.11	0.40	4.00	0.41	0.52	50
Phlox hoodii	0.08	0.11	0.40	4.00	0.41	0.52	53
Plantago eriopoda	0.32	0.46	1.25	8.00	0.83	1.29	33
Psoralea tenuiflora	0.08	0.11	0.40	4.00	0.41	0.52	54
Ranunculus cymbalaria	0.08	0.11	0.40	4.00	0.41	0.52	55
Sphaeralcea coccinea	0.64	0.91	1.70	20.00	2.07	2.98	21
Taraxacum officinale	0.56(0.16)	0.80	1.08	28.00	2.90	3.70	17
Vicia americana	1.76(0.16)	2.51	2.03	52.00	5.39	7.90	7
Sub-Total	4.88	6.94					
Sub-Shrubs & Half-Shrubs							
Artemisia frigida	0.32	0.46	1.25	8.00	0.83	1.29	30
Artemisia ludoviciana	0.48(0.08)	0.68	1.33	16.00	1.66	2.34	23
Sub-Total	0.80	1.14					
Warm Season Perennial Grasses							
Bouteloua gracilis	2.88	4.10	5.60	40.00	4.15	8.25	6
Calamovilfa longifolia	0.08	0.11	0.40	4.00	0.41	0.52	44
Panicum virgatum	0.08	0.11	0.40	4.00	0.41	0.52	52
Sporobolus airoides	2.24	3.19	6.72	12.00	1.24	4.43	15
Sporobolus cryptandrus	0.08	0.11	0.40	4.00	0.41	0.52	56
Sub-Total	5.36	7.62					
Total Stratified Vegetation Cover	72.24	1.23	17.34				
Total Non-Stratified Vegetation Cover	70.16	1.23	14.59				
LITTER/ROCK	13.04		8.51				
Total Ground Cover	83.28		8.75				
BARE SOIL	16.72		8.75				
Total Cover	100.00		0.00				
Species Abundance (No. of Species/Sample)	57.00						

Ludeman
Report: Cover Summary

Site Id: Silver Sage
Name:
Comm. Type/Form:
Sample Date: 7/1/2008

*() Represents Second Hit Data

Sample Method: Point Intercept
Sample Size: 50 Meter Transect
Number of Samples: 25
Report Date: 11/6/2008

Species	Cover (%) Mean Absolute *	Relative	Std. Dev. n - 1	Frequency (%) Absolute	Relative	I.V.	Rank
Annual Forbs							
Alyssum alyssoides	0.24	0.36	1.20	4.00	0.51	0.87	25
Alyssum desertorum	1.44	2.19	2.68	32.00	4.10	6.29	8
Camelina microcarpa	0.16	0.24	0.55	8.00	1.03	1.27	23
Cryptantha minima	0.32	0.49	0.95	12.00	1.54	2.03	17
Descurainia pinnata	0.32	0.49	0.95	12.00	1.54	2.03	18
Descurainia sophia	1.68	2.55	4.61	24.00	3.08	5.63	10
Lappula redowskii	0.24	0.36	0.66	12.00	1.54	1.90	20
Monolepis nuttalliana	0.08	0.12	0.40	4.00	0.51	0.63	32
Plantago patagonica	0.08	0.12	0.40	4.00	0.51	0.63	33
Polygonum aviculare	0.32	0.49	0.95	12.00	1.54	2.03	19
Sisymbrium altissimum	0.64	0.97	1.11	28.00	3.59	4.56	13
Tragopogon dubius	0.08	0.12	0.40	4.00	0.51	0.63	35
Sub-Total	5.60	8.50					
Annual Grasses							
Bromus tectorum	18.96	28.83	14.26	88.00	11.28	40.11	1
Hordeum vulgare	0.56	0.85	2.42	8.00	1.03	1.88	22
Vulpia octoflora	4.80	7.30	6.76	48.00	6.15	13.45	5
Sub-Total	24.32	36.98					
Cacti & Succulents							
Opuntia polyacantha	5.20	7.91	5.83	56.00	7.18	15.09	4
Sub-Total	5.20	7.91					
Cool Season Perennial Grasses							
Elymus lanceolatus	0.32	0.49	0.75	16.00	2.05	2.54	16
Elymus smithii	3.68	5.60	5.68	40.00	5.13	10.73	6
Elymus spicatus	0.08	0.12	0.40	4.00	0.51	0.63	29
Hesperostipa comata	4.96	7.54	6.25	60.00	7.69	15.23	3
Poa secunda	0.56	0.85	0.92	28.00	3.59	4.44	14
Sub-Total	9.60	14.60					
Full Shrubs							
Artemisia cana	12.72	19.34	7.79	96.00	12.31	31.65	2
Chrysothamnus viscidflorus	2.00	3.04	5.07	16.00	2.05	5.09	11
Sub-Total	14.72	22.38					
Introduced Perennial Grasses							
Agropyron cristatum	0.08	0.12	0.40	4.00	0.51	0.63	27
Bromus inermis	1.68	2.55	3.64	24.00	3.08	5.63	9
Sub-Total	1.76	2.67					
Lower Plants							
Lichens	0.96	1.46	1.74	28.00	3.59	5.05	12
Sub-Total	0.96	1.46					
Perennial Forbs							
Allium textile	0.08	0.12	0.40	4.00	0.51	0.63	28
Eremogone hookeri	0.08	0.12	0.40	4.00	0.51	0.63	30
Sphaeralcea coccinea	0.16	0.24	0.55	8.00	1.03	1.27	24
Taraxacum officinale	0.08	0.12	0.40	4.00	0.51	0.63	34
Vicia americana	0.16	0.24	0.80	4.00	0.51	0.75	26
Zygadenus venenosus	0.08	0.12	0.40	4.00	0.51	0.63	36

Ludeman
Report: Cover Summary

Site Id: Silver Sage
Name:
Comm. Type/Form:
Sample Date: 7/1/2008

*() Represents Second Hit Data

Sample Method: Point Intercept
Sample Size: 50 Meter Transect
Number of Samples: 25
Report Date: 11/6/2008

Species	Cover (%) Mean Absolute *	Relative	Std. Dev. n - 1	Frequency (%) Absolute	Relative	I.V.	Rank
Sub-Total	0.64	0.96					
Sub-Shrubs & Half-Shrubs							
Krascheninnikovia lanata	0.08	0.12	0.40	4.00	0.51	0.63	31
Sub-Total	0.08	0.12					
Warm Season Perennial Grasses							
Bouteloua gracilis	2.08	3.16	2.91	48.00	6.15	9.31	7
Sporobolus airoides	0.56	0.85	1.47	16.00	2.05	2.90	15
Sporobolus cryptandrus	0.24	0.36	0.66	12.00	1.54	1.90	21
Sub-Total	2.88	4.37					
Total Stratified Vegetation Cover	64.80	0.93	6.83				
Total Non-Stratified Vegetation Cover	64.80	0.93	6.83				
LITTER/ROCK	20.88		4.44				
Total Ground Cover	86.64		5.65				
BARE SOIL	13.36		5.65				
Total Cover	99.00		0.00				
Species Abundance (No. of Species/Sample)	36.00						

Ludeman
Report: Cover Summary

Site Id: Crested Wheatgrass
Name:
Comm. Type/Form:
Sample Date: 7/1/2008

*() Represents Second Hit Data

Sample Method: Point Intercept
Sample Size: 50 Meter Transect
Number of Samples: 25
Report Date: 11/6/2008

Species	Cover (%) Mean Absolute *	Relative	Std. Dev. n - 1	Frequency (%) Absolute	Relative	I.V.	Rank
Annual Forbs							
Alyssum desertorum	4.88	9.31	4.44	88.00	16.06	25.37	2
Lappula redowskii	0.16(0.08)	0.31	0.55	8.00	1.46	1.77	21
Melilotus officinalis	0.32	0.61	0.95	12.00	2.19	2.80	14
Monolepis nuttalliana	0.08	0.15	0.40	4.00	0.73	0.88	29
Plantago patagonica	0.64	1.22	1.11	28.00	5.11	6.33	6
Sub-Total	6.08	11.60					
Annual Grasses							
Bromus tectorum	1.68	3.21	4.15	24.00	4.38	7.59	4
Vulpia octoflora	0.80	1.53	1.29	32.00	5.84	7.37	5
Sub-Total	2.48	4.74					
Cacti & Succulents							
Opuntia polyacantha	0.24	0.46	0.88	8.00	1.46	1.92	19
Sub-Total	0.24	0.46					
Cool Season Perennial Grasses							
Elymus smithii	0.16	0.31	0.80	4.00	0.73	1.04	24
Elymus spicatus	0.56	1.07	2.42	8.00	1.46	2.53	16
Hesperostipa comata	0.80	1.53	1.73	20.00	3.65	5.18	11
Koeleria macrantha	0.24	0.46	0.88	8.00	1.46	1.92	18
Poa secunda	0.40	0.76	2.00	4.00	0.73	1.49	23
Sub-Total	2.16	4.13					
Full Shrubs							
Artemisia tridentata	0.80(0.08)	1.53	2.16	24.00	4.38	5.91	8
Sub-Total	0.80	1.53					
Introduced Perennial Grasses							
Agropyron cristatum	33.60	64.12	8.21	100.00	18.25	82.37	1
Sub-Total	33.60	64.12					
Lower Plants							
Lichens	0.56	1.07	1.08	24.00	4.38	5.45	9
Sub-Total	0.56	1.07					
Perennial Forbs							
Astragalus spatulatus	0.16	0.31	0.55	8.00	1.46	1.77	20
Calochortus nuttallii	0.08	0.15	0.40	4.00	0.73	0.88	26
Convolvulus arvensis	0.08	0.15	0.40	4.00	0.73	0.88	27
Gaura coccinea	0.24	0.46	0.66	12.00	2.19	2.65	15
Lomatium foeniculaceum	0.08	0.15	0.40	4.00	0.73	0.88	28
Lygodesmia juncea	0.56	1.07	1.36	16.00	2.92	3.99	12
Medicago sativa	1.12	2.14	4.25	8.00	1.46	3.60	13
Psoralea tenuiflora	1.28	2.44	3.26	20.00	3.65	6.09	7
Sphaeralcea coccinea	0.48	0.92	0.87	24.00	4.38	5.30	10
Vicia americana	0.16	0.31	0.55	8.00	1.46	1.77	22
Sub-Total	4.24	8.10					
Sub-Shrubs & Half-Shrubs							
Artemisia frigida	0.08	0.15	0.40	4.00	0.73	0.88	25
Sub-Total	0.08	0.15					
Warm Season Perennial Grasses							
Aristida purpurea	1.68	3.21	3.30	32.00	5.84	9.05	3

Ludeman
Report: Cover Summary

Site Id: Crested Wheatgrass
Name:
Comm. Type/Form:
Sample Date: 7/1/2008

*() Represents Second Hit Data

Sample Method: Point Intercept
Sample Size: 50 Meter Transect
Number of Samples: 25
Report Date: 11/6/2008

Species	Cover (%) Mean Absolute *	Relative	Std. Dev. n - 1	Frequency (%) Absolute	Relative	I.V.	Rank
Bouteloua gracilis	0.48	0.92	2.02	8.00	1.46	2.38	17
Sub-Total	2.16	4.13					
Total Stratified Vegetation Cover	52.00	1.83	7.35				
Total Non-Stratified Vegetation Cover	51.84	1.83	7.14				
LITTER/ROCK	23.68		5.91				
Total Ground Cover	76.08		5.87				
BARE SOIL	23.92		5.87				
Total Cover	99.00		0.00				
Species Abundance (No. of Species/Sample)	29.00						

ADDENDUM 3.5-C

VEGETATION DENSITY SUMMARIES

Ludeman
Report: Density Summary

Site Id: Upland Grassland
Name:
Comm. Type/Form:
Sample Date: 6/30/2008

Sample Method: Transect
Sample Size: 50 sq. m.
Number of Samples: 25
Report Date: 8/26/2008

	Mean (Number/Plot)	Relative Density	Std. Dev. n - 1 (Number/Plot)	Mean (Number/sq.m.)	Mean (Number/Acre)
Full Shrubs					
Artemisia tridentata	2.32	13.98	6.13	0.05	187.85
Sub-Total	2.32	13.98	6.13	0.05	187.85
Sub-Shrubs & Half-Shrubs					
Artemisia frigida	13.68	82.41	21.65	0.27	1,107.69
Artemisia ludoviciana	0.12	0.72	0.60	0.00	9.72
Gutierrezia sarothrae	0.48	2.89	1.58	0.01	38.87
Sub-Total	14.28	86.02	23.83	0.29	1,156.28
Total	16.60	100.00	22.19	0.33	1,344.13

Ludeman
Report: Density Summary

Site Id: Big Sage Shrubland
Name:
Comm. Type/Form:
Sample Date: 6/23/2008

Sample Method: Transect
Sample Size: 50 sq. m.
Number of Samples: 26
Report Date: 8/27/2008

	Mean (Number/Plot)	Relative Density	Std. Dev. n - 1 (Number/Plot)	Mean (Number/sq.m.)	Mean (Number/Acre)
Full Shrubs					
Artemisia cana	0.50	1.00	1.66	0.01	40.49
Artemisia tridentata	46.00	91.93	23.91	0.92	3,724.70
Sub-Total	46.50	92.93	25.56	0.93	3,765.18
Sub-Shrubs & Half-Shrubs					
Artemisia frigida	2.04	4.07	5.30	0.04	165.06
Artemisia pedatifida	1.38	2.77	7.06	0.03	112.11
Krascheninnikovia lanata	0.12	0.23	0.43	0.00	9.34
Sub-Total	3.54	7.07	12.79	0.07	286.52
Total	50.04	100.00	25.22	1.00	4,051.70

Ludeman
Report: Density Summary

Site Id: UG/RB
Name:
Comm. Type/Form:
Sample Date: 7/2/2008

Sample Method: Transect
Sample Size: 50 sq. m.
Number of Samples: 25
Report Date: 8/26/2008

	Mean (Number/Plot)	Relative Density	Std. Dev. n - 1 (Number/Plot)	Mean (Number/sq.m.)	Mean (Number/Acre)
Full Shrubs					
Artemisia tridentata	8.52	55.61	10.10	0.17	689.88
Atriplex canescens	0.16	1.04	0.47	0.00	12.96
Chrysothamnus sp.	0.40	2.61	2.00	0.01	32.39
Sub-Total	9.08	59.27	12.58	0.18	735.22
Sub-Shrubs & Half-Shrubs					
Artemisia frigida	5.76	37.60	14.32	0.12	466.40
Artemisia pedatifida	0.04	0.26	0.20	0.00	3.24
Yucca glauca	0.44	2.87	2.20	0.01	35.63
Sub-Total	6.24	40.73	16.72	0.12	505.26
Total	15.32	100.00	17.51	0.31	1,240.49

Ludeman
Report: Density Summary

Site Id: Lowland Grassland
Name:
Comm. Type/Form:
Sample Date: 7/1/2008

Sample Method: Transect
Sample Size: 50 sq. m.
Number of Samples: 25
Report Date: 8/28/2008

	Mean (Number/Plot)	Relative Density	Std. Dev. n - 1 (Number/Plot)	Mean (Number/sq.m.)	Mean (Number/Acre)
Full Shrubs					
Artemisia cana	0.08	0.13	0.40	0.00	6.48
Artemisia tridentata	7.28	12.24	13.91	0.15	589.47
Rosa woodsii	1.12	1.88	3.41	0.02	90.69
Symphoricarpos occidentalis	45.56	76.60	108.70	0.91	3,689.07
Sub-Total	54.04	90.85	126.42	1.08	4,375.71
Sub-Shrubs & Half-Shrubs					
Artemisia frigida	4.92	8.27	23.98	0.10	398.38
Artemisia ludoviciana	0.40	0.67	1.12	0.01	32.39
Gutierrezia sarothrae	0.08	0.13	0.40	0.00	6.48
Krascheninnikovia lanata	0.04	0.07	0.20	0.00	3.24
Sub-Total	5.44	9.15	25.70	0.11	440.49
Total	59.48	100.00	107.44	1.19	4,816.19

Ludeman
Report: Density Summary

Site Id: Silver Sage
Name:
Comm. Type/Form:
Sample Date: 7/3/2008

Sample Method: Transect
Sample Size: 50 sq. m.
Number of Samples: 25
Report Date: 8/29/2008

	Mean (Number/Plot)	Relative Density	Std. Dev. n - 1 (Number/Plot)	Mean (Number/sq.m.)	Mean (Number/Acre)
Full Shrubs					
Artemisia cana	54.32	71.51	35.30	1.09	4,398.38
Artemisia tridentata	2.28	3.00	10.58	0.05	184.62
Chrysothamnus viscidflorus	17.32	22.80	40.55	0.35	1,402.43
Sub-Total	73.92	97.31	86.43	1.48	5,985.43
Sub-Shrubs & Half-Shrubs					
Artemisia frigida	1.76	2.32	4.55	0.04	142.51
Atriplex gardneri	0.04	0.05	0.20	0.00	3.24
Krascheninnikovia lanata	0.12	0.16	0.44	0.00	9.72
Linanthus pungens	0.12	0.16	0.60	0.00	9.72
Sub-Total	2.04	2.69	5.79	0.04	165.18
Total	75.96	100.00	52.35	1.52	6,150.61

Ludeman
Report: Density Summary

Site Id: Crested Wheatgrass
Name:
Comm. Type/Form:
Sample Date: 6/30/2008

Sample Method: Transect
Sample Size: 50 sq. m.
Number of Samples: 25
Report Date: 8/18/2008

	Mean (Number/Plot)	Relative Density	Std. Dev. n - 1 (Number/Plot)	Mean (Number/sq.m.)	Mean (Number/Acre)
Full Shrubs					
Artemisia tridentata	5.64	56.63	13.93	0.11	456.68
Chrysothamnus viscidflorus	0.36	3.61	1.44	0.01	29.15
Ericameria nauseosa	0.16	1.61	0.55	0.00	12.96
Sub-Total	6.16	61.85	15.92	0.12	498.79
Sub-Shrubs & Half-Shrubs					
Artemisia frigida	3.28	32.93	7.30	0.07	265.59
Artemisia pedatifida	0.04	0.40	0.20	0.00	3.24
Krascheninnikovia lanata	0.12	1.20	0.60	0.00	9.72
Linanthus pungens	0.36	3.61	1.80	0.01	29.15
Sub-Total	3.80	38.15	9.90	0.08	307.69
Total	9.96	100.00	18.39	0.20	806.48

ADDENDUM 3.5-D

VEGETATION MAP

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED:

"VEGETATION MAP"

WITHIN THIS PACKAGE

D-01