

Table D8-1.1

Aerial Extent of Vegetation Communities

Vegetation Community	Study Area (Proposed Permit Boundary)		½ Mile Buffer Area	
	Acres	Percent of Area	Acres	Percent of Area
Upland Big Sagebrush Shrubland	5,370	93.8	5,425	93.4
Lowland Big Sagebrush Shrubland	325	5.7	372	6.4
Mixed Grass/Mat Cushion Grassland	27	0.5	--	--
Disturbed	2	<0.5	11	0.2
Water	<1	<0.5	--	--
Total	5,724	100	5,808	100

Table D8-1.2

Cover Parameters of the Upland Big Sagebrush Shrubland †

Species	Cover					Frequency			
	Mean Absolute	Relative (%)	Std. Dev. (n-1)	Lowest Value (%)	Highest Value (%)	Absolute	Relative (%)	I.V*	Rank
Native Cool Season Perennial Grasses									
<i>Achnatherum hymenoides</i>	0.6	2.1	1.6	0	6	15	3.2	5.3	6
<i>Elymus lanceolatus</i>	0.4	1.3	1.0	0	4	15	3.2	4.6	7
<i>Elymus smithii</i>	0.2	0.7	0.9	0	4	5	1.1	1.8	11
<i>Elymus spicatus</i>	0.5	1.6	1.6	0	6	10	2.1	3.9	8
<i>Hesperostipa comata</i>	1.3	4.3	2.1	0	8	40	8.5	13.2	5
<i>Koeleria macrantha</i>	0.4	1.3	1.0	0	4	15	3.2	4.6	7
<i>Poa secunda</i>	2.1	6.9	3.0	0	10	45	9.6	17.1	4
Sub-Total	5.5	18.0	4.0	--	--	145	30.8	50.5	--
Native Perennial Forbs									
<i>Eremogone hookeri</i>	0.3	1.0	1.3	0	6	5	1.1	2.1	10
<i>Phlox hoodii</i>	2.5	8.2	2.2	0	8	75	16.0	24.9	2
<i>Stenotus acaulis</i>	0.1	0.3	0.4	0	2	5	1.1	1.4	12
Sub-Total	2.9	9.5	3.1	--	--	85	18.1	28.4	--
Native Full Shrubs									
<i>Artemisia tridentata</i>	18.8	61.6	4.7	10	28	100	21.3	88.4	1
<i>Chrysothamnus viscidiflorus</i>	0.3	1.0	1.0	0	4	10	2.1	3.2	9
Sub-Total	19.1	62.6	4.6	--	--	110	23.4	91.6	--
Native Half & Sub-Shrubs									
<i>Krascheninnikovia lanata</i>	0.4	1.3	1.0	0	4	15	3.2	4.6	7
Sub-Total	0.4	1.3	1.0	--	--	15	3.2	4.6	--

Table D8-1.2 (Cont.) Cover Parameters of the Upland Big Sagebrush Shrubland †

Species	Cover					Frequency			
	Mean Absolute	Relative (%)	Std. Dev. (n-1)	Lowest Value (%)	Highest Value (%)	Absolute	Relative (%)	I.V*	Rank
Native Succulents									
<i>Opuntia polyacantha</i>	0.1	0.3	0.4	0	2	5	1.1	1.4	12
Sub-Total	0.1	0.3	0.4	--	--	5	1.1	1.4	--
Cryptograms									
<i>Moss</i>	0.0	0.0	0.0	0	0	0	0.0	0.0	13
<i>Lichen</i>	2.5	8.2	3.0	0	10	110	23.4	23.4	3
<i>Algae</i>	0.0	0.0	0.0	0	0	0	0.0	0.0	13
<i>Fungi</i>	0.0	0.0	0.0	0	0	0	0.0	0.0	13
Sub-Total	2.5	8.2	3.0	--	--	110	23.4	23.4	--
Totals									
Total Vegetation	28.0		5.5						
Total Vegetation w/Cryptograms	30.5		6.4						
Litter	22.2		10.1						
Rock	1.5		3.0						
Total Ground Cover	54.2		8.9						
Bare Soil	45.8		8.9						

† Based on data from twenty 50-meter point intercept transects sampled June 2013

*I.V. Stands for Importance Value

Table D8-1.3 Shrub and Sub-Shrub Densities of the Upland Big Sagebrush Shrubland

Species	Mean (Number/Plot)	Relative Density	Std. Dev. n-1 (Number/Plot)	Mean (Number/ sq. m.)	Mean (Number/Acre)
Native Full Shrubs					
<i>Artemisia tridentata</i>	284.4	95.3	102.1	2.8	11,508
<i>Chrysothamnus viscidiflorus</i>	7.4	2.5	18.7	0.1	298
Total Native Full Shrubs	291.7	97.8	103.2	2.9	11,805
Native Half & Sub-Shrubs					
<i>Gutierrezia sarothrae</i>	0.2	0.1	0.5	<0.1	6
<i>Krascheninnikovia lanata</i>	3.7	1.2	9.8	<0.1	150
<i>Linanthus pungens</i>	2.8	0.9	10.0	<0.1	113
Total Native Half & Sub-Shrubs	6.7	2.2	18.8	0.1	269
Total	298.4	100	106.7	3.0	12,074

Table D8-1.4 Cover Parameters of the Lowland Big Sagebrush Shrubland †

Species	Cover					Frequency			
	Mean Absolute	Relative (%)	Std. Dev. (n-1)	Lowest Value (%)	Highest Value (%)	Absolute	Relative (%)	I.V*	Rank
Native Cool Season Perennial Grasses									
<i>Achnatherum hymenoides</i>	0.2	0.5	0.6	0	2	10	2.7	3.2	8
<i>Elymus lanceolatus</i>	0.2	0.5	0.9	0	4	5	1.4	1.8	10
<i>Elymus smithii</i>	0.5	1.2	0.9	0	2	25	6.8	8.0	5
<i>Festuca idahoensis</i>	0.9	2.2	1.9	0	6	20	5.4	7.6	6
<i>Hesperostipa comata</i>	0.2	0.5	0.6	0	2	10	2.7	3.2	8
<i>Koeleria macrantha</i>	0.2	0.5	0.6	0	2	10	2.7	3.2	8
<i>Poa secunda</i>	1.3	3.1	2.1	0	6	35	9.5	12.6	4
Sub-Total	3.5	8.4	2.9	--	--	115	31.1	39.5	--
Native Grasslike Species									
<i>Carex filifolia</i>	0.2	0.5	0.6	0	2	10	2.7	3.2	8
Sub-Total	0.2	0.5	0.6	--	--	10	2.7	3.2	--
Native Perennial Forbs									
<i>Antennaria microphylla</i>	0.1	0.2	0.4	0	2	5	1.4	1.6	11
<i>Phlox hoodii</i>	0.2	0.5	0.6	0	2	10	2.7	3.2	8
Sub-Total	0.3	0.7	0.7	--	--	15	4.1	4.8	--
Native Full Shrubs									
<i>Artemisia tridentata</i>	33.1	79.2	9.9	16	54	100	27.0	106.4	1
<i>Chrysothamnus viscidiflorus</i>	2.3	5.5	2.6	0	8	50	13.5	19.0	2
<i>Ericameria nauseosa</i>	1.7	4.1	2.1	0	6	50	13.5	17.6	3
Sub-Total	37.1	88.8	11.0	--	--	200	54.1	143.0	--
Native Half & Sub-Shrubs									
<i>Gutierrezia sarothrae</i>	0.4	1.0	1.4	0	6	10	2.7	3.7	7
Sub-Total	0.4	1.0	1.4	--	--	10	2.7	3.7	--
Native Succulents									
<i>Opuntia polyacantha</i>	0.2	0.5	0.6	0	2	10	2.7	3.2	8
Sub-Total	0.2	0.5	0.6	--	--	10	2.7	3.2	--

Table D8-1.4 (Cont.) Cover Parameters of the Lowland Big Sagebrush Shrubland †

Species	Cover					Frequency			
	Mean Absolute	Relative (%)	Std. Dev. (n-1)	Lowest Value (%)	Highest Value (%)	Absolute	Relative (%)	I.V.*	Rank
Cryptograms									
<i>Moss</i>	0.0	0.0	0.0	0	0	0	0.0	0.0	12
<i>Lichen</i>	0.1	0.2	0.4	0	2	10	2.7	2.7	9
<i>Algae</i>	0.0	0.0	0.0	0	0	0	0.0	0.0	12
<i>Fungi</i>	0.0	0.0	0.0	0	0	0	0.0	0.0	12
Sub-Total	0.1	0.2	0.4	--	--	10	2.7	2.7	--
Totals									
Total Vegetation	41.7		9.9						
Total Vegetation w/Cryptograms	41.8		9.8						
Litter	37.5		9.6						
Rock	0.0		0.0						
Total Ground Cover	79.3		8.9						
Bare Soil	20.7		8.9						

† Based on data from twenty 50-meter point intercept transects sampled June 2013
 I.V. stands for Importance Value

Table D8-1.5 Native Full, Half, and Sub-Shrub Densities of the Lowland Big Sagebrush Shrubland

Species	Mean (Number/Plot)	Relative Density	Std. Dev. n-1 (Number/Plot)	Mean (Number/ sq. m.)	Mean (Number/Acre)
Native Full Shrubs					
<i>Artemisia tridentata</i>	242.6	83.6	223.2	2.4	9,816
<i>Chrysothamnus viscidiflorus</i>	29.2	10.1	25.8	0.3	1,180
<i>Ericameria nauseosa</i>	9.1	3.1	8.5	0.1	368
Total Native Full Shrubs	280.8	96.8	206.5	2.8	11,364
Native Half & Sub-Shrubs					
<i>Gutierrezia sarothrae</i>	9.1	3.1	21.9	0.1	366
<i>Linanthus pungens</i>	0.2	0.1	0.7	<0.1	8
Total Native Half & Sub-Shrubs	9.3	3.2	21.8	0.1	374
Total	290.1	100	220.9	2.9	11,738

Table D8-1.6 Cover Parameters of the Mixed Grass/Mat Cushion Grassland †

Species	Cover					Frequency			
	Mean Absolute	Relative (%)	Std. Dev. (n-1)	Lowest Value (%)	Highest Value (%)	Absolute	Relative (%)	I.V*	Rank
Native Cool Season Perennial Grasses									
<i>Elymus lanceolatus</i>	0.8	4.2	1.8	0	6	21	3.9	8.9	9
<i>Elymus smithii</i>	0.1	0.7	0.5	0	2	7	1.3	2.1	15
<i>Elymus spicatus</i>	0.5	2.4	2.0	0	10	7	1.3	4.2	11
<i>Hesperostipa comata</i>	0.3	1.7	0.9	0	4	14	2.6	4.7	10
<i>Koeleria macrantha</i>	1.2	6.3	2.2	0	8	28	5.2	11.5	7
<i>Poa secunda</i>	1.7	8.4	2.2	0	10	55	10.3	20.4	3
Sub-Total	4.7	23.8	3.3	--	--	131	24.5	51.8	--
Native Perennial Forbs									
<i>Antennaria microphylla</i>	0.3	1.4	1.5	0	8	3	0.7	2.4	14
<i>Eremogone hookeri</i>	0.2	1.0	0.8	0	4	7	1.3	2.5	13
<i>Eriogonum flavum</i>	0.3	1.4	0.9	0	4	10	1.9	3.6	12
<i>Ivesia gordonii</i>	0.1	0.3	0.4	0	2	3	0.7	1.0	16
<i>Phlox hoodii</i>	3.3	16.9	2.4	0	10	86	16.0	36.4	1
<i>Phlox muscoides</i>	0.8	3.9	1.5	0	4	24	4.5	9.2	8
<i>Stenotus acaulis</i>	1.7	8.4	2.2	0	8	48	9.0	19.0	4
<i>Tetranneuris acaulis</i>	0.1	0.3	0.4	0	2	3	0.7	1.0	16
Sub-Total	6.6	33.7	3.3	--	--	186	34.9	75.2	--
Native Full Shrubs									
<i>Artemisia tridentata</i>	3.2	16.5	3.6	0	12	66	12.3	32.0	2
<i>Chrysothamnus viscidiflorus</i>	0.1	0.3	0.4	0	2	3	0.7	1.0	16
<i>Ericameria nauseosa</i>	0.3	1.7	0.9	0	4	14	2.6	4.7	10
Sub-Total	3.7	18.6	3.7	--	--	83	15.5	37.7	--

Table D8-1.6 (Cont.) Cover Parameters of the Mixed Grass/Mat Cushion Grassland †

Species	Cover					Frequency			
	Mean Absolute	Relative (%)	Std. Dev. (n-1)	Lowest Value (%)	Highest Value (%)	Absolute	Relative (%)	I.V.*	Rank
Native Half & Sub-Shrubs									
<i>Krascheninnikovia lanata</i>	1.4	7.0	2.5	0	10	31	5.8	14.2	6
<i>Linanthus pungens</i>	0.1	0.3	0.4	0	2	3	0.7	1.0	16
Sub-Total	1.4	7.3	2.5	--	--	34	6.5	15.2	--
Native Succulents									
<i>Opuntia polyacantha</i>	0.1	0.7	0.5	0	2	7	1.3	2.1	15
Sub-Total	0.1	0.7	0.5	--	--	7	1.3	2.1	--
Cryptograms									
<i>Moss</i>	0.0	0.0	0.0	0	0	0	0.0	0.0	17
<i>Lichen</i>	3.2	16.5	5.2	0	16	90	16.8	16.8	5
<i>Algae</i>	0.0	0.0	0.00	0	0	0	0.0	0.0	17
<i>Fungi</i>	0.0	0.0	0.00	0	0	0	0.0	0.0	17
Sub-Total	3.2	16.5	5.2	--	--	90	16.8	16.8	--
Totals									
Total Vegetation	Mean		Std. Dev.						
Total Vegetation w/Cryptograms	16.4		3.4						
Litter	19.7		5.3						
Rock	15.2		6.7						
Total Ground Cover	1.0		2.0						
Bare Soil	35.9		9.3						
	64.1		9.3						

† Based on data from twenty-nine 50-meter point intercept transects sampled June 2013
I.V. stands for Importance Value

Table D8-1.7 Full, Half, and Sub-Shrub Densities of the Mix Grass/Mat Cushion Grassland

Species	Mean (Number/Plot)	Relative Density	Std. Dev. n-1 (Number/Plot)	Mean (Number/ sq. m.)	Mean (Number/Acre)
Native Full Shrubs					
<i>Artemisia tridentata</i>	46.7	77.6	48.08	0.5	1,888
<i>Chrysothamnus viscidiflorus</i>	0.7	1.1	1.78	<0.1	27
<i>Ericameria nauseosa</i>	7.8	13.0	9.80	0.1	317
Total Native Full Shrubs	55.1	91.7	47.05	0.6	2,232
Native Half & Sub-Shrubs					
<i>Artemisia frigida</i>	<0.1	0.1	0.2	<0.1	1
<i>Krascheninnikovia lanata</i>	0.7	1.2	2.4	<0.1	29
<i>Linanthus pungens</i>	4.2	7.1	16.0	<0.1	172
Total Native Half & Sub-Shrubs	5.0	8.3	16.1	0.1	202
Total	60.1	100	49.3	0.6	2,434

Table D8-1.8 List of Vegetation Species Observed at Lost Creek East

Acronym	Current Nomenclature	Common Name	Vegetation Community		
			UBSS	LBSS	MGMC
Introduced Annual Grasses					
BROTEC	<i>Bromus tectorum</i>	Cheatgrass	X	X	
Native Cool Season Perennial Grasses					
ACHHYM	<i>Achnatherum hymenoides</i>	Indian ricegrass	X	X	X
ELYCIN	<i>Elymus cinereus</i>	Basin wildrye		X	
ELYELY	<i>Elymus elymoides</i>	Bottlebrush squirreltail	X		
ELYLAN	<i>Elymus lanceolatus</i>	Thickspike wheatgrass	X	X	X
ELYSMI	<i>Elymus smithii</i>	Western wheatgrass	X	X	X
ELYSPI	<i>Elymus spicatus</i>	Bluebunch wheatgrass	X	X	X
FESIDA	<i>Festuca idahoensis</i>	Idaho fescue	X	X	
HESCOM	<i>Hesperostipa comata</i>	Needleandthread	X	X	X
KOEMAC	<i>Koeleria macrantha</i>	Prairie junegrass	X	X	X
NASVIR	<i>Nassella viridula</i>	Green needlegrass		X	
POASEC	<i>Poa secunda</i>	Sandberg bluegrass	X	X	X
Native Grasslike Species					
CARFIL	<i>Carex filifolia</i>	Threadleaf sedge		X	X
Native Annual Forbs					
DESPIN	<i>Descurainia pinnata</i>	Western tansymustard		X	
ERISTR	<i>Erigeron strigosus</i>	Rough fleabane			X
LAPRED	<i>Lappula redowskii</i>	Bluebur stickseed		X	
LUPPUS	<i>Lupinus pusillus</i>	Rusty lupine		X	
Introduced Annual Forbs					
DESSOP	<i>Descurainia sophia</i>	Flixweed		X	
Native Biennial Forbs					
ERIGLA	<i>Erigeron glabellus</i>	Streamside fleabane			X
Native Perennial Forbs					
ANTMIC	<i>Antennaria microphylla</i>	Littleleaf pussytoes		X	X
ASTSPA	<i>Astragalus spatulatus</i>	Spoonleaf milkvetch		X	
CIRUND	<i>Cirsium undulatum</i>	Wavyleaf thistle			X
EREHOO	<i>Eremogone hookeri</i>	Hooker sandwort	X		X
ERIFLA	<i>Eriogonum flavum</i>	Alpine golden			X
ERIOVA	<i>Eriogonum ovalifolium</i>	Cushion wild	X		
ERIUMB	<i>Eriogonum umbellatum</i>	Sulfur wild buckwheat	X	X	
IVEGOR	<i>Ivesia gordonii</i>	Gordon's ivesia			X
MACTAN	<i>Machaeranthera</i>	Tansyleaf tansy aster			X
PHLHOO	<i>Phlox hoodii</i>	Hoods phlox	X	X	X
PHLMUS	<i>Phlox muscoides</i>	Musk phlox	X		X
PHYSPP	<i>Physaria</i> species	Twinpod	X		
STEACA	<i>Stenotus acaulis</i>	Stemless goldenweed	X	X	X

Table D8-1.8 (Cont.) List of Vegetation Species Observed at Lost Creek East

Acronym	Current Nomenclature	Common Name	Vegetation Community		
			UBSS	LBSS	MGMC
Native Perennial Forbs (Cont.)					
TETACA	<i>Tetaneuris acaulis</i>	Stemless four-nerve			X
THERHO	<i>Thermopsis rhombifolia</i>	Golden banner		X	
Native Full Shrubs					
ARTTRI	<i>Artemisia tridentata</i>	Big sagebrush	X	X	X
CHRVIS	<i>Chrysothamnus</i>	Sticky-leaved	X	X	X
ERINAU	<i>Ericameria nauseosa</i>	Rubber rabbitbrush	X	X	X
Native Half & Sub-Shrubs					
ARTFRI	<i>Artemisia frigida</i>	Fringed sagewort			X
GUTSAR	<i>Gutierrezia sarothrae</i>	Broom snakeweed	X	X	
KRALAN	<i>Krascheninnikovia lanata</i>	Winterfat	X	X	X
LINPUN	<i>Linanthus pungens</i>	Granite pricklygila	X	X	X
Native Succulents					
OPUPOL	<i>Opuntia polyacantha</i>	Plains pricklypear	X	X	X
Total in each Vegetation Community			24	29	27
Total number of species=42					
X	Species observed and/or sampled				

Table D8-1.9 Designated Noxious and Declared Weeds Surveyed for at Lost Creek East

State of Wyoming Designated Noxious Weeds	
Scientific Name	Common Name
<i>Convolvulus arvensis</i>	Field bindweed
<i>Cirsium arvense</i>	Canada thistle
<i>Euphorbia esula</i>	Leafy spurge
<i>Sonchus arvensis</i>	Perennial saothistle
<i>Cardaria draba</i>	Hoary cress
<i>Lepidium latifolium</i>	Perennial pepperweed
<i>Chrysanthemum leucanthemum</i>	Ox-eye daisy
<i>Franseria discolor</i>	Skeletonleaf bursage
<i>Centaurea repens</i>	Russian knapweed
<i>Linaria vulgaris</i>	Yellow toadflax
<i>Linaria dalmatica</i>	Dalmatian toadflax
<i>Onopordum acanthium</i>	Scotch thistle
<i>Carduus nutans</i>	Musk thistle
<i>Arctium minus</i>	Common burdock
<i>Carduus acanthoides</i>	Plumeless thistle
<i>Isatis tinctoria</i>	Dyers woad
<i>Cynoglossum officinale</i>	Houndstongue
<i>Centaurea maculosa</i>	Spotted knapweed
<i>Centaurea diffusa</i>	Diffuse knapweed
<i>Lythrum salicaria</i>	Purple lustrife
<i>Tamarix</i> spp.	Saltcedar
<i>Hypericum perforatum</i>	Common St. Johnswort
<i>Tanacetum vulgare</i>	Common tansy
<i>Elaeagnus angustifolia</i>	Russian olive
Sweetwater County Declared Weeds	
Scientific Name	Common Name
<i>Hyoscyamus niger</i>	Black henbane
<i>Hordeum jubatum</i>	Foxtail barley
<i>Galium verum</i>	Lady's bedstraw
<i>Thermopsis montana</i>	Mountain thermopsis
<i>Glycyrrhiza lepidota</i>	Wild licorice

Table D8-1.10 Evaluation of Sample Adequacy

Transect #	Upland Big Sagebrush		Lowland Big Sagebrush		Mixed Grass/Mat Cushion	
	Vegetation Cover %	Ground Cover %	Vegetation Cover %	Ground Cover %	Vegetation Cover %	Ground Cover %
1	13	28	19	33	9	15
2	10	26	20	38	7	12
3	12	28	28	47	14	23
4	13	22	19	39	9	25
5	14	24	31	42	9	16
6	21	27	17	43	9	17
7	11	31	23	40	15	20
8	13	27	28	38	8	13
9	14	23	19	42	7	18
10	18	33	20	43	7	16
11	17	25	18	37	11	20
12	14	23	14	34	9	15
13	20	25	20	34	8	19
14	13	24	21	44	15	26
15	18	28	21	43	7	12
16	17	32	22	39	12	21
17	17	40	22	46	7	7
18	21	30	11	30	11	22
19	15	22	17	42	13	20
20	14	24	28	39	12	19
21	--	--	--	--	14	21
22	--	--	--	--	6	14
23	--	--	--	--	9	17
24	--	--	--	--	10	19
25	--	--	--	--	6	9
26	--	--	--	--	12	19
27	--	--	--	--	11	18
28	--	--	--	--	8	23
29	--	--	--	--	10	25
Vegetation Community		Mean	Standard Deviation	Actual Sample #	Computed Adequate Sample Size	Computed Z-Value
Upland Big Sagebrush						
Total Vegetation Cover		30.5	6.4	20	15	N/A
Total Ground Cover		54.2	8.9	20	9	N/A
Lowland Big Sagebrush						
Total Vegetation Cover		41.8	9.8	20	19	N/A
Total Ground Cover		79.3	8.9	20	5	N/A
Mixed Grass/Mat Cushion						
Total Vegetation Cover		19.7	5.3	29	24	N/A
Total Ground Cover		35.9	9.3	29	22	N/A

ATTACHMENT D8-1.1

Scope of Work



Matt Mead, Governor

Department of Environmental Quality

To protect, conserve and enhance the quality of Wyoming's environment for the benefit of current and future generations.



Todd Parfitt, Director

June 4, 2013

Ms. Dawn Gardner
BKS Environmental Associates
P. O. Box 3467
Gillette, WY 82717

RE: Acceptance of proposed vegetation sampling methodology for Lost Creek East Project, DN416

Dear Ms. Gardner:

The above-referenced proposed vegetation sampling methodology was reviewed by LQD's Craig Smith (via e-mail correspondence, attached) on May 30, 2013. The three comments cited by Mr. Smith's review were addressed by you in the form of a revised methodology. That revised methodology was reviewed and approved by Mr. Smith on June 3, 2013. The signed certification of LQD's acceptance of the proposed methodology is enclosed. Please do not hesitate to contact me regarding this correspondence at (307) 332-3047.

Sincerely,

Melissa L. Bautz, P.G.
District 2, Natural Resources Analyst
Land Quality Division

Enclosures: Electronic Mail correspondence (2 pages)
LQD-Certified Vegetation Sampling Methodology for Lost Creek East Project (9 pages)

cc John Cash, NFU Wyoming 5880 Enterprise Drive, Suite 200 Casper, WY 82609
LQD Cheyenne → DN416 File (w/encl)
LQD Lander, Mark Moxley/Craig Smith → DN416 File (w/encl)
Chron (Craig Smith, w/encl)

E:\MELISSA_WDEQ_WORK_FOLDER\MLB_WorkFiles\MyWorkStuff\Mines\Fremont_County_Sites\NFU-Wyoming\416DN (LCreek-East)\LC_East_Soil_Smplg_Appr_Ltr_6_4_2013.docx

Lander Field Office • 510 Meadowview Drive • Lander, WY 82520 • <http://deq.state.wy.us>

ABANDONED MINES
(307) 332-5085
FAX 332-7726

AIR QUALITY
(307) 332-6755
FAX 332-7726

LAND QUALITY
(307) 332-3047
FAX 332-7726

SOLID & HAZARDOUS WASTE
(307) 332-6924
FAX 332-7726

WATER QUALITY
(307) 332-3144
FAX 332-7726



Craig Smith <craig.smith@wyo.gov>

RE: NFU Wyoming LLC Lost Creek East Veg. Sampling

1 message

Dawn Gardner <dgardner@bksenvironmental.com>

Thu, May 30, 2013 at 3:19 PM

To: Craig Smith <craig.smith@wyo.gov>

Cc: John Cash <john.cash@ur-energy.com>, Paul Hildenbrand <PRH@lidstone.com>, Chris Lidstone <CDL@lidstone.com>

Craig,

Please find attached the revised Lost Creek East vegetation sampling methodology (Lost_Creek_Vegetation_WDEQ_Methodology_05302013) which addresses the comments received on Thursday, May 30, 2013. The date on the file name and date on the report has been revised as an indication of version. The following outlines how each comment was addressed in the text; no additional changes were made to the previously reviewed document (Lost_Creek_Vegetation_WDEQ_Methodology_05132013).

-
- 1) WDEQ Comment: Vegetation community classification and mapping section (p.2): Please add "Mixed Grass/Mat Cushion Grassland" to the list of communities.

BKS response: Added Mixed Grass/Mat Cushion Grassland to list of communities on page 2.

- 2) WDEQ Comment: Shrub Density Section (p.4): You state "it is assumed that this area is not part of any wildlife critical winter range; thus, shrub density is not necessary". It is not clear if this is a safe assumption. The area is part of the Sage Grouse Core area and there are Pronghorn crucial ranges in that area. Shrub density measurements would be important to know in this area especially in light of the increased interest in Sage grouse and their habitat.

BKS response: Removed "It is assumed that this area is not part of any wildlife critical winter range; thus, shrub density information is not necessary."

- 3) Other Data Collected Section (p.5): Please add listed noxious weeds and selenium indicator species to the list of other data collected. These should be noted in text and located on the vegetation map if they are found. If none are found just note in the text.

BKS response: (p.5) Changed/Added Text "All state designated noxious weed and county declared weeds will be noted, discussed in the text, and identified on the baseline vegetation map. Selenium indicator plant species listed in Appendix III of WDEQ-LQD Guideline 2 will be noted, discussed in the text, and identified on the baseline vegetation map. The text will indicate if state designated noxious weeds, county declared weeds, and/or selenium indicator plant species are not found within the project area."

Baseline Vegetation Survey Report Section III (p.6) Added as bullet four "Identify state designated noxious weeds, county declared weeds, and selenium indicator plant species, if present."

Baseline Vegetation Survey Report Section VII (p.8) changed to Present Other Data Collected and included the following three bullets:

- Text briefly describing special status plant species presence or absence.

- Text briefly describing state designated noxious weeds and county declared weeds presence or absence.
- Text briefly describing selenium indicator plant species presence or absence.

Previous change required renumbering of following sections.

Please let me know if you have any questions or comments regarding the responses to the May 30, 2013 comments.

Thank you for your time and help with this project,

Dawn Gardner

BKS Environmental Associates, Inc.

307.686.0800

From: Craig Smith [mailto:craig.smith@wyo.gov]
Sent: Thursday, May 30, 2013 10:21 AM
To: Dawn Gardner
Cc: Melissa Bautz
Subject: NFU Wyoming LLC Lost Creek East Veg. Sampling

Dawn,

Melissa forward me your proposed vegetation sampling protocols for review. I had just a few comments that should be quick and easy to change. Overall it looked good. Below please see the suggested changes/revisions.

- 1) Vegetation community classification and mapping section (p.2): Please add "Mixed Grass/Mat Cushion Grassland" to the list of communities.
- 2) Shrub Density Section (p.4): You state "it is assumed that this area is not part of any wildlife critical winter range; thus, shrub density is not necessary". It is not clear if this is a safe assumption. The area is part of the Sage Grouse Core area and there are Pronghorn crucial ranges in that area. Shrub density measurements would be important to know in this area especially in light of the increased interest in Sage grouse and their habitat.
- 3) Other Data Collected Section (p.5): Please add listed noxious weeds and selenium indicator species to the list of other data collected. These should be noted in text and located on the vegetation map if they are found. If none are found just note in the text.

Thank you,

Craig Smith
Vegetation Ecologist
Wyoming DEQ/LQD - District II
(307) 332-3047
craig.smith@wyo.gov

E-Mail to and from me, in connection with the transaction of public business, is subject to the Wyoming Public Records Act and may be disclosed to third parties.

Sampling Methods for Vegetation Baseline Study
NFU Wyoming, LLC
Lost Creek East Project Area
May 30, 2013

Land Quality Division Review & Acceptance Certification

The Land Quality Division has reviewed the following vegetation baseline permit plan and hereby certifies that it satisfactorily addresses the requirements of Land Quality Division Non-Coal Permitting regulations. Vegetation baseline permit field work conducted and reported in accordance with this plan will satisfy Wyoming regulatory and guideline requirements.

Accepted By: Wyoming Department of Environmental Quality – Land Quality Division
Name (printed): Craig Smith
Title: Environmental Scientist
Signature: *Craig Smith*
Date: 6/3/13

Accepted by: NFU Wyoming, LLC
Name (printed): John Cash
Title: V.P. Regulatory Affairs, Exploration and Geology
Date: 30 May 2013

Prepared by: BKS Environmental Associates, Inc
Name (printed): Cindy Adams
Title: Vegetation Ecologist
Signature: *Cindy Adams*
Date: 30 May 2013

Sampling Methods for Vegetation Baseline Study
 NFU Wyoming, LLC
 Lost Creek East Project Area
 May 30, 2013

INTRODUCTION

A vegetation baseline study will be performed in Sweetwater County approximately 50 miles north of Rawlins, Wyoming. The vegetation baseline study will occur within the proposed NFU Wyoming, LLC Lost Creek East project area. The proposed Lost Creek East project area is located in all or portions of:

- Sections 1, 2, 3, 10, 11, 14, 15, 20, 21, 22, 23, 27, 28, and 29, T25N, R92W

The proposed Lost Creek East project area encompasses approximately 5,724 acres. Vegetation communities located within the proposed Lost Creek East project area were classified and mapped on 8 October 2012. Refer to Table 2 for a list of vegetation communities and acreages within the proposed Lost Creek East project area.

Baseline vegetation sampling will be conducted no later than 15 July 2013. Sampling will be completed within a three-week period. If sampling within a three week period is not possible, BKS will notify Wyoming Department of Environmental Quality (WDEQ)-Land Quality Division (LQD) immediately.

The procedures described in this document follow the WDEQ-LQD Guideline 2 - Vegetation for Non-Coal Operations. Vegetation baseline sampling will be conducted using the procedures described in this document. Vegetation parameter sampling will be conducted by vegetation community as specified in Table 1. Disturbed areas and the ½ mile buffer will be excluded from all vegetation parameter sampling.

Table 1: Vegetation Baseline Sampling – Measured Parameters.

Parameter	Upland Big Sagebrush Shrubland	Lowland Big Sagebrush Shrubland	Mixed Grass/Mat Cushion Grassland
% Absolute Total Ground Cover	Yes	Yes	Yes
First Hit % Absolute Total Vegetation Cover	Yes	Yes	Yes
Multiple Hit Vegetation	Yes	Yes	Yes
Production	No	No	No
Shrub/Sub-shrub Density	Yes (Not Required)	Yes (Not Required)	Yes (Not Required)
Tree Count and Distribution	No	No	No

Wetlands may occur within the proposed project area, but such features are limited in extent and distribution. Wetlands will not be sampled as part of the baseline study, but will be included under U.S. Army Corps of Engineers delineation requirements.

VEGETATION COMMUNITY CLASSIFICATION & MAPPING

Vegetation communities within the proposed Lost Creek East project area were classified and mapped using 2011 true color ortho aerial imagery and verified through field survey conducted on 8 October 2013. Classification of vegetation communities followed Lost Creek naming conventions.

Vegetation mapping and classification identified the presence of the following three native vegetation communities within the proposed Lost Creek East project area:

- Upland Big Sagebrush Shrubland
- Lowland Big Sagebrush Shrubland
- Mixed Grass/Mat Cushion Grassland

Sampling Methods for Vegetation Baseline Study
NFU Wyoming, LLC
Lost Creek East Project Area
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Disturbed areas and water present within the proposed Lost Creek East project area were identified and mapped, based on the scale of the available mapping. Table 2 presents a tabular summary of vegetation community acreages within the proposed Lost Creek East project area.

Table 2: Vegetation Map Units and Associated Acreages.

Vegetation Map Units	Permit Area Acreage
Upland Big Sagebrush Shrubland	5,369.64
Lowland Big Sagebrush Shrubland	325.10
Mixed Grass/Mat Cushion Grassland	27.04
Disturbed	2.32
Water	0.26
TOTAL	5,724.36

All areas within ½ mile of the proposed project area will be mapped, based on a review of 2011 true color ortho aerial imagery and known expression of 2011 true color ortho aerial imagery within the proposed project area, based on October 2012 field surveys. No vegetation sampling will be conducted within this area.

TRANSECT ORIGIN SELECTION

A computerized systematic grid (through ArcGIS) will be used to randomly locate sample points within the Upland Big Sagebrush Shrubland, Lowland Big Sagebrush Shrubland, and Mixed Grass/Mat Cushion Grassland vegetation communities. These computer generated random numbers will be uploaded to a hand-held GPS unit for actual location in the field. Sample points will be sampled in numerical order until the minimum sample size is attained and then until either sample adequacy is met or the required maximum number of samples has been collected.

LINE TRANSECT LAYOUT

Within the Upland Big Sagebrush Shrubland, Lowland Big Sagebrush Shrubland, and Mixed Grass/Mat Cushion Grassland vegetation communities, 50-meter line transect will be used. Each 50-meter line transect will begin at its specified random origin point and extend in a randomly generated compass direction.

Transects that exceed the boundaries of the vegetation community being sampled will be 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 does not place the transect within the sampled vegetation community, a 45 degree angle of reflection will be used.

GROUND COVER

Line-transect point-intercept methods will be used to collect percent absolute cover data from the Upland Big Sagebrush Shrubland, Lowland Big Sagebrush Shrubland, and Mixed Grass/Mat Cushion vegetation communities within the proposed project area.

Each 50-meter transect will represent a single sample point. Percent cover measurements will be taken from point-intercepts at 1-meter intervals along a 50-meter transect using a laser point device. Should a transect run out of the vegetation community boundary or a non-vegetated feature, it will be redirected as described above. Each point-intercept will represent 2% towards the cover measurements.

Percent cover measurements will record first-hit point-intercepts by live foliar vegetation species, litter, rock, or bare ground. Litter will include all non-living organic material. Manure will be included with bare

Sampling Methods for Vegetation Baseline Study
NFU Wyoming, LLC
Lost Creek East Project Area
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ground. Rock fragments will be recorded when they are equal to or greater than one centimeter in size (i.e., sheet flow, minimum non-erodible particle size). First-hit data will be recorded and tabulated to evaluate total ground cover and total vegetation cover. Multiple hits on vegetation will be recorded, but used only for the purpose of constructing a plant species list for each vegetation community. Total ground cover is the sum of cover values for percent vegetation, percent litter, and percent rock.

Total Vegetation Cover

Vegetation cover data will be recorded by species using first-hit data. All point intercepts of living vegetation and growth produced during the current growing season will be counted toward total vegetation cover. Total vegetation cover measurements will be expressed in absolute percentages for each sample point. Relative cover values for percent species cover will be provided. Percent vegetation cover is the vertical projection of the general outline of plants to the ground surface. Total vegetation cover will include lichen and moss.

Total Ground Cover

Total ground cover data will be recorded by live vegetation, litter, rock, or bare ground. Litter will include all dead organic matter that is recognizable. Total ground cover measurements will be expressed in absolute percentages for each sample point. Total ground cover will include lichen and moss.

SPECIES DIVERSITY

Species diversity will be determined by noting all plant species observed or sampled within 1-meter on either side of the 50-meter cover transect (100-square meter belt transect). The number of belt transects will equal the number of cover transects for a given vegetation community. Species diversity will be summarized by lifeform. Species diversity calculations will not include Species Lacking Credible Value (SLCV): halogeton (*Halogeton glomeratus*), Japanese brome (*Bromus japonicus*), cheatgrass (*Bromus tectorum*), summer cypress (*Bassia sieversiana*), Russian thistle (*Salsola tragus*), State Designated Noxious Weeds, and County Declared Weeds.

PRODUCTION

No production sampling will be necessary for the 2013 baseline vegetation assessment.

SHRUB DENSITY

Although shrub density sampling is not required for non-coal sites, this data will be taken at the time of cover sampling to ensure adequate use of field time and data collection and to ensure that adequate species diversity and density information has been acquired. Summarization of that data, however, may not be included in the report submittal for the permit. Shrub density can also be used to determine degree of suitable wildlife habitat present. Also, shrub density is a tool that can be used in the recommendations for reclamation planning and seeding for shrubland communities.

Shrub density data will be collected in conjunction with randomly selected cover transects. All shrubs, full or sub, will be counted within 1-meter on either side of the 50-meter cover transect (100-square meter belt transect). Sample adequacy will not be calculated on shrub density transects; however, shrub density data will be qualitatively evaluated. The number of belt transects will equal the number of cover transects for a given vegetation community. No shrub height measurements will be statistically summarized. General approximations of shrub heights will be recorded.

Sampling Methods for Vegetation Baseline Study
 NFU Wyoming, LLC
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TREE DENSITY

It is anticipated that trees will not be found within the proposed project areas. No tree density sampling will be carried out; however, if trees are observed within the proposed project area, they will be noted and qualitatively summarized within the report text.

SAMPLE ADEQUACY

A minimum of 20 cover transects per vegetation community will be sampled in the Upland Big Sagebrush Shrubland, Lowland Big Sagebrush Shrubland, and Mixed Grass/Mat Cushion Grassland vegetation communities. Sample adequacy will be calculated and an incremental number of cover transects will be sampled up to the maximum of 50.

The sample adequacy formula outlined in WDEQ-LQD Guideline 2 will be utilized to determine the minimum required size of the sample population. The sampled vegetation communities are anticipated to be both "grassland" and "shrubland". Using Table 1 in WDEQ-LQD Guideline 2, the constant values to be used in statistical test are (for both grassland and shrubland total vegetation cover and total cover): "z"²=1.28 and "d" = 0.1. All sampled vegetation will be included in the sample adequacy test (i.e., "Species Lacking Creditable Value" will not be eliminated from the equation).

Table 3: Vegetation Monitoring Minimum/Maximum Sample Population Requirements for the Proposed Lost Creek East Project Area.

Vegetation Community	Parameter	Minimum Sample Size	Maximum Sample Size
Upland Big Sagebrush Shrubland	Ground Cover	20	50
	Vegetation Cover		
Lowland Big Sagebrush Shrubland	Ground Cover	20	50
	Vegetation Cover		
Mixed Grass/Mat Cushion Grassland	Ground Cover	20	50
	Vegetation Cover		
Total		60	150

PLANT SPECIES LISTS

A plant species list by scientific name, common name, and lifeform will be developed individually for the Upland Big Sagebrush Shrubland, Lowland Big Sagebrush Shrubland, and Mixed Grass/Mat Cushion Grassland vegetation communities. This list will be compiled from species noted during all vegetation monitoring activities including point-intercept line transect cover measurements, species diversity belt transect measurements, and other opportunistic observations of the sampling area.

OTHER DATA COLLECTED

Habitat and species surveys for any United States Fish and Wildlife Service or Bureau of Land Management threatened, endangered, sensitive, or candidate species or any state species of special concern listed in the Wyoming Natural Heritage database will be conducted during the appropriate period based on phenology. Identified individuals, populations, or suitable habitat will be identified on the baseline vegetation map.

All state designated noxious weed and county declared weeds will be noted, discussed in the text, and identified on the baseline vegetation map. Selenium indicator plant species listed in Appendix III of WDEQ-LQD Guideline 2 will be noted, discussed in the text, and identified on the baseline vegetation map. The text will indicate if state designated noxious weeds, county declared weeds, and/or selenium indicator plant species are not found within the project area.

Sampling Methods for Vegetation Baseline Study
NFU Wyoming, LLC
Lost Creek East Project Area
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Photographs will be taken of each of the vegetation communities. Photographic locations will be documented and illustrated on the baseline vegetation map.

EXTENDED REFERENCE AREA MAPPING & JUSTIFICATION

Although the initial permit used the Comparison Area concept for determining vegetation reclamation success, LQD now favors the Extended Reference Area (EXREFA) concept. As noted in the Vegetation Community Classification & Mapping section, all lands within the proposed project area were mapped as one of three native vegetation communities, disturbed lands, or water. All Upland Big Sagebrush Shrubland, Lowland Big Sagebrush Shrubland, and Mixed Grass/Mat Cushion Grassland vegetation communities, within the project area, unaffected by the mining operation will serve as the EXREFA. Lands within the ½ mile buffer will not be included as part of the EXREFA. For the purposes of this permit amendment EXREFA means a native land unit which will be used to evaluate revegetation success for each of the same native vegetation communities which were affected by the mining operation. The EXREFA will be a subset of the mapped native vegetation communities and will be included as potential sample points for the cover sampling program. The EXREFA will remain unaffected over the course of the mining operation and will be as large as practical, at least two acres, considering land ownership patterns and land management history. The amendment application Appendix D-8 will show the EXREFA on the vegetation map and will include text justifying the choice of the EXREFA.

BASELINE VEGETATION SURVEY REPORT

A summary of all field data collected and will include the following major headings and content:

- I. Table of Contents
- II. Approved mapping and sampling methods
 - Text that briefly lists the title and date for the approved methods and includes a reference to the location of the approved methods in Appendix D-8.
 - Text making a clear statement that all sampling methods were executed as approved.
 - Text noting the time periods when field sampling occurred.
- III. Map of the vegetation communities within the proposed project area. The EXREFA and ½ mile buffer will also be included on this map.
 - Map with appropriate legend information for all entries.
 - Identify photo locations.
 - Identify sample points in each vegetation community.
 - Identify state designated noxious weeds, county declared weeds, and selenium indicator plant species, if present.
 - Identify projected affected area and tabulate acreage.
 - Tabulate acreage of each map unit.

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IV. Present and discuss sample numbers.

- Tabular presentation

Plant Community	Total Vegetation Cover (%)	Actual Sample Size	Computed Adequate Sample Size	Computed Z-Value	Confidence Level Achieved
Upland Big Sagebrush Shrubland					
Lowland Big Sagebrush Shrubland					
Mixed Grass/Mat Cushion Grassland					

Plant Community	Total Ground Cover (%)	Actual Sample Size	Computed Adequate Sample Size	Computed Z-Value	Confidence Level Achieved
Upland Big Sagebrush Shrubland					
Lowland Big Sagebrush Shrubland					
Mixed Grass/Mat Cushion Grassland					

- Text briefly discussing numbers in relation to the approved methods

V. Present sample data

- Tabular presentation.

Vegetation Parameter	Vegetation Community		
	Upland Big Sagebrush Shrubland	Lowland Big Sagebrush Shrubland	Mixed Grass/Mat Cushion Grassland
Absolute Vegetation Cover (%)			
Absolute Total Ground Cover (%)			

- Text which describes the major vegetation and topographic characteristics of each community; integrate soil type(s) as useful.

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 NFU Wyoming, LLC
 Lost Creek East Project Area
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- Tabulate and discuss relative cover values by life form.

Life Form	Upland Big Sagebrush Shrubland		Lowland Big Sagebrush Shrubland		Mixed Grass/Mat Cushion Grassland	
	Absolute %	Relative %	Absolute %	Relative %	Absolute %	Relative %
Native Annual Grasses						
Introduced Annual Grasses						
Native Cool Season Perennial Grasses						
Native Warm Season Perennial Grasses						
Introduced Perennial Grasses						
Native Annual Forbs						
Introduced Annual Forbs						
Native Perennial Forbs						
Introduced Perennial Forbs						
Half and Sub-Shrubs						
Full Shrubs						
Succulents						

- Present and discuss photographs.
- VI. Present species lists by vegetation community.
- Text briefly discussing lists.
 - Text noting the presence or absence of federally listed threatened and endangered species, state designated noxious weeds, and county declared weeds.
- VII. Present Other Data Collected
- Text briefly describing special status plant species presence or absence.
 - Text briefly describing state designated noxious weeds and county declared weeds presence or absence.
 - Text briefly describing selenium indicator plant species presence or absence.
- VIII. Present Extended Reference Area
- Text briefly describing reference units in baseline map.
 - Text discussing and justifying representative nature of the EXREFA.
- IX. References
- Includes citations for plant identification, etc.

Sampling Methods for Vegetation Baseline Study
NFU Wyoming, LLC
Lost Creek East Project Area
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- X. Photographs
 - Each caption is complete and descriptive.
- XI. Raw Cover Data
 - Includes tables for raw cover and density data.

ATTACHMENT D8-1.2

Raw Data

Attachment D8-1.2**Raw Data**

Table Number	Content
Attachment D8-1.2 Table 1	Cover Data for the Upland Big Sagebrush Shrubland
Attachment D8-1.2 Table 2	Density Data for the Upland Big Sagebrush Shrubland
Attachment D8-1.2 Table 3	Cover Data for the Lowland Big Sagebrush Shrubland
Attachment D8-1.2 Table 4	Density Data for the Lowland Big Sagebrush Shrubland
Attachment D8-1.2 Table 5	Cover Data for Mixed Grass/Mat Cushion Plant Community
Attachment D8-1.2 Table 6	Density Data for Mixed Grass/Mat Cushion Plant Community

Attachment D8-1.2 Table 2: Density Data for the Upland Big Sagebrush Shrubland

Species	Density																			
	Transect Number																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
<i>Artemisia tridentata</i>	201	204	488	238	338	269	168	310	323	202	286	263	380	130	351	273	150	507	371	235
<i>Chrysothamnus viscidiflorus</i>	2	0	0	2	9	83	5	0	2	1	0	0	9	2	0	25	4	3	0	0
Total Native Full Shrubs	203	204	488	240	347	352	173	310	325	203	286	263	389	132	351	298	154	510	371	235
<i>Gutierrezia sarothrae</i>	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
<i>Krascheninnikovia lanata</i>	0	2	0	0	2	0	0	0	1	0	0	0	0	0	0	38	4	2	25	0
<i>Linanthus pungens</i>	0	0	0	0	0	2	0	0	1	0	0	0	6	0	0	45	0	2	0	0
Total Native Half & Sub-Shrubs	0	2	0	1	2	2	0	2	2	0	0	0	6	0	0	83	4	4	25	0
Total Density	203	206	488	241	349	354	173	312	327	203	286	263	395	132	351	381	158	514	396	235

Attachment D8-1.2 Table 3: Cover Data for the Lowland Big Sagebrush Shrubland

Species	Cover																			
	Transect Number																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
<i>Achnatherum hymenoides</i>	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0
<i>Elymus lanceolatus</i>	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
<i>Elymus smithii</i>	0	1	1	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0
<i>Festuca idahoensis</i>	0	0	2	0	0	0	0	0	0	3	0	0	0	0	2	0	2	0	0	0
<i>Hesperostipa comata</i>	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
<i>Koeleria macrantha</i>	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
<i>Poa secunda</i>	3	0	0	3	1	2	2	1	0	0	0	0	0	0	0	0	0	1	0	0
Total Native Cool Season Perennial Grasses	4	1	3	4	1	2	2	5	0	3	2	1	0	1	2	1	2	1	0	0
<i>Carex filifolia</i>	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Total Native Grasslike Species	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
<i>Antennaria microphylla</i>	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Phlox hoodii</i>	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Total Native Perennial Forbs	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
<i>Artemisia tridentata</i>	11	17	22	9	27	15	19	22	17	14	15	11	19	18	16	16	20	8	12	23
<i>Chrysothamnus viscidiflorus</i>	1	2	3	0	0	0	2	0	2	2	0	0	0	0	2	2	0	0	4	3
<i>Ericameria nauseosa</i>	2	0	0	0	3	0	0	0	0	1	1	0	1	2	0	3	0	1	1	2
Total Native Full Shrubs	14	19	25	9	30	15	21	22	19	17	16	11	20	20	18	21	20	9	17	28
<i>Gutierrezia sarothrae</i>	0	0	0	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Total Native Half & Sub-Shrubs	0	0	0	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
<i>Opuntia polyacantha</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
Total Native Succulents	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0

Attachment D8-1.2 Table 3 (Cont.): Cover Data for the Lowland Big Sagebrush Shrubland

Species	Cover																			
	Transect Number																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Lichen	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fungi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Algae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Moss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Cryptograms	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bare Ground	17	12	3	11	8	7	10	12	8	7	13	16	16	6	7	11	4	20	8	11
Litter	14	18	19	20	11	26	17	10	23	23	19	20	14	23	22	17	24	19	25	11
Rock	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Vegetation Cover	19	20	28	18	31	17	23	28	19	20	18	14	20	21	21	22	22	11	17	28
Total Vegetation w/Cryptograms	19	20	28	19	31	17	23	28	19	20	18	14	20	21	21	22	22	11	17	28
Total Ground Cover	33	38	47	39	42	43	40	38	42	43	37	34	34	44	43	39	46	30	42	39
No. of Species Sampled excluding SLCV	6	3	4	6	3	2	3	6	2	4	4	4	2	3	4	4	2	4	3	3
No. of Species Observed excluding SLCV	3	1	2	2	5	4	4	2	3	0	8	2	6	4	2	4	1	2	2	5
Total No. of Species excluding SLCV	9	4	6	8	8	6	7	8	5	4	12	6	8	7	6	8	3	6	5	8

Species	Density																			
	Transect Number																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
<i>Artemisia tridentata</i>	163	266	176	443	89	738	129	633	109	131	49	777	160	91	117	127	190	276	98	89
<i>Chrysothamnus viscidiflorus</i>	66	34	30	0	9	0	67	0	52	35	3	0	26	53	49	24	28	0	83	24
<i>Ericameria nauseosa</i>	3	2	0	23	19	5	16	0	0	2	27	0	15	13	7	13	0	17	10	10
Total Native Full Shrubs	232	302	206	466	117	743	212	633	161	168	79	777	201	157	173	164	218	293	191	123
<i>Gutierrezia sarothrae</i>	0	0	0	71	0	14	0	0	0	0	1	70	0	0	0	0	0	25	0	0
<i>Linanthus pungens</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	1
Total Native Half & Sub-Shrubs	0	0	0	71	0	14	0	0	0	0	1	70	0	3	0	0	0	25	0	1
Total Density	232	302	206	537	117	757	212	633	161	168	80	847	201	160	173	164	218	318	191	124

Table 5: Cover Data for the Mixed Grass/Mat Cushion Plant Community

Species	Cover																												
	Transect Number																												
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
<i>Elymus lanceolatus</i>	1	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	3	3	2	0	0	0	0	0	0	0	0	0	0
<i>Elymus smithii</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	
<i>Elymus spicatus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	5	0	
<i>Hesperostipa comata</i>	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	
<i>Koeleria macrantha</i>	3	2	0	0	1	0	0	2	1	4	0	0	2	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Poa secunda</i>	0	0	1	0	0	1	1	0	1	1	0	0	1	1	1	0	0	1	1	3	5	2	1	0	1	2	0		
Total Native Cool Season Perennial Grasses	4	2	2	2	1	1	1	2	3	5	0	0	3	1	3	1	4	4	3	3	5	2	2	2	2	7	1	2	
<i>Antennaria microphylla</i>	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Eremogone hookeri</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	
<i>Eriogonum flavum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	1	0	
<i>Ivesia gordonii</i>	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Phlox hoodii</i>	2	2	3	1	1	0	2	0	1	1	1	2	1	3	1	2	1	1	3	1	3	0	3	3	0	5	1	1	3
<i>Phlox muscoides</i>	0	2	0	0	2	0	0	0	0	1	0	1	2	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	
<i>Stenotus acaulis</i>	0	0	0	0	3	0	1	4	1	0	0	1	1	0	2	0	1	0	0	1	0	0	1	2	0	2	3	1	0
<i>Tetranuris acaulis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Total Native Perennial Forbs	2	4	3	1	6	0	3	4	3	2	1	4	4	3	4	2	6	1	3	2	3	0	4	5	3	7	4	4	4
<i>Artemisia tridentata</i>	4	1	0	1	0	6	2	2	0	0	1	1	3	1	2	3	0	6	4	4	1	0	0	1	0	0	0	1	3
<i>Chrysothamnus viscidiflorus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
<i>Ericameria nauseosa</i>	2	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Total Native Full Shrubs	6	1	0	1	1	6	2	2	0	0	1	2	3	1	2	3	0	6	4	4	1	0	0	1	1	0	0	2	3
<i>Krascheninnikovia lanata</i>	0	0	0	5	0	1	3	0	1	0	0	3	1	0	0	0	0	0	0	0	0	0	2	2	0	2	0	0	0
<i>Linanthus pungens</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total Native Half & Sub-Shrubs	0	0	0	5	0	1	3	0	1	0	0	3	1	0	0	0	0	0	0	0	0	0	2	2	0	2	0	0	1

Table 6: Density Data for the Mixed Grass/Mat Cushion Plant Community

Species	Density																												
	Transect Number																												
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
<i>Artemisia tridentata</i>	88	66	8	18	11	49	39	26	52	23	149	7	80	26	29	102	30	76	208	112	23	3	20	17	2	12	0	37	40
<i>Chrysothamnus viscidiflorus</i>	2	1	0	0	0	0	0	0	2	0	0	0	0	0	3	0	1	0	1	0	0	0	0	0	0	0	0	0	9
<i>Ericameria nauseosa</i>	13	12	0	0	33	0	0	7	11	11	1	16	27	0	14	0	18	0	0	0	0	0	2	1	31	0	11	9	10
Total Native Full Shrubs	103	79	8	18	44	49	39	33	65	34	150	23	107	26	43	105	48	77	208	113	23	3	22	18	33	12	11	46	59
<i>Artemisia frigida</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
<i>Krascheninnikovia lanata</i>	0	0	0	5	0	12	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0
<i>Linanthus pungens</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	50	72
Total Native Half & Sub-Shrubs	0	0	0	5	0	12	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	1	51	72
Total Density	103	79	8	23	44	61	40	33	65	34	150	23	107	26	44	105	49	77	208	113	23	4	22	18	33	12	12	97	131

ATTACHMENT D8-1.3

**Threatened, Endangered,
and Sensitive Species
Survey Summary**

Attachment D8-1.3 Threatened, Endangered, and Sensitive Species Survey Summary

Threatened and Endangered Habitat and Species Surveys

Habitat suitability for Ute ladies'-tresses (*Spiranthes diluvialis*), within the proposed amendment area, was evaluated based on the presence of the following characteristics: late season perennial water source, associated vegetation species, sandy or loamy textured soils, gradual transitions between uplands and water bodies or drainages, vegetation density between 75% and 90%, vegetation height less than 18 inches, and non-alkaline soils. Based on 2013 field evaluations conducted during the appropriate timeframe, late season perennial water sources were not present within the proposed amendment area. No individuals or populations of Ute ladies'-tresses were found during 2013 field surveys, and based on the lack of suitable habitat characteristics, local habitat was confirmed unsuitable for Ute ladies'-tresses.

Habitat suitability for blowout penstemon (*Penstemon haydenii*), within the proposed amendment area, was evaluated based on the presence of the following characteristics: eolian sand deposits or sand deposits greater than three feet in depth, fine sandy textured soils absent of rocks and coarse fragments, wind or gravity erosion versus water erosion, slopes greater than 25%, slope elevation changes of 60 to 120 feet, vegetation cover of less than 40%, and associated plant species. Based on Natural Resource Conservation (NRCS) soil data and baseline soil sampling, soils derived from eolian sources were not present within the proposed permit area. No individuals or populations of blowout penstemon were found during field surveys, and based on the lack of suitable habitat characteristics; local habitat was confirmed unsuitable for blowout penstemon.

Habitat suitability for desert yellowhead (*Yermo xanthocephalus*) within the proposed amendment area was evaluated based on the presence of surface outcrops of Miocene ash deposits. It's only known population occurs in the Beaver Rim Area of southern Fremont County, Wyoming. No individuals or populations of desert yellowhead were found during field surveys, and based on the lack of suitable habitat characteristics; local habitat was confirmed unsuitable for desert yellowhead.

Plant Species of Local Concern

Bureau of Land Management Sensitive plant species for the Rawlins Field Office are summarized in Table 1. Wyoming Natural Diversity Database (WYNDD) reports no BLM sensitive or special status plant species with the proposed permit area (WYNDD 2013). No individuals were observed during 2013 field surveys.

References

U.S. Department of the Interior, Bureau of Land Management 2011. Plant Conservation Program. Sensitive Species Which May Occur in the Rawlins Field Office.

Wyoming Natural Diversity Database. 2013. Data compilation for C. Wood of BKS Environmental Associates Inc., completed May 1, 2013. Unpublished report. Wyoming Natural Diversity Database, University of Wyoming, Laramie, Wyoming

Attachment D8-1.3 Table 1: BLM Rawlins Field Office Sensitive Species List*

Scientific Name	Common Name	Local Distribution	Heritage ¹ / State Rank ²
<i>Aquilegia laramiensis</i>	Laramie columbine	Albany and Converse counties	G2/S2, FSR2
<i>Astragalus diversifolius</i>	Meadow milkvetch	Sweetwater and Sublette counties	G2/S1, FSR4
<i>Cirsium aridum</i>	Cedar Rim thistle	Sublette, Fremont, Carbon, and Sweetwater counties	G2Q/S2
<i>Penstemon gibbensii</i>	Gibbens' beardtongue	Carbon and Sweetwater counties	G1G2/S1
<i>Pinus flexilis</i>	Limber pine	Campbell, Converse, Fremont, Natrona and Sweetwater	G4/S5
<i>Rorippa calycina</i>	Persistent sepal yellowcress	Albany, Big Horn, Carbon, Fremont, Park, Sweetwater, and	G3/S3
<i>Sphaeromeria simplex</i>	Laramie false sagebrush	Albany, Carbon, Converse, and Natrona counties	G2G3/S2

* (BLM 2011)

¹ **Heritage Rank Codes:**

- G1: Critically imperiled globally because of extreme rarity (5 or fewer occurrences, or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extinction (Critically endangered throughout its range).
- G2: Imperiled globally because of rarity (6 to 20 occurrences) or because of other factors demonstrably making it very vulnerable to extinction throughout its range. (Endangered throughout its range).
- G3: Very rare or local throughout its range or found locally in a restricted range (21 to 100 occurrences. (Threatened throughout its range).
- G4: Apparently secure globally, though it might be quite rare in parts of its range, especially at the periphery.
- G5: Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
- T1: The variety is critically imperiled globally because of extreme rarity (5 or fewer occurrences, or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extinction (Critically endangered throughout its range).
- Q: Indicates uncertainty about taxonomic status.

² **State Rank Codes:**

- S1: Critically imperiled in state because of extreme rarity (5 or fewer occurrences, or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extirpation from the state. (Critically endangered in state).
- S2: Imperiled in state because of rarity (6 to 20 occurrences) or because of other factors demonstrably making it very vulnerable to extirpation from the state (Endangered or threatened in state).
- S3: Rare in state (21 to 100 occurrences)
- SH: Of historical occurrence, not documented in Wyoming since 1920.