Cunningham Hill Reclamation Project

LAC Minerals (USA) LLC

2020 REVEGETATION EVALUATION REPORT

DECEMBER, 2020

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In Text Tables, Charts, and Figures

LAC Minerals (USA) LLC

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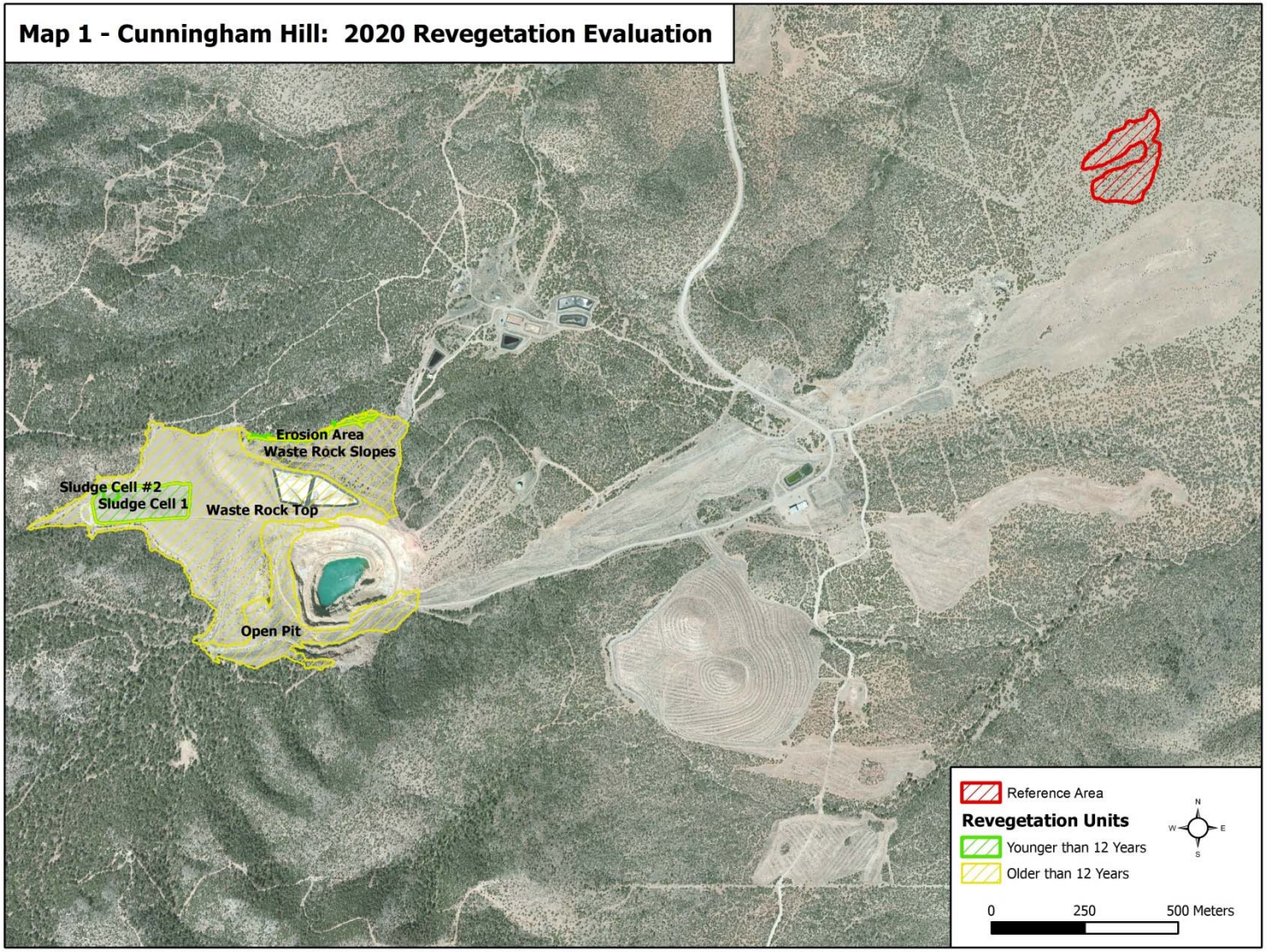
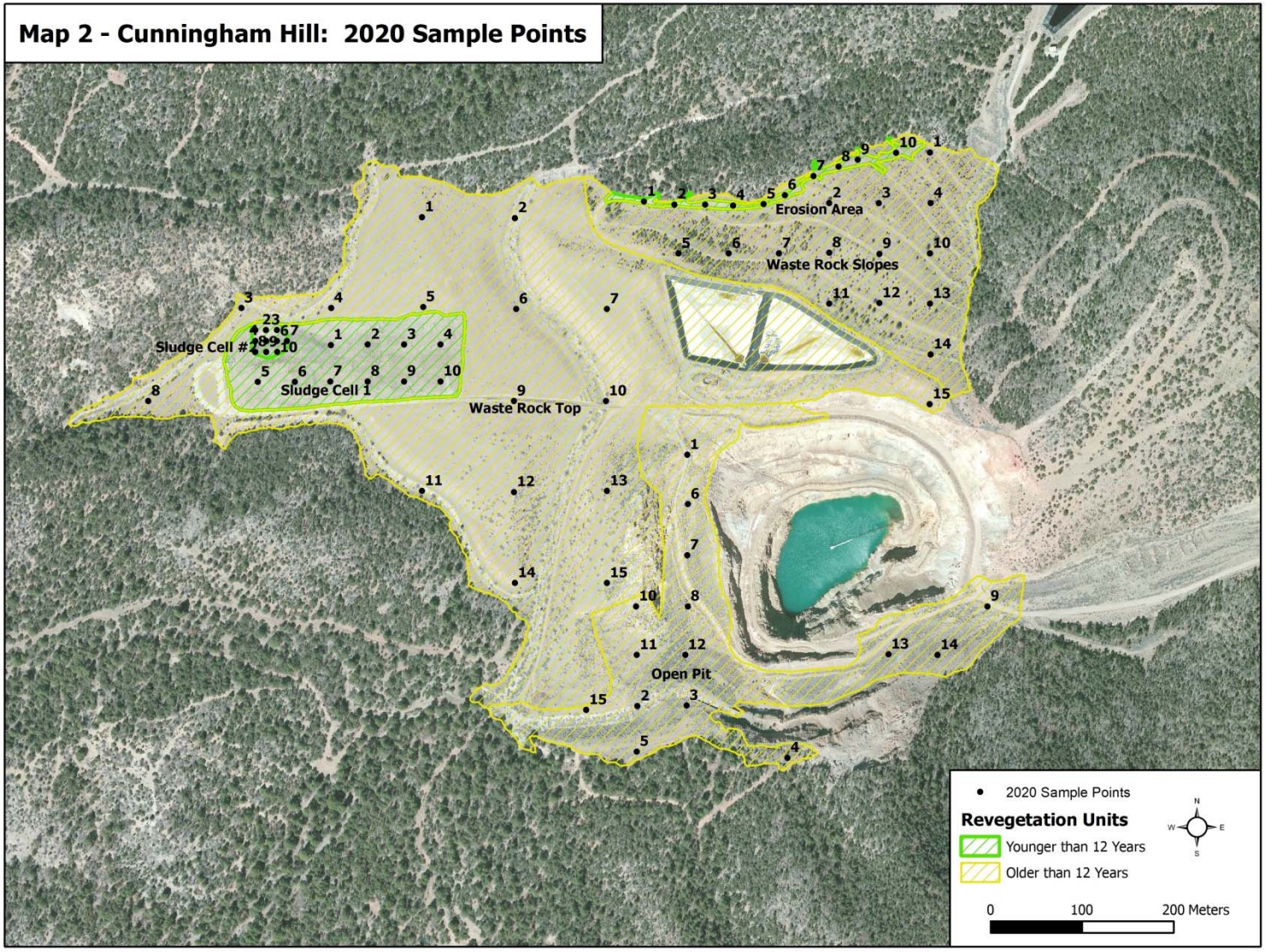
2020 REVEGETATION EVALUATION REPORT

1.0 INTRODUCTION

1.1 General

In 2020 LAC Minerals (USA) LLC's (LAC) retained Cedar Creek Associates, Inc. (Cedar Creek) to evaluate revegetation efforts across the mine site for monitoring purposes. A reference area, established and approved by the Mining and Minerals Division (MMD) in 1997, was sampled to facilitate comparison. Revegetation evaluation was conducted in accordance with the approved close-out plan for the Cunningham Hill Reclamation Project. Sampling was conducted on September 29, 2020 by or under the direct supervision of Cedar Creek's Senior Reclamation Ecologist, Mr. Jesse H. Dillon. Revegetation evaluation occurred in the following areas: Erosion Area, Sludge Cell Areas 1 and 2, Open Pit Area, Waste Rock Top Area, Waste Rock Slope Area, and Reference Area. Area locations are presented on Map 1; transect locations are noted on Map 2. Sampling methodologies are presented in Appendix A.


Map 1 - Cunningham Hill: 2020 Revegetation Evaluation
Erosion Area
Waste Rock Slopes
Sludge Cell #2
Sludge Cell 1
Waste Rock Top
Open Pit
Reference Area
Revegetation Units
Younger than 12 Years
Older than 12 Years
N
W
E
S
0
250
500 Meters


Map 2 - Cunningham Hill: 2020 Sample Points
Erosion Area
Waste Rock Slopes
Sludge Cell #2
Sludge Cell 1
Waste Rock Top
Open Pit
2020 Sample Points
Revegetation Units
Younger than 12 Years
Older than 12 Years
0
100
200 Meters
N
W
E
S

1.2 Precipitation

Table P presents precipitation accumulated annually at the Cunningham Hill Reclamation Project over the past 13 years. Chart P1 displays the seasonal precipitation over the historical record and Chart P2 displays 2019/2020 seasonal precipitation in comparison with the 12 year average. The overall average annual precipitation for the past 13 years is 13.36 inches while the monthly average precipitation levels ranges from 0.60 in April to 2.28 inches in August. This indicates that the growing season at Cunningham Hill Reclamation Project relies on monsoonal precipitation. Average winter precipitation is 2.52 inches while spring, summer, and fall averages 2.26, 4.95, and 3.75 inches, respectively.

Examination of Chart P2 indicates that precipitation for the seasons prior to sampling can be considered slightly below average (2019/2020 precipitation was 82% of 12 year average). The winter and summer of the 2019/2020 growing season received below average precipitation with 68% and 67% of normal levels, respectively. Spring and fall precipitation was approximately average, at 111% and 95%, respectively. The month preceding sampling in September was well below average with 0.18 inches (8% of average) of precipitation for August; however July was above average with 2.74 inches (126% of average). Overall, conditions should be considered somewhat less favorable for the revegetation progress with plants exhibiting slightly below average production and vigor.

Table P - Annual Precipitation at the Cunningham Hill, 2008 - 2020

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2008	1.52	0.95	0.33	0.27	0.47	0.73	2.07	3.85	2.21	2.34	0.11	1.13	**15.98**
2009	1.01	0.88	2.17	0.39	0.06	0.61	2.61	2.71	1.42	0.18	0.31	1.6	**13.95**
2010	0.03	0.64	0.72	1.36	1.01	1.91	1.7	1.07	2.23	0.95	0.28	4.45	**16.35**
2011*	0.03	0.45	0.2	0.21	0.07	0.04	1.92	3.58	0.65	2.29	0.38	1.44	**11.26**
2012*	0.54	0.47	0.3	0.53	0.31	0.15	1.82	1.22	0.97	0.23	0.08	1.18	**7.80**
2013*	0.37	0.49	0.28	0.08	0.17	0.72	3.02	2.46	3.38	1.05	2.08	0.55	**14.65**
2014*	0	0.33	0.78	0.20	2.17	0.08	2.35	2.32	0.65	0.60	0.78	1.15	**11.41**
2015*	0.86	0.89	0.52	0.59	3.22	1.01	3.07	0.60	0.98	2.78	1.36	1.34	**17.22**
2016*	0.64	0.82	0	1.27	1.04	1.22	0.59	4.17	1.95	0.14	2.03	0.78	**14.65**
2017*	2.29	0.47	0.4	1.66	0.19	0.33	2.53	2.48	2.87	0.98	0.20	0.08	**14.48**
2018^	0.18	0.61	0.33	0.00	0.65	0.39	1.67	2.46	1.45	3.16	0.34	1.11	**12.35**
2019^	1.12	0.56	1.71	0.95	1.05	0.51	2.22	2.55	0.78	0.50	2.28	0.63	**14.86**
2020^	0.37	0.71	0.85	0.30	1.37	0.40	2.74	0.18	0.69	0.87	0.21	-----	**8.69**
2008-2020 Avg.	**0.69**	**0.64**	**0.66**	**0.60**	**0.91**	**0.62**	**2.18**	**2.28**	**1.56**	**1.24**	**0.80**	**1.19**	**13.36**

***Precipitation data from Santa Fe Seton, NM NOAA Station- Closest proximity data available for dates listed**

^Precipitation data from Santa Fe 15.7 SSW, NM NOAA Station -Closest proximity data available for dates listed

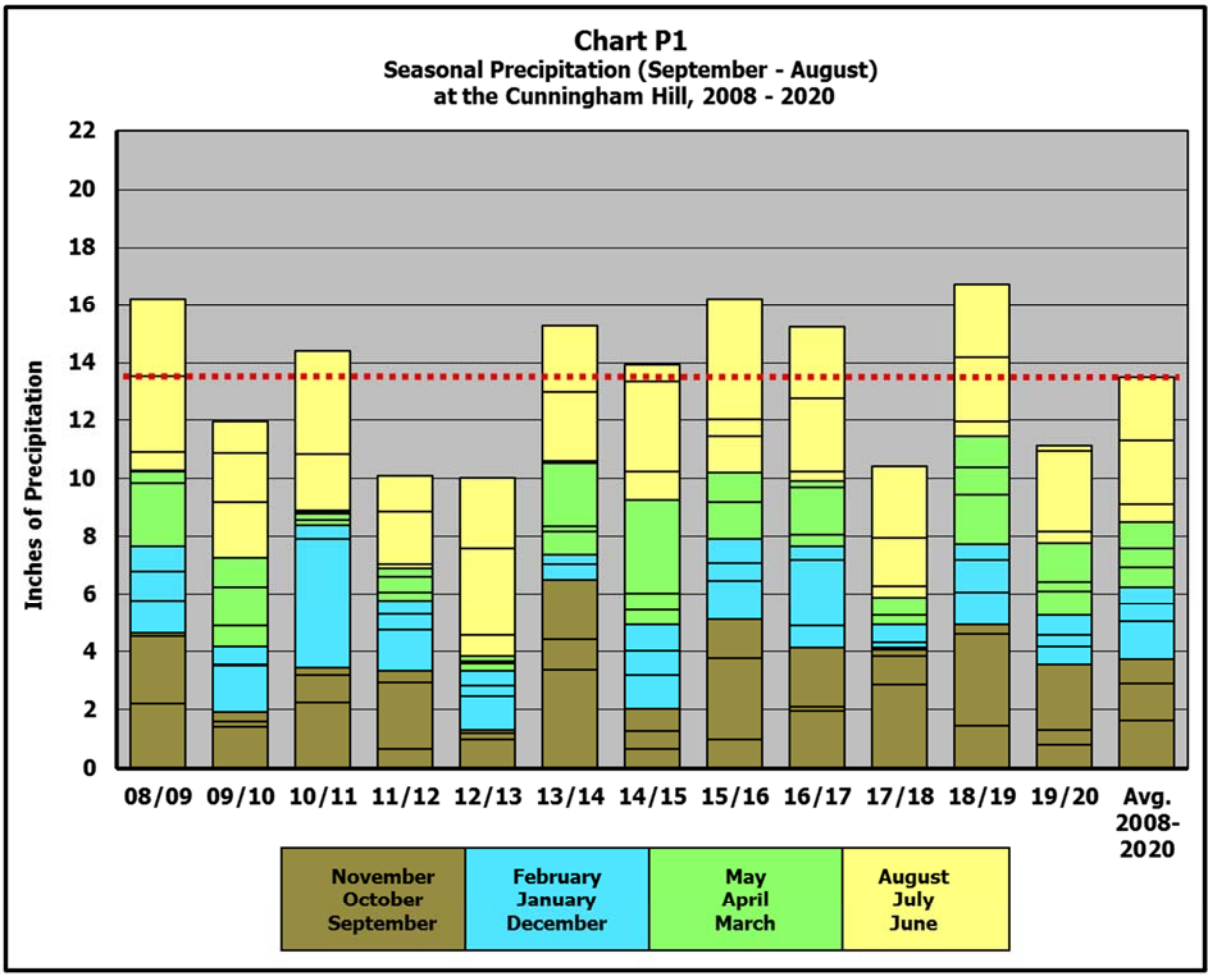


Chart P1
Seasonal Precipitation (September - August)
at the Cunningham Hill, 2008 - 2020
Inches of Precipitation
22
20
18
16
14
12
10
8
6
4
2
0
08/09
09/10
10/11
11/12
12/13
13/14
14/15
15/16
16/17
17/18
18/19
19/20
Avg. 2008-2020
November
October
September
February
January
December
May
April
March
August
July
June

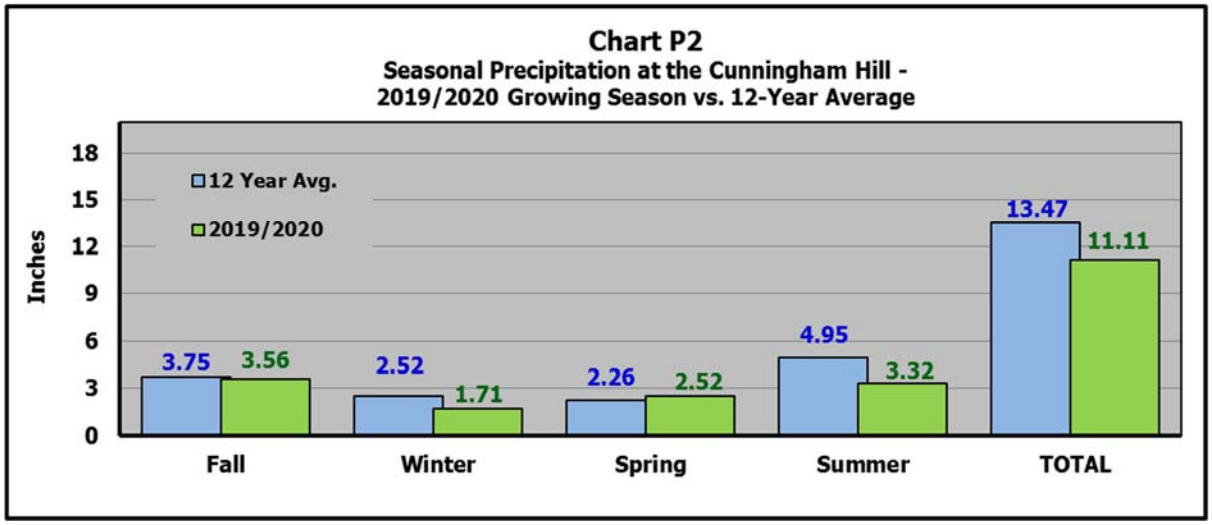


Chart P2
Seasonal Precipitation at the Cunningham Hill -
2019/2020 Growing Season vs. 12-Year Average
Inches
18
15
12
9
6
3
0
12 Year Avg.
2019/2020
3.75
3.56
2.52
1.71
2.26
2.52
4.95
3.32
13.47
11.11
Fall
Winter
Spring
Summer
TOTAL

2.0 REVEGETATION STANDARDS

In accordance with Cunningham Hill's Closeout Plan, revegetated units, planted as shrubland or woodland with woody plants for wildlife habitat, must meet performance standards for ground cover, species diversity, and woody plant density. Revegetation efforts will be considered successful when all standards have been met at the end of the 12-year liability period.

1. Vegetative Ground Cover Standard

Vegetative ground cover must meet at least one of the following two tests:

a) the total vegetative ground cover (exclusive of annual species) in the revegetated unit equals or exceeds 75 percent of the approved reference area's total vegetative ground cover (exclusive of annual species), with 90 percent statistical confidence; or

b) the total vegetative ground cover (exclusive of annual species) in the revegetated unit equals or exceeds 50 percent of the approved reference area's total vegetative cover (exclusive of annual species) with 90 percent statistical confidence, and predicted values of soil loss using the Revised Universal Soil Loss Equation (RUSLE) are equal to or less than the comparison "T" value, which essentially is the soil genesis rate in tons per acre per year.

2. Species Diversity Standard

Species Diversity Standard, as described in the close out plan, requires all non-annual (perennial and biennial) species that contribute at least 2% relative cover (composition) or at least 1% average cover must be tallied. Important species on revegetation units must be greater than 50% of the reference area's important species.

3. Woody Plant Density Standard

Woody Plant Density Standard requires the sampled area to exhibit 220 or more live woody plants per acre suitable for wildlife habitat.

3.0 RESULTS

3.1 Summary

Ground cover data and associated species diversity collected from the Erosion Area, Open Pit Area, Sludge Cell's 1 and 2, Waste Rock Top and Slope Areas, and the Reference Area have been organized, summarized, and presented on a variety of tables and charts at the rear of this document.

Review of the 2020 revegetation evaluation results indicate that the Open Pit Area and the Waste Rock Top and Slope Areas are in excellent condition and readily pass bond release standards for ground cover and species diversity. The Sludge Cell 1, Sludge Cell 2, and Erosion areas are exhibiting favorable plant community development and are progressing toward bond release standards. Summary comparison data presented on Tables 1 - 3 as well as Charts 1 - 5 indicate that in response to LAC's revegetation effort, these areas show excellent revegetation establishment and perennial plant community development. Raw data can be found in Appendix B.

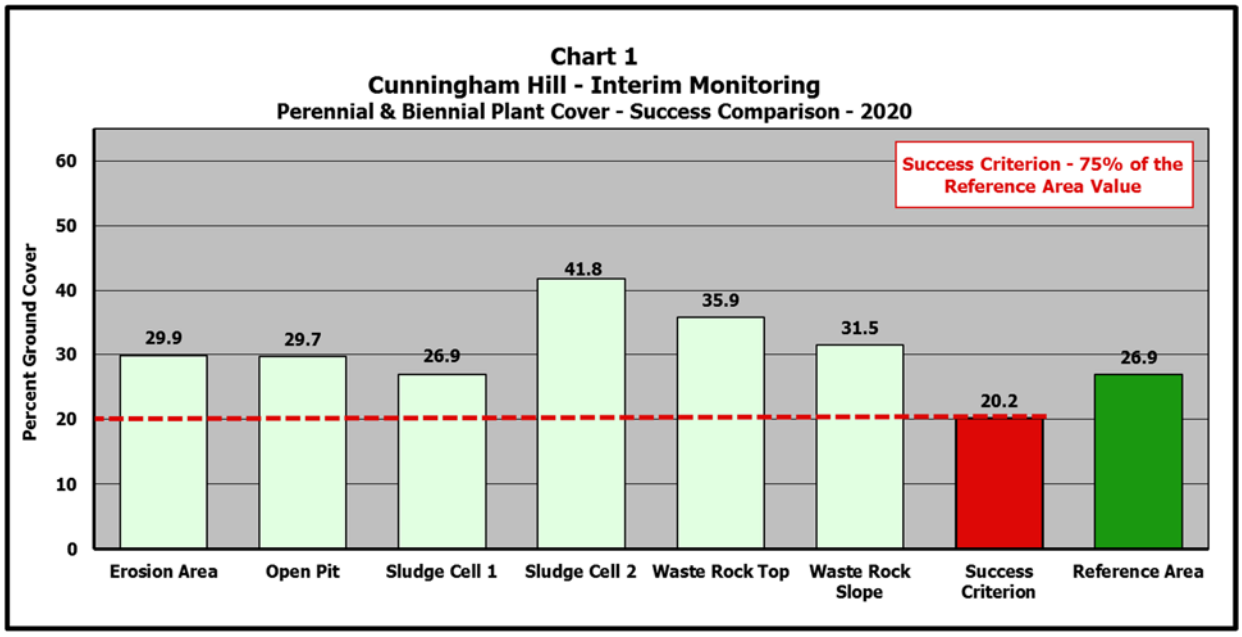


Chart 1
Cunningham Hill - Interim Monitoring
Perennial & Biennial Plant Cover - Success Comparison - 2020
Success Criterion - 75% of the Reference Area Value
Percent Ground Cover
0
10
20
30
40
50
60
29.9
29.7
26.9
41.8
35.9
31.5
20.2
26.9
Erosion Area
Open Pit
Sludge Cell 1
Sludge Cell 2
Waste Rock Top
Waste Rock Slope
Success Criterion
Reference Area

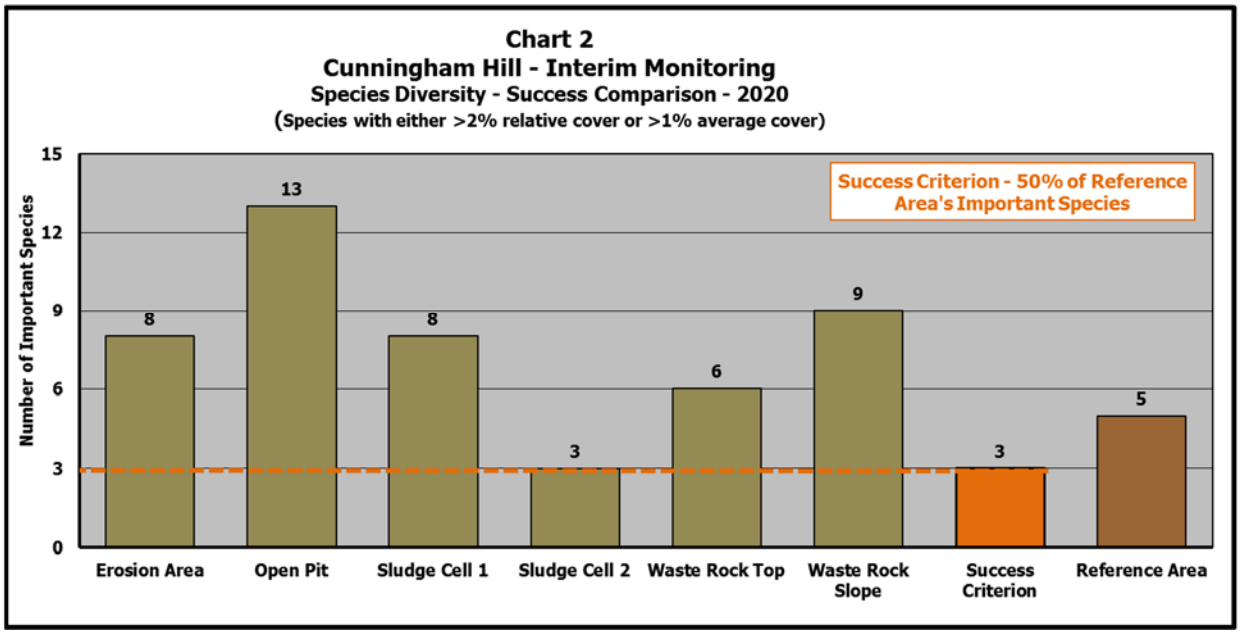


Chart 2
Cunningham Hill - Interim Monitoring
Species Diversity - Success Comparison - 2020
(Species with either >2% relative cover or >1% average cover)
Success Criterion - 50% of Reference Area's Important Species
Number of Important Species
0
3
6
9
12
15
8
13
8
3
6
9
3
5
Erosion Area
Open Pit
Sludge Cell 1
Sludge Cell 2
Waste Rock Top
Waste Rock Slope
Success Criterion
Reference Area

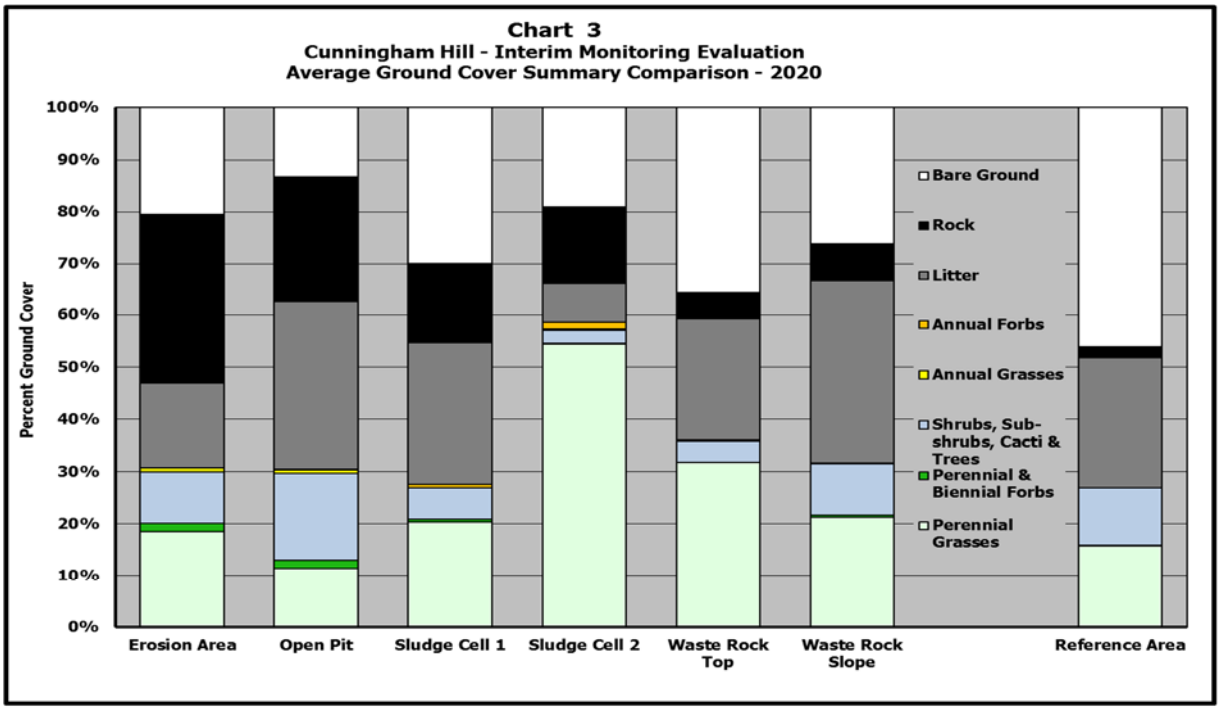


Chart 3
Cunningham Hill - Interim Monitoring Evaluation
Average Ground Cover Summary Comparison - 2020
Percent Ground Cover
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Erosion Area
Open Pit
Sludge Cell 1
Sludge Cell 2
Waste Rock Top
Waste Rock Slope
Reference Area
Bare Ground
Rock
Litter
Annual Forbs
Annual Grasses
Shrubs, Sub-shrubs, Cacti & Trees
Perennial & Biennial Forbs
Perennial Grasses

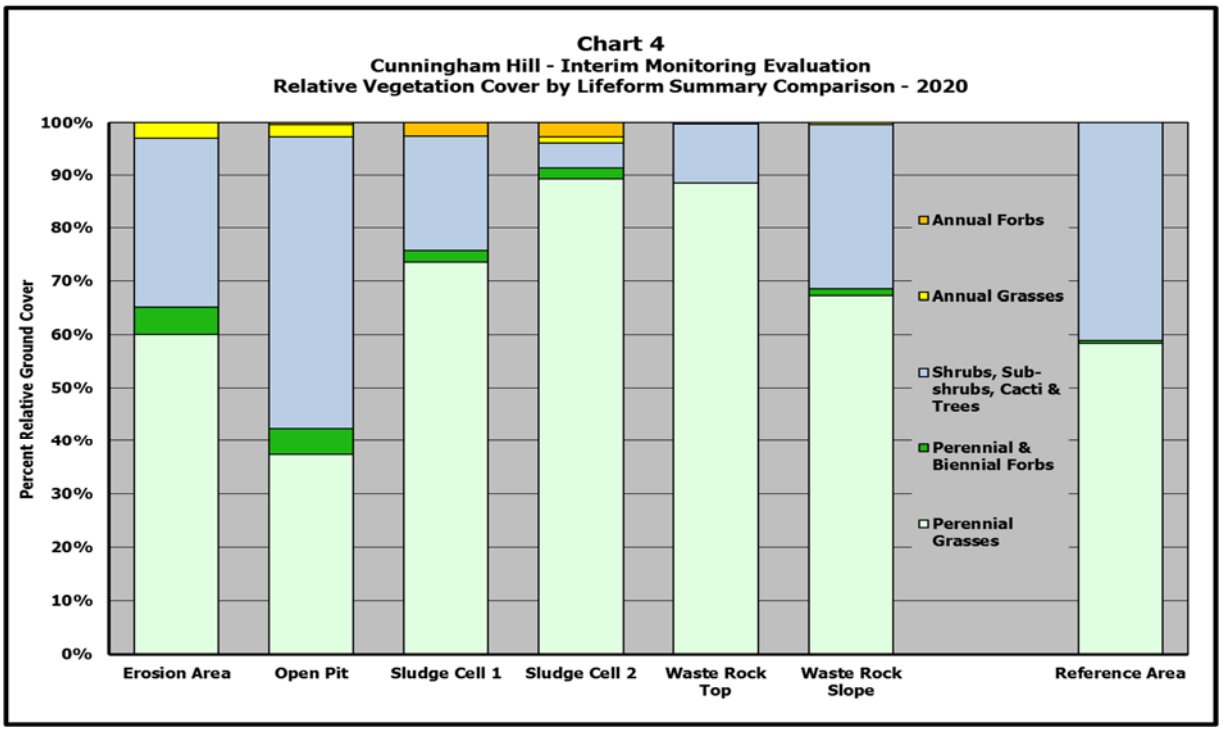


Chart 4
Cunningham Hill - Interim Monitoring Evaluation
Relative Vegetation Cover by Lifeform Summary Comparison - 2020
Percent Relative Ground Cover
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Erosion Area
Open Pit
Sludge Cell 1
Sludge Cell 2
Waste Rock Top
Waste Rock Slope
Reference Area
Annual Forbs
Annual Grasses
Shrubs, Sub-shrubs, Cacti & Trees
Perennial & Biennial Forbs
Perennial Grasses

Table 1 Cunningham Hill - 2020

Average Cover Summary - Interim Monitoring

Percent Ground Cover Based on Point-Intercept Sampling

	Area Sampled -->	Erosion Area	Open Pit	Sludge Cell 1	Sludge Cell 2	Waste Rock Top	Waste Rock Slope	Reference Area
	Scientific Name **Common Name**							
Grasses and Grass - likes								
P	*Agropyron dasystachyum* Thickspike wheatgrass	-	-	3.30	-	1.07	1.73	-
P	*Agropyron smithii* Western wheatgrass	0.40	0.67	3.00	3.80	2.73	0.60	-
P	*Agropyron spicatum* Bluebunch wheatgrass	-	-	-	-	-	0.87	-
P	*Aristida purpurea* Purple three - awn	0.20	0.07	0.10	-	-	-	-
P	*Bouteloua curtipendula* Sideoats grama	1.90	5.93	2.50	0.70	16.80	4.73	-
P	*Bouteloua gracilis* Blue grama	11.80	2.07	6.50	33.80	9.67	4.27	15.60
P	*Bromus inermis* Smooth Brome	-	0.07	0.20	0.20	1.47	0.20	-
A	*Bromus japonicus* Japanese Brome	0.90	-	-	-	-	0.13	-
A	*Bromus tectorum* Cheatgrass	-	0.67	-	0.50	0.07	-	-
P	*Elymus cinereus* Great basin wildrye	-	0.20	-	-	-	-	-
P	*Hilaria jamesii* Galleta	1.40	0.47	-	-	0.07	8.07	0.07
P	*Koeleria cristata* Prairie Junegrass	-	-	-	-	-	0.47	-
P	*Muhlenbergia wrightii* Spike muhly	-	0.27	-	-	-	-	-
P	*Oryzopsis hymenoides* Indian Ricegrass	0.30	-	1.10	0.40	-	-	-
P	*Schizachyrium scoparium* Little bluestem	2.00	-	-	-	-	0.27	-
P	*Sitanion hystrix* Bottlebrush Squirreltail	0.50	0.93	-	-	-	-	0.07
P	*Sporobolus airoides* Alkali Sacaton	-	0.73	0.50	0.10	-	-	-
P	*Stipa neomexicana* New Mexico Feathergrass	-	-	3.10	0.10	-	0.07	-
Forbs								
P	*Euphorbia sp.* Sandmat	-	0.07	-	-	-	-	-
A	*Ipomopsis longiflora* Flaxflowered ipomopsis	-	0.07	-	-	-	-	-
A	*Machaeranthera canescens* Hoary tansyaster	-	0.07	0.70	0.10	-	-	-
B	*Melilotus officinalis* Yellow Sweetclover	-	0.27	0.30	0.20	-	0.07	-
P	*Penstemon palmeri* Palmer Penstemon	0.20	1.20	-	-	-	0.20	-
P	*Petalostemon purpureum* Purple prairie clover	0.30	-	-	-	-	-	-
A	*Salsola tragus* Russian Thistle	-	-	-	1.10	-	-	-
P	*Solanum elaeagnifolium* Silverleaf nightshade	-	-	-	0.30	-	-	-
P	*Sphaeralcea coccinea* Scarlet Globemallow	1.10	-	0.30	0.40	-	0.07	0.13
B	*Tragopogon dubius* Yellow salsify		-		-	-	0.07	-
Shrubs, Sub-shrubs, Cacti & Trees								
P	*Atriplex canescens* Fourwing Saltbush	3.10	-	-	1.50	-	-	-
P	*Berberis fremontii* Fremont's Barberry	-	-	-	-	-	-	0.20
P	*Brickellia californica* California Brickellbush	-	0.47	-	-	-	-	-
P	*Cercocarpus ledifolius* Curl-leaf Mtn. Mahogany	-	1.13	-	-	-	-	-
P	*Cercocarpus montanus* Mountain Mahogany	-	0.20	-	-	-	-	-
P	*Chrysothamnus nauseosus* Rubber Rabbitbrush	2.30	3.13	2.40	-	-	1.80	-
P	*Fallugia paradoxa* Apache Plume	-	0.80	-	-	-	0.27	-
P	*Gutierrezia sarothrae* Broom Snakeweed	4.20	1.33	3.20	0.40	3.00	3.13	6.13
P	*Juniperus monosperma* One-seed Juniper	-	0.67	-	-	0.53	3.33	2.53
P	*Opuntia polyacantha* Plains Pricklypear	-	-	0.20	-	0.27	-	0.67
P	*Opuntia spinosior* Walkingstick Cactus	-	0.07	-	-	-	0.27	1.20
P	*Pinus edulis* Two-needle Pinyon	-	0.87	-	-	-	-	0.33
P	*Pinus ponderosa* Ponderosa pine	-	-	-	-	-	1.00	-
P	*Rhus trilobata* Skunkbush Sumac	-	8.07	-	-	-	-	-
P	*Senecio flaccidus var. f.* Threadleaf Ragwort	-	-	0.20	-	-	-	-
P	*Yucca glauca* Soapweed Yucca	0.20	-	-	0.20	0.27	-	-
	Total Plant Cover	**30.80**	**30.47**	**27.60**	**43.80**	**35.93**	**31.60**	**26.93**
	Rock	32.70	24.20	15.40	13.20	4.93	7.13	2.07
	Litter	16.10	32.13	27.10	22.20	23.40	35.13	24.87
	Bare ground	20.40	13.20	29.90	20.80	35.73	26.13	46.13
	Perennial & Biennial Plant Cover	**29.90**	**29.67**	**26.90**	**41.80**	**35.87**	**31.47**	**26.93**
Sampling Adequacy Calculations:	**variance =**	81.96	133.84	115.60	109.29	193.07	73.54	36.64
	n =	10	15	10	10	15	15	15
	n_{min} =	**29.03**	**44.73**	**50.99**	**19.14**	**46.39**	**22.85**	**15.67**

* P - Perennial, B - Biennial, A - Annual

Table 2 Cunningham Hill - 2020

Relative Cover Summary (Composition) - Interim Monitoring

Percent Ground Cover Based on Point-Intercept Sampling

	Scientific Name	*Area Sampled -->* Common Name	Erosion Area	Open Pit	Sludge Cell 1	Sludge Cell 2	Waste Rock Top	Waste Rock Slope	Reference Area
Grasses and Grass - likes									
P	*Agropyron dasystachyum*	Thickspike wheatgrass	-	-	**11.96**	-	**2.97**	**5.49**	-
P	*Agropyron smithii*	Western wheatgrass	1.30	**2.19**	**10.87**	**8.68**	**7.61**	1.90	-
P	*Agropyron spicatum*	Bluebunch wheatgrass	-	-	-	**-**	-	**2.74**	-
P	*Aristida purpurea*	Purple three - awn	0.65	0.22	0.36	-	-	-	-
P	*Bouteloua curtipendula*	Sideoats grama	**6.17**	**19.47**	**9.06**	1.60	**46.75**	**14.98**	-
P	*Bouteloua gracilis*	Blue grama	**38.31**	**6.78**	**23.55**	**77.17**	**26.90**	**13.50**	**57.92**
P	*Bromus inermis*	Smooth Brome	-	0.22	0.72	0.46	**4.08**	0.63	-
A	*Bromus japonicus*	Japanese Brome	2.92	-	-	-	**-**	0.42	-
A	*Bromus tectorum*	Cheatgrass	-	2.19	-	1.14	0.19	-	-
P	*Elymus cinereus*	Great basin wildrye	-	0.66	-	-	-	-	-
P	*Hilaria jamesii*	Galleta	**4.55**	1.53	-	-	0.19	**25.53**	0.25
P	*Koeleria cristata*	Prairie Junegrass	-	-	-	-	-	1.48	-
P	*Muhlenbergia wrightii*	Spike muhly	-	0.88	-	-	-	-	-
P	*Oryzopsis hymenoides*	Indian Ricegrass	0.97	-	**3.99**	0.91	-	-	-
P	*Schizachyrium scoparium*	Little bluestem	**6.49**	-	-	-	-	0.84	-
P	*Sitanion hystrix*	Bottlebrush Squirreltail	1.62	**3.06**	-	-	-	-	0.25
P	*Sporobolus airoides*	Alkali Sacaton	-	**2.41**	1.81	0.23	-	-	-
P	*Stipa neomexicana*	New Mexico Feathergrass	-	-	**11.23**	0.23	-	0.21	-
Forbs									
P	*Euphorbia sp.*	Sandmat	-	0.22	-	-	-	-	-
A	*Ipomopsis longiflora*	Flaxflowered ipomopsis	-	0.22	-	-	-	-	-
A	*Machaeranthera canescens*	Hoary tansyaster	-	0.22	2.54	0.23	-	-	-
B	*Melilotus officinalis*	Yellow Sweetclover	-	0.88	1.09	0.46	-	0.21	-
P	*Penstemon palmeri*	Palmer Penstemon	0.65	**3.94**	-	-	-	0.63	-
P	*Petalostemon purpureum*	Purple prairie clover	0.97	-	-	-	-	-	-
A	*Salsola tragus*	Russian Thistle	-	-	-	2.51	-	-	-
P	*Solanum elaeagnifolium*	Silverleaf nightshade	-	-	-	0.68	-	-	-
P	*Sphaeralcea coccinea*	Scarlet Globemallow	**3.57**	-	1.09	0.91	-	0.21	0.50
B	*Tragopogon dubius*	Yellow salsify	-	-	-	-	-	0.21	-
Shrubs, Sub-shrubs, Cacti & Trees									
P	*Atriplex canescens*	Fourwing Saltbush	**10.06**	-	**-**	**3.42**	-	-	-
P	*Berberis fremontii*	Fremont's Barberry	**-**	-	**-**	**-**	-	-	0.74
P	*Brickellia californica*	California Brickellbush	**-**	1.53	**-**	**-**	-	-	-
P	*Cercocarpus ledifolius*	Curl-leaf Mtn. Mahogany	-	**3.72**	-	-	-	-	-
P	*Cercocarpus montanus*	Mountain Mahogany	-	0.66	-	-	-	-	-
P	*Chrysothamnus nauseosus*	Rubber Rabbitbrush	**7.47**	**10.28**	**8.70**	-	-	**5.70**	-
P	*Fallugia paradoxa*	Apache Plume	-	**2.63**	-	-	-	0.84	-
P	*Gutierrezia sarothrae*	Broom Snakeweed	**13.64**	**4.38**	**11.59**	0.91	**8.35**	**9.92**	**22.77**
P	*Juniperus monosperma*	One-seed Juniper	-	**2.19**	-	-	1.48	**10.55**	**9.41**
P	*Opuntia polyacantha*	Plains Pricklypear	-	-	0.72	-	0.74	-	**2.48**
P	*Opuntia spinosior*	Walkingstick Cactus	-	0.22	-	-	-	0.84	**4.46**
P	*Pinus edulis*	Two-needle Pinyon	-	**2.84**	-	-	-	-	1.24
P	*Pinus ponderosa*	Ponderosa pine	-	-	-	-	-	**3.16**	-
P	*Rhus trilobata*	Skunkbush Sumac	-	**26.48**	-	-	-	-	-
P	*Senecio flaccidus var. f.*	Threadleaf Ragwort	-	-	0.72	-	-	-	-
P	*Yucca glauca*	Soapweed Yucca	0.65	-	-	0.46	0.74	-	-
	Number of Species with > 2% Relative Cover or > 1% Absolute Cover (excluding annuals)		**8**	**13**	**8**	**3**	**6**	**9**	**5**

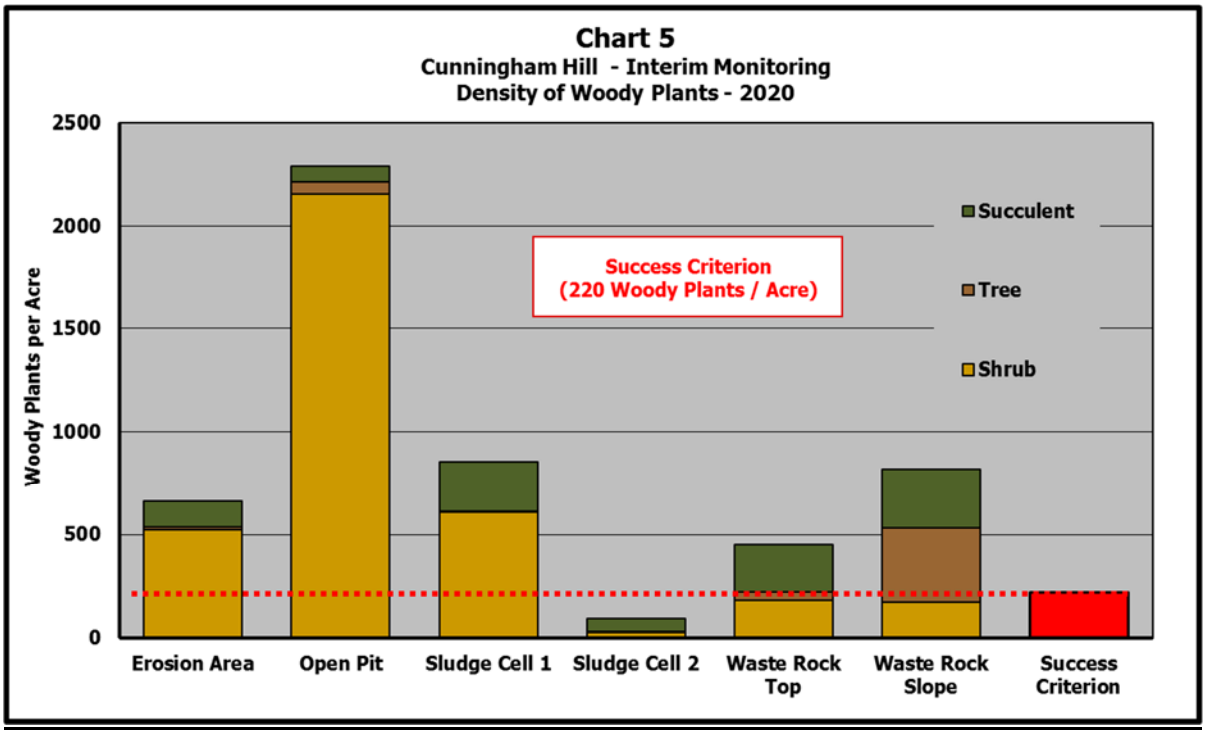
***** P - Perennial, B - Biennial, A - Annual

Table 3 Cunningham Hill - Vegetation Density - 2020

Woody Plant Density Summary - Interim Monitoring

Live Stems per Acre

Lifeform	Scientific name	Common Name	Erosion Area	Open Pit	Sludge Cell 1	Sludge Cell 2	Waste Rock Top	Waste Rock Slope
		Area Sampled -->						
S	*Atriplex canescens*	Fourwing Saltbush	186.2	59.4	85.0	28.3	43.2	45.9
S	*Brickellia californica*	California Brickellbush	-	8.1	8.1	-	78.2	-
S	*Cercocarpus ledifolius*	Curl-leaf Mtn. Mahogany	-	54.0	-	-	-	-
S	*Cercocarpus montanus*	Mountain Mahogany	4.0	59.4	-	-	-	2.7
S	*Chrysothamnus nauseosus*	Rubber Rabbitbrush	311.6	1,044.1	509.9	-	51.3	97.1
S	*Fallugia paradoxa*	Apache Plume	12.1	45.9	4.0	-	2.7	18.9
T	*Juniperus monosperma*	One-seed Juniper	-	24.3	4.0	4.0	27.0	137.6
Su	*Opuntia polyacantha*	Plains Pricklypear	52.6	24.3	105.2	16.2	148.4	126.8
Su	*Opuntia spinosior*	Walkingstick Cactus	4.0	37.8	28.3	4.0	45.9	107.9
T	*Pinus edulis*	Two-needle Pinyon	12.1	27.0	-	-	13.5	134.9
T	*Pinus ponderosa*	Ponderosa pine	-	2.7	-	-	-	83.6
T	*Quercus gambelii*	Gambels oak	-	8.1	-	-	-	2.7
S	*Rhus trilobata*	Skunkbush Sumac	-	884.9	-	-	2.7	2.7
S	*Senecio flaccidus var. flaccidus*	Threadleaf Ragwort	8.1	-	-	-	2.7	5.4
Nx	*Ulmus pumila*	Siberian elm	-	-	-	-	2.7	-
Su	*Yucca glauca*	Soapweed Yucca	72.8	13.5	109.3	44.5	35.1	54.0
Life Form		**Shrub (S)**	**522.0**	**2,155.6**	**607.0**	**28.3**	**180.8**	**172.7**
		Tree (T)	**12.1**	**62.1**	**4.0**	**4.0**	**40.5**	**358.8**
		Succulent (Su)	**129.5**	**75.5**	**242.8**	**64.7**	**229.3**	**288.7**
		Noxious (Nx)	**-**	**-**	**-**	**-**	**2.7**	**-**
Total Woody Plants per Acre (Excluding Noxious)			**663.7**	**2,293.2**	**853.9**	**97.1**	**450.6**	**820.2**
Sample Adequacy Calculations		**n =**	**10**	**15**	**10**	**Total Count**	**15**	**15**
		n_{min} =	**245.86**	**71.38**	**349.49**		**161.71**	**64.72**



3.2 Erosion Area

The Erosion Area was sampled with 10 cover transects in 2020 (see Map 2). Examination of Table 1 indicates that total plant cover was 30.8%, of which 29.9% was expressed as perennial and biennial cover. Rock, litter, and bare ground exposure exhibited cover values of 32.7%, 16.1%, and 20.4%, respectively. Total vegetative cover (exclusive of annual species) for Erosion Area exceeds the ground cover performance criterion (29.9% vs. 20.2% [75% of Reference Area Cover]). A total of 22 species were observed in the Erosion Area (Table A1), 8 of which are considered "important" species, exceeding the species diversity performance criterion (8 vs. 3 [50% of Reference Area "Important" Species]). Dominant taxa were blue grama (*Bouteloua gracilis*), broom snakeweed (*Gutierrezia sarothrae*), and fourwing saltbush (*Atriplex canescens*) with 11.8%, 4.2%, and 3.1% cover, respectively. Review of Table 3 and Chart 5 reveal that woody plant density (excluding noxious species) on this unit was 663 woody plants per acre. Dominant woody plants were rubber rabbitbrush (*Chrysothamnus nauseosus*) with 311 plants per acre and fourwing saltbush (*Atriplex canescens)* with 186 plants per acre. The Erosion Area exceeds the woody plant density performance criterion (663 live stems per acre vs 220 live stems per acre). These results indicate that the Erosion Area currently passes all bond release performance criteria for revegetation.

Photo 1. Erosion Area - 2020

3.3 Open Pit Area

The Open Pit Area was sampled with 15 cover transects in 2020 (see Map 2). Examination of Table 1 indicates that total plant cover was 30.5%, of which 29.7% was expressed as perennial and biennial cover. Rock, litter, and bare ground exposure exhibited cover values of 24.2%, 32.1%, and 13.2%, respectively. Total vegetative cover (exclusive of annual species) for Open Pit Area exceeds the ground cover performance criterion (29.7% vs. 20.2% [75% of Reference Area Cover]). A total of 31 species were observed in the Open Pit Area (Table A1), 13 of which are considered "important" species, exceeding the species diversity performance criterion (13 vs. 3 [50% of Reference Area "Important" Species]). Dominant taxa were skunkbush sumac (*Rhus trilobata*), sideoats grama (*Bouteloua curtipendula*), and rubber rabbitbrush with 8.0%, 5.9% and 3.1% cover, respectively. Review of Table 3 and Chart 5 reveal that woody plant density on this unit was 2,293 woody plants per acre (excluding noxious species). Dominant woody plants were rubber rabbitbrush and skunkbush sumac and with 1,044 and 884 plants per acre, respectively. The Open Pit Area significantly exceeds the woody plant density performance criterion (2,293 live stems per acre vs 220 live stems per acre). These results indicate that the Open Pit Area currently passes all bond release performance criteria for revegetation.

Photo 2. Open Pit Area - 2020

3.4 Sludge Cell 1 Area

The Sludge Cell 1 Area was sampled with 10 cover transects in 2020 (see Map 2). Examination of Table 1 indicates that total plant cover was 27.6%, of which 26.9% was expressed as perennial and biennial cover. Rock, litter, and bare ground exposure exhibited cover values of 15.4%, 27.1%, and 29.9%, respectively. Total vegetative cover (exclusive of annual species) for Sludge Cell 1 Area exceeds the ground cover performance criterion (26.9% vs. 20.2% [75% of Reference Area Cover]). A total of 21 species were observed in the Sludge Cell 1 Area (Table A1), 8 of which are considered "important" species, exceeding the species diversity performance criterion (8 vs. 3 [50% of Reference Area "Important" Species]). Dominant taxa were blue grama with 6.5% cover, thickspike wheatgrass (*Agropyron dasystachyum*) with 3.3% cover, western wheatgrass (*Agropyron smithii*) with 3.0% cover, new mexico feathergrass (*Stipa neomexicana*) with 3.1% cover and broom snakeweed with 3.2% cover. Review of Table 3 and Chart 5 reveal that woody plant density on this unit was 853 woody plants per acre (excluding noxious species). The dominant woody plant was rubber rabbitbrush with 509 plants per acre. The Sludge Cell 1 Area significantly exceeds the woody plant density performance criterion (853 live stems per acre vs 220 live stems per acre). These results indicate that the Sludge Cell 1 Area currently passes all bond release performance criteria for revegetation.

Photo 3. Sludge Cell 1 Area - 2020

3.5 Sludge Cell 2 Area

The Sludge Cell 2 Area was sampled with 10 cover transects in 2020 (see Map 2). Examination of Table 1 indicates that total plant cover was 43.8%, of which, 41.8% was expressed as perennial and biennial cover. Rock, litter, and bare ground exposure exhibited cover values of 13.2%, 22.2%, and 20.8%, respectively. Total vegetative cover (exclusive of annual species) for Sludge Cell 2 Area significantly exceeds the ground cover performance criterion (41.8% vs. 20.2% [75% of Reference Area Cover]). A total of 19 species were observed in the Sludge Cell 2 Area (Table A1), 3 of which are considered "important" species, this does not exceed the species diversity performance criterion (3 vs. 3 [50% of Reference Area "Important" Species]). Blue grama was the dominant taxon contributing 33.8% cover. Review of Table 3 and Chart 5 reveal that woody plant density on this unit was 97 woody plants per acre (excluding noxious species). The dominant woody plant was soapweed yucca (*Yucca glauca*) with 44.5 plants per acre. The Sludge Cell 2 Area does not exceed the woody plant density performance criterion (97 live stems per acre vs 220 live stems per acre). These results indicate that the Sludge Cell 2 Area is still progressing towards passing bond release performance criteria for revegetation.

Photo 4. Sludge Cell 2 Area - 2020

3.6 Waste Rock Top Area

The Waste Rock Top Area was sampled with 15 cover transects in 2020 (see Map 2). Examination of Table 1 indicates that total plant cover was 35.9%, of which 35.8% was expressed as perennial and biennial cover. Rock, litter, and bare ground exposure exhibited cover values of 4.9%, 23.4%, and 35.7%, respectively. Total vegetative cover (exclusive of annual species) for Waste Rock Top Area significantly exceeds the ground cover performance criterion (35.8% vs. 20.2% [75% of Reference Area Cover]). A total of 20 species were observed in the Waste Rock Top Area (Table A1), 6 of which are considered "important" species, exceeding the species diversity performance criterion (6 vs. 3 [50% of Reference Area "Important" Species]). Dominant taxa were sideoats grama, blue grama, and broom snakeweed with 16.8%, 9.6%, and 3% cover, respectively. Review of Table 3 and Chart 5 reveal that woody plant density on this unit was 450 woody plants per acre (excluding noxious species). Dominant woody plants were plains prickly pear (*Opuntia polyacantha*) and california brickellbush *(Brickellia californica*) with 148 and 78 plants per acre, respectively. The Waste Rock Top Area significantly exceeds the woody plant density performance criterion (450 live stems per acre vs 220 live stems per acre). These results indicate that the Waste Rock Top Area currently passes all bond release performance criteria for revegetation.

Photo 5. Waste Rock Top Area - 2020

3.7 Waste Rock Slope Area

The Waste Rock Slope Area was sampled with 15 cover transects in 2020 (see Map 2). Examination of Table 1 indicates that total plant cover was 31.6%, of which 31.4% was expressed as perennial and biennial cover. Rock, litter, and bare ground exposure exhibited cover values of 7.1%, 35.1%, and 26.1%, respectively. Total vegetative cover (exclusive of annual species) for Waste Rock Slope Area significantly exceeds the ground cover performance criterion (31.4% vs. 20.2% [75% of Reference Area Cover]). A total of 29 species were observed in the Waste Rock Slope Area (Table A1), 9 of which are considered "important" species, exceeding the species diversity performance criterion (9 vs. 3 [50% of Reference Area "Important" Species]). Dominant taxa were galleta (*Hilaria jamesii*), sideoats grama, and blue grama with 8.0%, 4.7 %, and 4.2% cover, respectively. Review of Table 3 and Chart 5 reveal that woody plant density on this unit was 820 woody plants per acre (excluding noxious species). Dominant woody plants were one-seed juniper (*Juniperus monosperma)* and two-needle pinon (*Pinus edulis*) with 137 and 134 plants per acre, respectively. The Waste Rock Slope Area significantly exceeds the woody plant density performance criterion (820 live stems per acre vs 220 live stems per acre). These results indicate that the Waste Rock Slope Area currently passes all bond release performance criteria for revegetation.

Photo 6. Waste Rock Slope Area - 2020

3.8 Reference Area

The approved reference area was sampled with 15 cover transects in 2020 (Map 2). Examination of Table 1 indicates that total plant cover was 26.9%, consisting entirely as perennial and biennial cover. Rock, litter, and bare ground exposure exhibited cover values of 2.0%, 24.8%, and 46.1%, respectively. Dominant taxa were blue grama, and broom snakeweed, with 15.6%, and 6.1% cover, respectively. A total of 10 species were observed in the reference area (Table A1), 5 which are considered "important" species.

Photo 7. Reference Area - 2020

4.0 RECOMMENDATIONS

Based on the results of this evaluation it is clear that all revegetation areas are exhibiting plant community development as expected. Therefore, Cedar Creek recommends that future monitoring efforts incorporate the smaller, younger areas (Erosion, Sludge Cell 1, and Sludge Cell 2) into the larger areas they are contained within. The Erosion area (0.72 acres) seeded in 2009 can be absorbed into the Waste Dump Slope area (14.43 acres) seeded in 1992. The Sludge Cell 1 (5.43 acres) and Sludge Cell 2 (0.33 acres) areas seeded in 2008 and 2011 respectively can be absorbed into the Waste Dump Top area (44.62 acres) seeded in 1992.

5.0 REFERENCES CITED

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Appendix A

Sampling Methods

Appendix A - Sampling Methods

INTRODUCTION

Cedar Creek's sampling protocols involve a concentration upon ground cover* to facilitate repeatable future statistical comparisons among treatment areas (or unique revegetation units) and over time. A concentration on ground cover is recommended for a multitude of reasons. First, concentration on a single variable of plant ecology facilitates improved comprehension and comparability over time and among treatment scenarios. Second, ground cover data, especially when determined using a very precise method such as the point-intercept procedure, provides some of the most important information regarding community variability that ecologists can evaluate. Such data facilitate the determination of the true species composition, relative health (condition), and successional status of the sampled area. Furthermore, the same data can be utilized to develop the additional variables of frequency and species composition if desired. Third, strong inferences can be developed with other reasonably correlated variables such as production when species composition is factored into the analysis. Fourth, ground cover is a preferred variable for monitoring because cover data can be readily obtained in a statistically adequate and cost-effective manner (using the proper procedures), has broad application for evaluation (including erosion control modeling), precisely reflects species' dominance of a given area, and when collected using bias-free techniques such as the point-intercept procedure is one of the most repeatable variables among independent observers. Finally, cover is the primary variable indicated for use by the company's Closeout Plan for determination of successful revegetation.

However, in addition to ground cover sampling, MMD and hence the Closeout Plan, require evaluation of woody plant density. In this regard, it was determined most appropriate to monitor the progress of woody plant establishment and development (for wildlife habitat considerations) utilizing density belts as detailed in Section A-3.

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* To avoid confusion, the term "ground cover" is utilized to indicate the variable of non-overlapping foliar cover (the percent of the ground occupied by all above ground live plant material) in addition to the ground surface covered by litter or rock. Non-overlapping means that only that cover which would be wetted by a light mist would be counted as opposed to that plant material which would not get wet due to overshadowing plant material. In this manner, total ground cover cannot exceed 100%. Other forms of "cover" would include: basal cover (the percent of the ground surface occupied by the living base of plants), crown or canopy cover (the percent of the ground occupied by the canopies of plants), or overlapping foliar cover (the percent of the ground occupied by all plant material allowing for overlapping vegetation - i.e., such cover can exceed 100%). Non-overlapping foliar cover is preferred because of its inherent repeatability among observers, resulting data are directly applicable to erosion control modeling efforts, and significant precedent has already been set in the industry. In contrast, the determination of the live portion of the base of a plant (as necessary for basal cover) becomes increasingly difficult given life forms such as certain bunch grasses and sod-formers.

A-1 Sample Site Selection / Location

As indicated in the revised Closeout Plan, sample site location for the reclaimed areas suggests use of a systematic procedure initiated in an unbiased manner for each unique revegetation unit investigated as well as the reference area. In this manner, "representation" from the entire reclaimed unit is "forced" rather than risking the chance that significant pockets are entirely missed, or over-emphasized, as may occur in strictly random sampling. This systematic procedure also provides proportionate representation from across the reclaimed unit for such characteristics as aspect and slope. An example of this procedure is indicated on Figure 1 and the actual results on Map 2.

The systematic procedure for sample location occurred in the following stepwise manner. First, a fixed point of reference was selected for each area to facilitate location of the systematic grid in the field. Second, a systematic grid of appropriate dimensions (e.g., 125' X 125') was selected by Cedar Creek to provide a minimum number of coordinate intersections within the reclaimed unit that could then be used for the initial set of sample sites. Third, a scaled representation of the grid was overlain on computer-generated field maps of each facility extending parallel to major compass axes. Fourth, unbiased placement of this grid was controlled by selection of two random numbers to be used as coordinates to establish a sampling starting point. Fifth, utilizing a handheld compass and pacing techniques or a handheld GPS, all of the initial sample points for each area were located in the field. The result of this activity is provided on Map 2. If the initial systematic samples had not been sufficient to provide an adequate ground cover or woody plant density sample for bond release evaluations, an "intergrid" would have been selected to provide additional systematically determined sample points.

The reference area to be utilized for comparison to the reclaimed areas was selected from an undisturbed area typical of the soils and other physical attributes of the reclaimed area (see Map 1). This area was approved by MMD on September 2, 1997. More important, however, is that this is one of the few areas sufficiently sizable (6.84 acres) in the project area that is dominated by a natural grassland community, the most appropriate and representative target for reclaimed communities. A few scattered junipers occur within the reference area but are exempted from sampling if mature. The other communities in the project area (primarily piñon - juniper woodland) are overwhelmingly dominated by woody species that take decades, perhaps centuries, to evolve. Furthermore, reference areas comprised of these "woody" communities would defeat certain fundamental assumptions necessary for a valid comparison the most primary of which is equivalence or similarity of form and function. In any event, sample site selection in the reference area occurred in a manner very similar to that for the reclaimed areas. The only difference being that the occasional mature junipers were specifically avoided as they are not representative of the grassland community. In this regard, where a ground cover transect intercepted a mature tree (greater than 5 feet in height), the cover transect was interrupted at the "drip line" of the

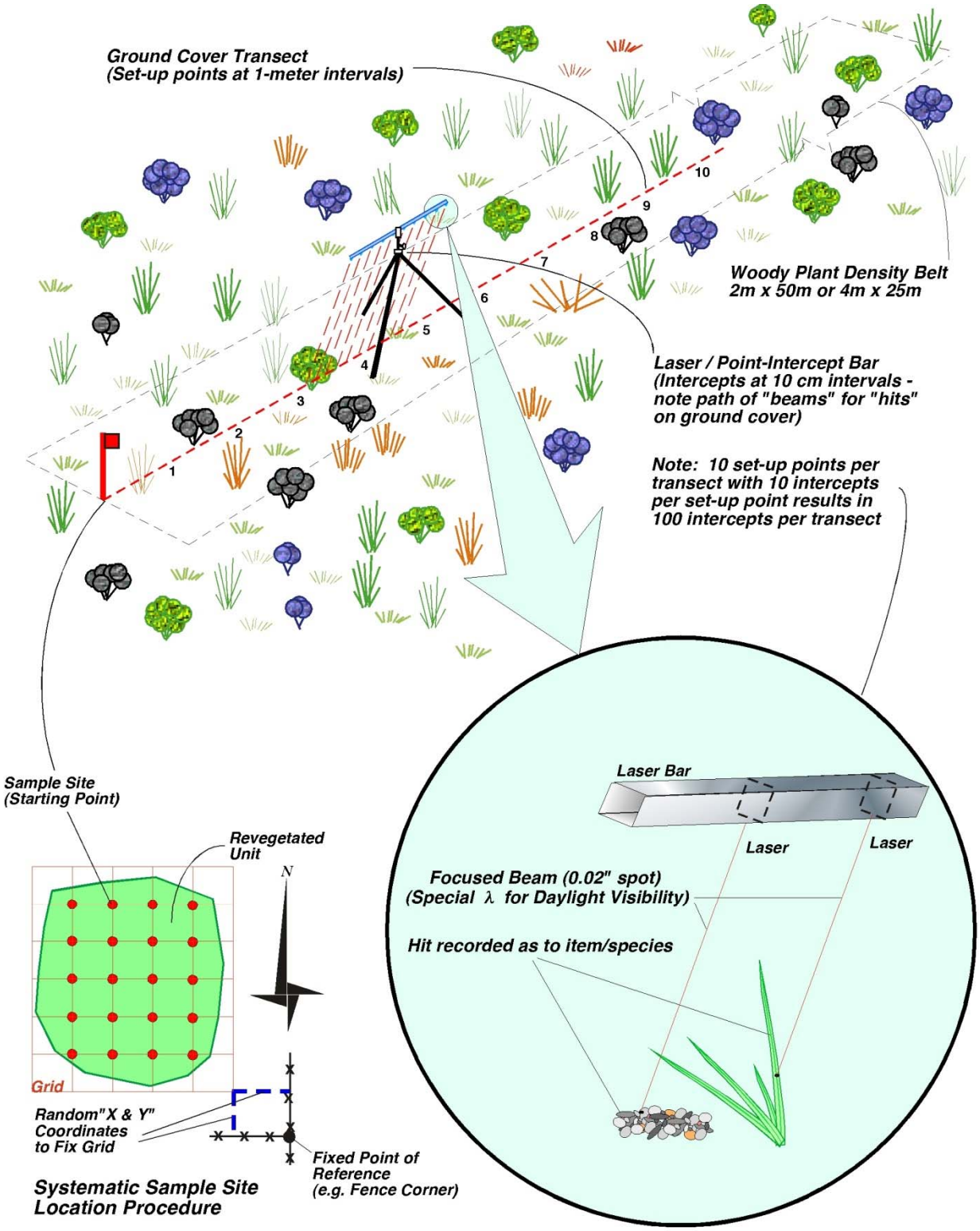

Figure 1

Sampling Procedure at a Systematic Sample Site Location

tree canopy and then resumed on the opposite side. Immature trees (less than 5 feet tall) that were intercepted by the cover transect were recorded along with all other vegetation. This process was deemed appropriate as young trees also occur in the reclamation.

A-2 Determination of Ground Cover

Ground cover at each sampling site was determined utilizing the point-intercept methodology (Bonham 1989) as illustrated on Figure 1. This methodology has been utilized for range studies for over eighty (80) years, however, Cedar Creek utilizes new state-of-the-art instrumentation which it has pioneered to facilitate much more rapid and accurate collection of data. Implementation of the technique for the sampling effort occurred as follows: First, one transect of 10 meters length was extended from the starting point of each sample site toward the direction of the next site to be sampled. Then, at each one-meter interval along the transect, a "laser point bar" was situated vertically above the ground surface, and a set of 10 readings recorded as to hits on vegetation (by species), litter, rock (>2mm), or bare soil. Hits were determined at each meter interval by activating a battery of 10 specialized lasers situated along the bar at 10 centimeter intervals and recording the variable intercepted by each of the narrow (0.02") focused beams (see Figure 1). In this manner, a total of 100 intercepts per transect were recorded resulting in 1 percent cover per intercept. This methodology and instrumentation facilitates the collection of the most unbiased, repeatable, precise, and cost-effective ground cover data possible. Furthermore, the point-intercept procedure has been widely accepted in the scientific community, especially the mining industry, as the protocol of choice for vegetation monitoring and bond release determination.

A-3 Determination of Woody Plant Density

Woody plant density at each sampling site was determined using fixed length / width belt transects extended from the starting point of each sample site toward the direction of the next site to be sampled. Each belt was a total of 100 m^2 and were either 2 meter by 50 meter or 4 meter by 25 meter, depending on the size of the unit. All live shrubs, sub-shrubs, cacti and trees rooted within the boundaries of these belts were counted and classified according to species. Determination of whether or not a plant could be counted was dependent upon the location of its main stem or root collar where it exited the ground surface with regard to belt limits. Entire plants rather than stems were counted to provide a more accurate representation of actual woody plant density.

A-4 Sample Adequacy Determination

Ground cover sampling within the reclaimed areas as well as the reference area was conducted to a minimum of 10 or 15 initial transects. Woody plant density sampling within the reclaimed areas sampled for interim monitoring were co-located with ground cover transects. From these preliminary efforts, a sample mean and standard deviation for total non-overlapping vegetation ground cover and woody plant density were calculated. These parameters were calculated in the field to insure collection of an adequate sample and once again by computer during final data analyses for each area. Sampling continued until an adequate ground cover or woody plant density sample, $\mathbf{n_{min}}$, had been collected in accordance with the Cochran formula (below) for determining sample adequacy, whereby the population would be estimated to within 10% of the true mean (μ) with 90% confidence. Sampling to these limits facilitates a very strong estimate of target populations. Cochran's formula was utilized as it is the procedure indicated for use in the new Section 4.4 of the Closeout Plan as well as in MMD's regulatory guidelines. Sample adequacy was calculated for informational purposes as achieving an adequate sample is not required for interim monitoring evaluations.

When the inequality ($\mathbf{n_{min}} \leq \mathbf{n}$) is true, sampling is adequate and $\mathbf{n_{min}}$ is determined as follows:

$$\mathbf{n_{min} = (t^2 s^2) / (0.1\ \bar{x})^2}$$

where:

n = the number of actual samples collected (initial size = 10 or 15)

t = the value from the two-tailed t distribution for 90% confidence with n-1 degrees of freedom;

s^2 = the variance of the estimate as calculated from the initial samples;

$\bar{x}$ = the mean of the estimate as calculated from the initial samples.

A-5 Testing for Success

Following statistically adequate sampling, the comparison process is initiated by calculating the mean ground cover value for non-annual plants only (non-annual ground cover, or "NAGC") for each revegetated unit and the reference area. The test for revegetation success for ground cover includes the following steps.

Step 1: The first step is to determine whether the mean NAGC of the revegetated unit(s) ($\overline{x}_{(rv)}$) exceeds 75 percent of the mean NAGC for the reference area ($\overline{x}_{(co)}$). If $\overline{x}_{(rv)} \geq 0.75$ ($\overline{x}_{(co)}$), then the ground cover test has been passed and the soils are assumed to be stable.

Step 2: If the mean NAGC of the revegetated unit equals or exceeds 50% (but is less than 75%) of the mean NAGC for the reference area, then a "gray area" determination will be conducted to evaluate soil stability. The evaluation of soil stability using the RUSLE model is detailed in subsection 4.4.4 of the closeout plan.

Appendix B

Raw Data

Table A1 Cunningham Hill - 2020

Observed Species

	Scientific Name	*Area Sampled -->* Common Name	Erosion Area	Open Pit	Sludge Cell 1	Sludge Cell 2	Waste Rock Top	Waste Rock Slope	Reference Area
Grasses and Grass - likes									
P	*Agropyron dasystachyum*	Thickspike wheatgrass			X		X	X	
P	*Agropyron smithii*	Western wheatgrass	X	X	X	X	X	X	
P	*Agropyron spicatum*	Bluebunch wheatgrass						X	
P	*Aristida purpurea*	Purple three - awn	X	X	X				
P	*Bouteloua curtipendula*	Sideoats grama	X	X	X	X	X	X	
P	*Bouteloua gracilis*	Blue grama	X	X	X	X	X	X	X
P	*Bromus inermis*	Smooth Brome		X	X	X	X	X	
A	*Bromus japonicus*	Japanese Brome	X					X	
A	*Bromus tectorum*	Cheatgrass		X		X	X		
P	*Elymus cinereus*	Great basin wildrye		X					
P	*Hilaria jamesii*	Galleta	X	X			X	X	X
P	*Koeleria cristata*	Prairie Junegrass						X	
P	*Muhlenbergia wrightii*	Spike muhly		X					
P	*Oryzopsis hymenoides*	Indian Ricegrass	X		X	X			
P	*Schizachyrium scoparium*	Little bluestem	X					X	
P	*Sitanion hystrix*	Bottlebrush Squirreltail	X	X					X
P	*Sporobolus airoides*	Alkali Sacaton		X	X	X			
P	*Stipa neomexicana*	New Mexico Feathergrass			X	X		X	
Forbs									
P	*Euphorbia sp.*	Sandmat		X					
A	*Ipomopsis longiflora*	Flaxflowered ipomopsis		X					
A	*Machaeranthera canescens*	Hoary tansyaster		X	X	X			
B	*Melilotus officinalis*	Yellow Sweetclover		X	X	X		X	
P	*Penstemon palmeri*	Palmer Penstemon	X	X				X	
P	*Petalostemon purpureum*	Purple prairie clover	X						
A	*Salsola tragus*	Russian Thistle				X			
P	*Solanum elaeagnifolium*	Silverleaf nightshade				X			
P	*Sphaeralcea coccinea*	Scarlet Globemallow	X		X	X		X	X
B	*Tragopogon dubius*	Yellow salsify						X	
Shrubs, Sub-shrubs, Cacti & Trees									
P	*Atriplex canescens*	Fourwing Saltbush	X	X	X	X	X	X	
P	*Berberis fremontii*	Fremont's Barberry							X
P	*Brickellia californica*	California Brickellbush		X	X		X		
P	*Cercocarpus ledifolius*	Curl-leaf Mtn. Mahogany		X					
P	*Cercocarpus montanus*	Mountain Mahogany	X	X				X	
P	*Chrysothamnus nauseosus*	Rubber Rabbitbrush	X	X	X		X	X	
P	*Fallugia paradoxa*	Apache Plume	X	X	X		X	X	
P	*Gutierrezia sarothrae*	Broom Snakeweed	X	X	X	X	X	X	X
P	*Juniperus monosperma*	One-seed Juniper		X	X	X	X	X	X
P	*Opuntia polyacantha*	Plains Pricklypear	X	X	X	X	X	X	X
P	*Opuntia spinosior*	Walkingstick Cactus	X	X	X	X	X	X	X
P	*Pinus edulis*	Two-needle Pinyon	X	X			X	X	X
P	*Pinus ponderosa*	Ponderosa pine		X				X	
P	*Quercus gambelii*	Gambels oak		X				X	
P	*Rhus trilobata*	Skunkbush Sumac		X			X	X	
P	*Senecio flaccidus var. f.*	Threadleaf Ragwort	X				X	X	
Nx	*Ulmus pumila*	Siberian elm					X		
P	*Yucca glauca*	Soapweed Yucca	X	X	X	X	X	X	
		Total Species Encountered	**22**	**31**	**21**	**19**	**20**	**29**	**10**

***** P - Perennial, B - Biennial, A - Annual, Nx - Noxious

* Includes species found in both Cover & WPD transects

Table A2 Cunningham Hill - Vegetation Cover - 2020

Erosion Area - Raw Data

Percent Ground Cover Based on Point-Intercept Sampling

		Transect No.——>	1	2	3	4	5	6	7	8	9	10	Average Cover	Relative Cover	Freq.
Grasses and Grass-likes															
P	*Agropyron smithii*	Western wheatgrass			1	1			2				**0.40**	**1.30**	**30**
P	*Aristida purpurea*	Purple three - awn			2								**0.20**	**0.65**	**10**
P	*Bouteloua curtipendula*	Sideoats grama	5	6	6						2		**1.90**	**6.17**	**40**
P	*Bouteloua gracilis*	Blue grama	13	7	1	2	14	22	22	29	5	3	**11.80**	**38.31**	**100**
A	*Bromus japonicus*	Japanese brome								2		7	**0.90**	**2.92**	**20**
P	*Hilaria jamesii*	Galleta				2		8	4				**1.40**	**4.55**	**30**
P	*Oryzopsis hymenoides*	Indian Ricegrass		1					1	1			**0.30**	**0.97**	**30**
P	*Schizachyrium scoparium*	Little bluestem	5	4	3						8		**2.00**	**6.49**	**40**
P	*Sitanion hystrix*	Bottlebrush Squirreltail					2		3				**0.50**	**1.62**	**20**
Forbs															
P	*Penstemon palmeri*	Palmer Penstemon			2								**0.20**	**0.65**	**10**
P	*Petalostemon purpureum*	Purple prairie clover									3		**0.30**	**0.97**	**10**
P	*Sphaeralcea coccinea*	Scarlet Globemallow			2	8		1					**1.10**	**3.57**	**30**
Shrubs, Sub-shrubs, Cacti & Trees															
P	*Atriplex canescens*	Fourwing Saltbush					21					10	**3.10**	**10.06**	**20**
P	*Chrysothamnus nauseosus*	Rubber Rabbitbrush			3							20	**2.30**	**7.47**	**20**
P	*Gutierrezia sarothrae*	Broom Snakeweed		2	6	15	13				5	1	**4.20**	**13.64**	**60**
P	*Yucca glauca*	Soapweed Yucca				2							**0.20**	**0.65**	**10**
														Mean	
		Total Plant Cover	**23**	**20**	**26**	**30**	**50**	**31**	**32**	**32**	**23**	**41**		**30.80**	
		Rock	65	42	41	10	3	35	19	26	67	19		**32.70**	
		Litter	6	11	9	27	18	5	24	28	3	30		**16.10**	
		Bare ground	6	27	24	33	29	29	25	14	7	10		**20.40**	
		Total Perennial & Biennial Cover	**23**	**20**	**26**	**30**	**50**	**31**	**32**	**30**	**23**	**34**		**29.90**	

Sample Adequacy Calculations	***t* = 1.8331** **n = 10** **Variance = 81.96** **n_{min} = 29.03**
Diversity	**No. of Important Perennial or Biennial Sps. = 8 (>2% Relative Cover or >1% Average Cover)**

* P - Perennial, B - Biennial, A - Annual

Table A3 Cunningham Hill - Vegetation Cover - 2020

Open Pit - Raw Data

Percent Ground Cover Based on Point-Intercept Sampling

		Transect No.——>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Average Cover	Relative Cover	Freq.
Grasses and Grass-likes																				
P	*Agropyron smithii*	Western wheatgrass											7		1		2	**0.67**	**2.19**	**20**
P	*Aristida purpurea*	Purple three - awn							1									**0.07**	**0.22**	**7**
P	*Bouteloua curtipendula*	Sideoats grama		2		15	38			2		10					22	**5.93**	**19.47**	**40**
P	*Bouteloua gracilis*	Blue grama		3	2		1	1			9				9		6	**2.07**	**6.78**	**47**
P	*Bromus inermis*	Smooth Brome				1												**0.07**	**0.22**	**7**
A	*Bromus tectorum*	Cheatgrass							1			6	3					**0.67**	**2.19**	**20**
P	*Elymus cinereus*	Great basin wildrye		3														**0.20**	**0.66**	**7**
P	*Hilaria jamesii*	Galleta							1		2					4		**0.47**	**1.53**	**20**
P	*Muhlenbergia wrightii*	Spike muhly													4			**0.27**	**0.88**	**7**
P	*Sitanion hystrix*	Bottlebrush Squirreltail			3											11		**0.93**	**3.06**	**13**
P	*Sporobolus airoides*	Alkali Sacaton		2	1							4	4					**0.73**	**2.41**	**27**
Forbs																				
P	*Euphorbia sp.*	Sandmat		1														**0.07**	**0.22**	**7**
A	*Ipomopsis longiflora*	Flaxflowered ipomopsis		1														**0.07**	**0.22**	**7**
A	*Machaeranthera canescens*	Hoary tansyaster				1												**0.07**	**0.22**	**7**
B	*Melilotus officinalis*	Yellow Sweetclover								1			1			2		**0.27**	**0.88**	**20**
P	*Penstemon palmeri*	Palmer Penstemon	7					6	3						2			**1.20**	**3.94**	**27**
Shrubs, Sub-shrubs, Cacti & Trees																				
P	*Brickellia californica*	California Brickellbush									7							**0.47**	**1.53**	**7**
P	*Cercocarpus ledifolius*	Curl-leaf Mtn. Mahogany						5	10	2								**1.13**	**3.72**	**20**
P	*Cercocarpus montanus*	Mountain Mahogany								3								**0.20**	**0.66**	**7**
P	*Chrysothamnus nauseosus*	Rubber Rabbitbrush	12		6						7			9		13		**3.13**	**10.28**	**33**
P	*Fallugia paradoxa*	Apache Plume							8			4						**0.80**	**2.63**	**13**
P	*Gutierrezia sarothrae*	Broom Snakeweed			6		8				1		3				2	**1.33**	**4.38**	**33**
P	*Juniperus monosperma*	One-seed Juniper													10			**0.67**	**2.19**	**7**
P	*Opuntia spinosior*	Walkingstick Cactus									1							**0.07**	**0.22**	**7**
P	*Pinus edulis*	Two-needle Pinyon				13												**0.87**	**2.84**	**7**
P	*Rhus trilobata*	Skunkbush Sumac						6	5	22	9	20		40	11	8		**8.07**	**26.48**	**53**
																			Mean	
		Total Plant Cover	**19**	**12**	**18**	**30**	**47**	**18**	**29**	**30**	**36**	**44**	**18**	**49**	**37**	**38**	**32**		**30.47**	
		Rock	60	28	35	12	1	48	44	38	3	39	12	8	16	8	11		**24.20**	
		Litter	21	43	33	26	35	30	27	30	49	9	32	43	43	47	14		**32.13**	
		Bare ground	0	17	14	32	17	4	0	2	12	8	38	0	4	7	43		**13.20**	
		Total Perennial & Biennial Cover	**19**	**11**	**18**	**29**	**47**	**18**	**28**	**30**	**36**	**38**	**15**	**49**	**37**	**38**	**32**		**29.67**	

Sample Adequacy Calculations	***t* = 1.7613** **n = 15** **Variance = 133.84** **n_{min} = 44.73**
Diversity	**No. of Important Perennial or Biennial Sps. = 13** **(>2% Relative Cover or >1% Average Cover)**

* P - Perennial, B - Biennial, A - Annual

Table A4 Cunningham Hill - Vegetation Cover - 2020

Sludge Cell 1 - Raw Data

Percent Ground Cover Based on Point-Intercept Sampling

			Transect No.——>	1	2	3	4	5	6	7	8	9	10	Average Cover	Relative Cover	Freq.
Grasses and Grass-likes																
P	*Agropyron dasystachyum*	Thickspike wheatgrass		17	9	4					1	2		**3.30**	**11.96**	**50**
P	*Agropyron smithii*	Western wheatgrass	20	10										**3.00**	**10.87**	**20**
P	*Aristida purpurea*	Purple three - awn					1							**0.10**	**0.36**	**10**
P	*Bouteloua curtipendula*	Sideoats grama			10	8							7	**2.50**	**9.06**	**30**
P	*Bouteloua gracilis*	Blue grama					12	22	17	8	6			**6.50**	**23.55**	**50**
P	*Bromus inermis*	Smooth Brome			2									**0.20**	**0.72**	**10**
P	*Oryzopsis hymenoides*	Indian Ricegrass						2					9	**1.10**	**3.99**	**20**
P	*Sporobolus airoides*	Alkali Sacaton	5											**0.50**	**1.81**	**10**
P	*Stipa neomexicana*	New Mexico Feathergrass								6	11	14		**3.10**	**11.23**	**30**
Forbs																
A	*Machaeranthera canescens*	Hoary tansyaster	3	4										**0.70**	**2.54**	**20**
B	*Melilotus officinalis*	Yellow Sweetclover								3				**0.30**	**1.09**	**10**
P	*Sphaeralcea coccinea*	Scarlet Globemallow				1					1	1		**0.30**	**1.09**	**30**
Shrubs, Sub-shrubs, Cacti & Trees																
P	*Chrysothamnus nauseosus*	Rubber Rabbitbrush	6					2		4	12			**2.40**	**8.70**	**40**
P	*Gutierrezia sarothrae*	Broom Snakeweed	6	6	1	1	1	3		3	1	10		**3.20**	**11.59**	**90**
P	*Opuntia polyacantha*	Plains Pricklypear		2										**0.20**	**0.72**	**10**
P	*Senecio flaccidus var. f.*	Threadleaf Ragwort									2			**0.20**	**0.72**	**10**
															Mean	
			Total Plant Cover	**40**	**39**	**22**	**14**	**14**	**29**	**17**	**25**	**35**	**41**		**27.60**	
			Rock	5	4	4	3	67	21	19	11	12	8		**15.40**	
			Litter	44	38	34	43	1	20	34	23	20	14		**27.10**	
			Bare ground	11	19	40	40	18	30	30	41	33	37		**29.90**	
			Total Perennial & Biennial Cover	**37**	**35**	**22**	**14**	**14**	**29**	**17**	**25**	**35**	**41**		**26.90**	

Sample Adequacy Calculations	***t* = 1.8331** **n = 10** **Variance = 115.60** **n_{min} = 50.99**
Diversity	**No. of Important Perennial or Biennial Sps. = 8** **(>2% Relative Cover or >1% Average Cover)**

* P - Perennial, B - Biennial, A - Annual

Table A5 Cunningham Hill - Vegetation Cover - 2020

Sludge Cell 2 - Raw Data

Percent Ground Cover Based on Point-Intercept Sampling

			Transect No.——>	1	2	3	4	5	6	7	8	9	10	Average Cover	Relative Cover	Freq.
Grasses and Grass-likes																
P	*Agropyron smithii*	Western wheatgrass			6			15	17				**3.80**	**8.68**	**30**
P	*Bouteloua curtipendula*	Sideoats grama				3	2	2					**0.70**	**1.60**	**30**
P	*Bouteloua gracilis*	Blue grama	41	29	33	28	39	17	19	23	63	46	**33.80**	**77.17**	**100**
P	*Bromus inermis*	Smooth Brome	1			1							**0.20**	**0.46**	**20**
A	*Bromus tectorum*	Cheatgrass							5				**0.50**	**1.14**	**10**
P	*Oryzopsis hymenoides*	Indian Ricegrass					1	1			2		**0.40**	**0.91**	**30**
P	*Sporobolus airoides*	Alkali Sacaton								1			**0.10**	**0.23**	**10**
P	*Stipa neomexicana*	New Mexico Feathergrass									1		**0.10**	**0.23**	**10**
Forbs																
A	*Machaeranthera canescens*	Hoary tansyaster								1			**0.10**	**0.23**	**10**
B	*Melilotus officinalis*	Yellow Sweetclover					2						**0.20**	**0.46**	**10**
A	*Salsola tragus*	Russian Thistle							11				**1.10**	**2.51**	**10**
P	*Solanum elaeagnifolium*	Silverleaf nightshade								3			**0.30**	**0.68**	**10**
P	*Sphaeralcea coccinea*	Scarlet Globemallow							1	3			**0.40**	**0.91**	**20**
Shrubs, Sub-shrubs, Cacti & Trees																
P	*Atriplex canescens*	Fourwing Saltbush				7		8					**1.50**	**3.42**	**20**
P	*Gutierrezia sarothrae*	Broom Snakeweed				1	2		1				**0.40**	**0.91**	**30**
P	*Yucca glauca*	Soapweed Yucca								2			**0.20**	**0.46**	**10**
														Mean		
			Total Plant Cover	**42**	**29**	**39**	**40**	**46**	**43**	**54**	**33**	**66**	**46**	**43.80**		
			Rock	18	37	23	14	13	5	6	2	4	10	**13.20**		
			Litter	14	15	13	17	20	30	29	49	9	26	**22.20**		
			Bare ground	26	19	25	29	21	22	11	16	21	18	**20.80**		
			Total Perennial & Biennial Cover	**42**	**29**	**39**	**40**	**46**	**43**	**38**	**29**	**66**	**46**	**41.80**		

Sample Adequacy Calculations	***t* = 1.8331** **n = 10** **Variance = 109.29** **n_{min} = 19.14**
Diversity	**No. of Important Perennial or Biennial Sps. = 3** **(>2% Relative Cover or >1% Average Cover)**

* P - Perennial, B - Biennial, A - Annual

Table A6 Cunningham Hill - Vegetation Cover - 2020

Waste Rock Top - Raw Data

Percent Ground Cover Based on Point-Intercept Sampling

			Transect No.—–>	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**Average Cover**	**Relative Cover**	**Freq.**
Grasses and Grass-likes																						
P	*Agropyron dasystachyum*	Thickspike wheatgrass															16		**1.07**	**2.97**	**7**
P	*Agropyron smithii*	Western wheatgrass	2	6	33														**2.73**	**7.61**	**20**
P	*Bouteloua curtipendula*	Sideoats grama	18	4	37	21	11	3		31	6	8	49	9	10	23	22		**16.80**	**46.75**	**93**
P	*Bouteloua gracilis*	Blue grama	6	1		8	28	8	40		21			27	2		4		**9.67**	**26.90**	**67**
P	*Bromus inermis*	Smooth Brome		7						2		13							**1.47**	**4.08**	**20**
A	*Bromus tectorum*	Cheatgrass		1															**0.07**	**0.19**	**7**
P	*Hilaria jamesii*	Galleta						1											**0.07**	**0.19**	**7**
Forbs																						
	None																		**0.00**	**0.00**	**0**
Shrubs, Sub-shrubs, Cacti & Trees																						
P	*Gutierrezia sarothrae*	Broom Snakeweed		11			7	7	1		7	1	6		2	2	1		**3.00**	**8.35**	**67**
P	*Juniperus monosperma*	One-seed Juniper						4							4				**0.53**	**1.48**	**13**
P	*Opuntia polyacantha*	Plains Pricklypear			1						2			1					**0.27**	**0.74**	**20**
P	*Yucca glauca*	Soapweed Yucca								3						1			**0.27**	**0.74**	**13**
																				Mean	
			Total Plant Cover	**26**	**30**	**71**	**29**	**46**	**23**	**41**	**36**	**36**	**22**	**55**	**37**	**18**	**42**	**27**	**35.93**		
			Rock	4	0	0	3	2	5	2	0	0	40	1	3	8	0	6	**4.93**		
			Litter	19	27	24	18	12	33	26	41	25	20	12	26	32	12	24	**23.40**		
			Bare ground	51	43	5	50	40	39	31	23	39	18	32	34	42	46	43	**35.73**		
			Total Perennial & Biennial Cover	**26**	**29**	**71**	**29**	**46**	**23**	**41**	**36**	**36**	**22**	**55**	**37**	**18**	**42**	**27**	**35.87**		

Sample Adequacy Calculations	***t* = 1.7613 n = 15** **Variance = 193.07 n_{min} = 46.39**
Diversity	**No. of Important Perennial or Biennial Sps. = 6** **(>2% Relative Cover or >1% Average Cover)**

* P - Perennial, B - Biennial, A - Annual

Table A7 Cunningham Hill - Vegetation Cover - 2020

Waste Rock Slope - Raw Data

Percent Ground Cover Based on Point-Intercept Sampling

		Transect No.——>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Average Cover	Relative Cover	Freq.
Grasses and Grass-likes																				
P	*Agropyron dasystachyum*	Thickspike wheatgrass														26		**1.73**	**5.49**	**7**
P	*Agropyron smithii*	Western wheatgrass		2							1		4	1			1	**0.60**	**1.90**	**33**
P	*Agropyron spicatum*	Bluebunch wheatgrass										9		4				**0.87**	**2.74**	**13**
P	*Bouteloua curtipendula*	Sideoats grama	13	8	10	19		7		5			3				6	**4.73**	**14.98**	**53**
P	*Bouteloua gracilis*	Blue grama		1			7	1	2	7	13	3	5		17		8	**4.27**	**13.50**	**67**
P	*Bromus inermis*	Smooth brome						3										**0.20**	**0.63**	**7**
A	*Bromus japonicus*	Japanese brome		2														**0.13**	**0.42**	**7**
P	*Hilaria jamesii*	Galleta		13	5		4	16	8	17	21	18		19				**8.07**	**25.53**	**60**
P	*Koeleria cristata*	Prairie Junegrass													2		5	**0.47**	**1.48**	**13**
P	*Schizachyrium scoparium*	Little bluestem								4								**0.27**	**0.84**	**7**
P	*Stipa neomexicana*	New Mexico Feathergrass		1														**0.07**	**0.21**	**7**
Forbs																				
B	*Melilotus officinalis*	Yellow Sweetclover													1			**0.07**	**0.21**	**7**
P	*Penstemon palmeri*	Palmer Penstemon											3					**0.20**	**0.63**	**7**
P	*Sphaeralcea coccinea*	Scarlet Globemallow							1									**0.07**	**0.21**	**7**
B	*Tragopogon dubius*	Yellow salsify		1														**0.07**	**0.21**	**7**
Shrubs, Sub-shrubs, Cacti & Trees																				
P	*Chrysothamnus nauseosus*	Rubber Rabbitbrush	3													24		**1.80**	**5.70**	**13**
P	*Fallugia paradoxa*	Apache Plume											4					**0.27**	**0.84**	**7**
P	*Gutierrezia sarothrae*	Broom Snakeweed	6	10		7		1					6			2	15	**3.13**	**9.92**	**47**
P	*Juniperus monosperma*	One-seed Juniper	14		12								9		15			**3.33**	**10.55**	**27**
P	*Opuntia spinosior*	Walkingstick Cactus	1				2					1						**0.27**	**0.84**	**20**
P	*Pinus ponderosa*	Ponderosa pine							15									**1.00**	**3.16**	**7**
																		Mean		
		Total Plant Cover	**37**	**38**	**27**	**26**	**13**	**28**	**26**	**33**	**35**	**31**	**34**	**24**	**35**	**52**	**35**	**31.60**		
		Rock	2	9	5	1	32	9	21	4	1	2	9	0	0	0	12	**7.13**		
		Litter	34	40	39	42	14	36	33	41	25	41	30	55	36	36	25	**35.13**		
		Bare ground	27	13	29	31	41	27	20	22	39	26	27	21	29	12	28	**26.13**		
		Total Perennial & Biennial Cover	**37**	**36**	**27**	**26**	**13**	**28**	**26**	**33**	**35**	**31**	**34**	**24**	**35**	**52**	**35**	**31.47**		

Sample Adequacy Calculations	***t* = 1.7613** **n = 15** **Variance = 73.54** **n_{min} = 22.85**
Diversity	**No. of Important Perennial or Biennial Sps. = 9** **(>2% Relative Cover or >1% Average Cover)**

* P - Perennial, B - Biennial, A - Annual

Table A8 Cunningham Hill - Vegetation Cover - 2020

Reference Area- Raw Data

Percent Ground Cover Based on Point-Intercept Sampling

		Transect No.——>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Average Cover	Relative Cover	Freq.
Grasses and Grass-likes																				
P	*Bouteloua gracilis*	Blue grama	26	6	13	15	20	22	10	19	4	17	10	22	23	8	19	**15.60**	**57.92**	**100**
P	*Hilaria jamesii*	Galleta													1			**0.07**	**0.25**	**7**
P	*Sitanion hystrix*	Bottlebrush Squirreltail				1												**0.07**	**0.25**	**7**
Forbs																				
P	*Sphaeralcea coccinea*	Scarlet Globemallow															2	**0.13**	**0.50**	**7**
Shrubs, Sub-shrubs, Cacti & Trees																				
P	*Berberis fremontii*	Fremont's Barberry			3													**0.20**	**0.74**	**7**
P	*Gutierrezia sarothrae*	Broom Snakeweed	8	2	13	6	4	8	6	2	1	8	9	5	6	1	13	**6.13**	**22.77**	**100**
P	*Juniperus monosperma*	One-seed Juniper		17						8	9	4						**2.53**	**9.41**	**27**
P	*Opuntia polyacantha*	Plains Pricklypear		1		2			5								2	**0.67**	**2.48**	**27**
P	*Opuntia spinosior*	Walkingstick Cactus													2	16		**1.20**	**4.46**	**13**
P	*Pinus edulis*	Two-needle Pinyon			5													**0.33**	**1.24**	**7**
																		Mean		
		Total Plant Cover	**34**	**26**	**34**	**24**	**24**	**30**	**21**	**29**	**14**	**29**	**19**	**27**	**32**	**25**	**36**	**26.93**		
		Rock	0	3	0	1	0	2	0	9	1	0	2	2	10	1	0	**2.07**		
		Litter	34	14	39	27	29	12	39	10	35	6	18	15	20	39	36	**24.87**		
		Bare ground	32	57	27	48	47	56	40	52	50	65	61	56	38	35	28	**46.13**		
		Total Perennial & Biennial Cover	**34**	**26**	**34**	**24**	**24**	**30**	**21**	**29**	**14**	**29**	**19**	**27**	**32**	**25**	**36**	**26.93**		

Sample Adequacy Calculations	***t* = 1.7613** **n = 15** **Variance = 36.64** **n_{min} = 15.67**
Diversity	**No. of Important Perennial or Biennial Sps. = 5** **(>2% Relative Cover or >1% Average Cover)**

* P - Perennial, B - Biennial, A - Annual

Table A9 Cunningham Hill - Vegetation Density - 2020

Erosion Area - Raw Data

Sampling Method: 2m x 50m Belt Transects

	Species	1	2	3	4	5	6	7	8	9	10	Total Count	Per Acre
S	*Atriplex canescens*				1	2	15	20		3	5	**46**	**186.16**
S	*Cercocarpus montanus*			1								**1**	**4.05**
S	*Chrysothamnus nauseosus*								4	24	49	**77**	**311.61**
S	*Fallugia paradoxa*								3			**3**	**12.14**
Su	*Opuntia polyacantha*	1			4	6	2					**13**	**52.61**
Su	*Opuntia spinosior*	1										**1**	**4.05**
T	*Pinus edulis*	3										**3**	**12.14**
S	*Senecio flaccidus var. flaccidus*	2										**2**	**8.09**
Su	*Yucca glauca*			12	6							**18**	**72.84**
	Total	**7**	**0**	**13**	**11**	**8**	**17**	**20**	**7**	**27**	**54**	**164**	**664**

Total by Lifeform	**Shrub (S) = 522.04**	**Tree (T) = 12.14**	
	Succulent (Su) = 129.50	**Noxious (Nx) = 0.00**	
Sample Adequacy Calc.	**t = 1.685**	**mean = 16.40**	**var. = 232.9**	**nmin = 245.86**

* S - Shrub, T - Tree, Su - Succulent, Nx - Noxious

Table A10 Cunningham Hill - Vegetation Density - 2020

Open Pit - Raw Data

Sampling Method: 2m x 50m Belt Transects

	Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total Count	Per Acre
S	*Atriplex canescens*	1		4						1	6	8	2				**22**	**59.4**
S	*Brickellia californica*			1							1	1					**3**	**8.1**
S	*Cercocarpus ledifolius*						4	2	6	3				1	4		**20**	**54.0**
S	*Cercocarpus montanus*	1					6	3	2	7			1	1	1		**22**	**59.4**
S	*Chrysothamnus nauseosus*	46	25	37	46	12	1	26	3	49	3	48	26	21	39	5	**387**	**1,044.1**
S	*Fallugia paradoxa*		3				1	1	7	1				1	3		**17**	**45.9**
T	*Juniperus monosperma*				2			2	1	3			1				**9**	**24.3**
Su	*Opuntia polyacantha*			3		2			2	1	1						**9**	**24.3**
Su	*Opuntia spinosior*			4	1			1				4	4				**14**	**37.8**
T	*Pinus edulis*				2	6	2										**10**	**27.0**
T	*Pinus ponderosa*												1				**1**	**2.7**
T	*Quercus gambelii*		3														**3**	**8.1**
S	*Rhus trilobata*		33		1		35	29	50	22	5	4	13	78	56	2	**328**	**884.9**
Su	*Yucca glauca*				2							3					**5**	**13.5**
	Total	**48**	**64**	**49**	**54**	**20**	**49**	**64**	**71**	**87**	**16**	**68**	**48**	**102**	**103**	**7**	**850**	**2,293.2**

Total by Lifeform	**Shrub (S) = 2,155.6**	**Tree (T) = 62.1**	**Succulent (Su) = 75.5**	**Noxious (Nx) = 0.0**
Sample Adequacy Calc.	**t = 1.685**	**mean = 56.67**	**var. = 807.4**	**nmin = 71.38**

* S - Shrub, T - Tree, Su - Succulent, Nx - Noxious

Table A11 Cunningham Hill - Vegetation Density - 2020

Sludge Cell 1 - Raw Data

Sampling Method: 2m x 50m Belt Transects

	Species	1	2	3	4	5	6	7	8	9	10	Total Count	Per Acre
S	*Atriplex canescens*				2		1	1	17			**21**	**85.0**
S	*Brickellia californica*						2					**2**	**8.1**
S	*Chrysothamnus nauseosus*		2	4	9	14	7	4	67	15	4	**126**	**509.9**
S	*Fallugia paradoxa*										1	**1**	**4.0**
T	*Juniperus monosperma*										1	**1**	**4.0**
Su	*Opuntia polyacantha*	10	1	12			1	2				**26**	**105.2**
Su	*Opuntia spinosior*	3	4									**7**	**28.3**
Su	*Yucca glauca*	1	6	3	5		5	4	3			**27**	**109.3**
	Total	**14**	**13**	**19**	**16**	**14**	**16**	**11**	**87**	**15**	**6**	**211**	**853.9**

Total by Lifeform	**Shrub (S) = 607.0**	**Tree (T) = 4.0**	
	Succulent (Su) = 242.8	**Noxious (Nx) = 0.0**	
Sample Adequacy Calc.	**t = 1.685**	**mean = 21.10**	**var. = 548.1** **nmin = 349.49**

* S - Shrub, T - Tree, Su - Succulent, Nx - Noxious

Table A12 Cunningham Hill - Vegetation Density - 2020

Sludge Cell 2 - Raw Data

Sampling Method: 2m x 50m Belt Transects

	Species	Total Count	Per Acre
S	*Atriplex canescens*	**7**	**28.3**
T	*Juniperus monosperma*	**1**	**4.0**
Su	*Opuntia polyacantha*	**4**	**16.2**
Su	*Opuntia spinosior*	**1**	**4.0**
Su	*Yucca glauca*	**11**	**44.5**
	Total	**24**	**97.1**

Total by Lifeform	**Shrub (S) = 28.3**	**Tree (T) = 4.0**
	Succulent (Su) = 64.7	**Noxious (Nx) = 0.0**

* S - Shrub, T - Tree, Su - Succulent, Nx - Noxious

Table A13 Cunningham Hill - Vegetation Density - 2020

Waste Rock Top - Raw Data

Sampling Method: 2m x 50m Belt Transects

	Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total Count	Per Acre
S	*Atriplex canescens*							1				2	8	4		1	**16**	**43.2**
S	*Brickellia californica*			24				5									**29**	**78.2**
S	*Chrysothamnus nauseosus*		1	2							2		5	4	3	2	**19**	**51.3**
S	*Fallugia paradoxa*															1	**1**	**2.7**
T	*Juniperus monosperma*	1					1							7	1		**10**	**27.0**
Su	*Opuntia polyacantha*	10	2	4	2	6	6		2	6	1	1	1	9		5	**55**	**148.4**
Su	*Opuntia spinosior*	4	1				2	1		4			2	1	1	1	**17**	**45.9**
T	*Pinus edulis*								4					1			**5**	**13.5**
S	*Rhus trilobata*								1								**1**	**2.7**
S	*Senecio flaccidus var. flaccidus*		1														**1**	**2.7**
Nx	*Ulmus pumila*			1													**1**	**2.7**
Su	*Yucca glauca*				1			2	1	6						3	**13**	**35.1**
	Total	**15**	**5**	**31**	**3**	**6**	**9**	**9**	**8**	**16**	**3**	**3**	**16**	**26**	**5**	**13**	**168**	**453.2**

Total by Lifeform	**Shrub (S) = 180.8**	**Tree (T) = 40.5**	**Succulent (Su) = 229.3**	**Noxious (Nx) = 2.7**
Sample Adequacy Calc.	**t = 1.685**	**mean = 11.20**	**var. = 71.5**	**nmin = 161.71**

* S - Shrub, T - Tree, Su - Succulent, Nx - Noxious

Table A14 Cunningham Hill - Vegetation Density - 2020

Waste Rock Slope - Raw Data

Sampling Method: 2m x 50m Belt Transects

	Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total Count	Per Acre
S	*Atriplex canescens*	1		1							3	1	3	2	1	5	**17**	**45.9**
S	*Cercocarpus montanus*									1							**1**	**2.7**
S	*Chrysothamnus nauseosus*	16			5							5		2	3	5	**36**	**97.1**
S	*Fallugia paradoxa*						4		1					1		1	**7**	**18.9**
T	*Juniperus monosperma*	12	4	3	5	4	1	4	2		6		4	3	2	1	**51**	**137.6**
Su	*Opuntia polyacantha*	5	1	9	9	4			1		2	3	5	2	3	3	**47**	**126.8**
Su	*Opuntia spinosior*	2	1	4		14					7	1	4	5		2	**40**	**107.9**
T	*Pinus edulis*	2	3	2	3	4	2	6	3	1	6	5	3	2	4	4	**50**	**134.9**
T	*Pinus ponderosa*	5	1		3		5	11	3	1		1			1		**31**	**83.6**
T	*Quercus gambelii*	1															**1**	**2.7**
S	*Rhus trilobata*														1		**1**	**2.7**
S	*Senecio flaccidus var. flaccidus*	2															**2**	**5.4**
Su	*Yucca glauca*			7				2	1	4						6	**20**	**54.0**
	Total	**46**	**10**	**26**	**25**	**26**	**12**	**23**	**11**	**7**	**24**	**16**	**19**	**17**	**15**	**27**	**304**	**820.2**
	Total by Lifeform	**Shrub (S) = 172.7**					**Tree (T) = 358.8**					**Succulent (Su) = 288.7**					**Noxious (Nx) = 0.0**	
	Sample Adequacy Calc.	**t = 1.685**					**mean = 20.27**					**var. = 93.6**					**nmin = 64.72**	

* S - Shrub, T - Tree, Su - Succulent, Nx - Noxious