

Castle Gate Holding Company
Castle Gate Mine
P.O. Box 30
847 NW HWY 191
Helper, UT 84526
Phone (435) 472-4737

March 14, 2013



Mr. Daron Haddock
Coal Program Manager
Utah Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
P.O. Box 145801
Salt Lake City, Utah 84114-5801

RE: 2012 Annual Report for Castle Gate Holding Company, Castle Gate Mine, C/007/0004

Dear Mr. Haddock

Please find attached an electronic copy of the 2012 Annual Report for Castle gate Holding Company's Castle Gate Mine.

This report includes the Divisions required Annual Report form as well as Castle Gate Holding Companies Castle Gate Mine year-nine vegetation study conducted by MT Nebo Scientific.

If you have any problems opening these files please call me at 435-650-2951 or by email at dware@alphanr.com.

Sincerely,

Dennis N. Ware
Authorized Agent

Print Form

Submit by Email

Reset Form

Annual Report

This Annual Report shows information the Division has for your mine. Submit the completed document and any additional information identified in the Appendices to the Division by the date specified in the cover letter. During a complete inspection an inspector will check and verify the information.

GENERAL INFORMATION

Company Name	Castle Gate Holding Company	Mine Name	Castle Gate Mine
Permit Number	C/007/0004	Permit expiration Date	December 23, 2014
Operator Name	Castle Gate Holding Company	Phone Number	+1 (435) 472-0475
Mailing Address	P.O. Box 30	Email	dware@alphanr.com
City	Helper		
State	Utah	Zip Code	84526

DOGM File Location or Annual Report Location

Excess Spoil Piles	<input type="checkbox"/> Required <input checked="" type="checkbox"/> Not Required	No excess spoil piles
Refuse Piles	<input type="checkbox"/> Required <input checked="" type="checkbox"/> Not Required	Refuse piles reclaimed
Impoundments	<input type="checkbox"/> Required <input checked="" type="checkbox"/> Not Required	No impoundments
Other:		

OPERATOR COMMENTS

REVIEWER COMMENTS Met Requirements Did Not meet Requirements

REPORTING OF OTHER TECHNICAL DATA

Please list other technical data or information that was not included in the form above, but is required under the approved plan, which must be periodically submitted to the Division.

Please list attachments:

Year-Nine Vegetation Study for the Hardscrabble and Sowbelly Substation sites conducted by MT Nebo Scientific.

Reviewer Comments

MAPS

Copies of mine maps, current and up-to-date, are to be provided to the Division as an attachment to this report in accordance with the requirements of R645-301-525.240. The map copies shall be made in accordance with 30 CFR 75.1200 as required by MSHA. Mine maps are not considered confidential.

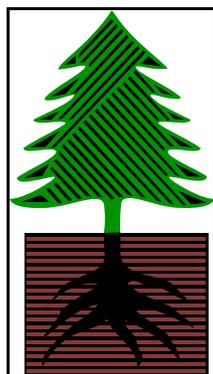
Map Name	Map Number	Included		Confidential	
		Yes	No	Yes	No
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Reviewer Comments Met Requirements Did Not Meet Requirements

VEGETATION MONITORING
FOR PHASE III BOND RELEASE
AT SELECTED SITES
AT THE CASTLE GATE MINE
YEAR ONE

2012

FOR THE
CASTLE GATE HOLDING COMPANY



Prepared by

MT. NEBO SCIENTIFIC, INC.

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by

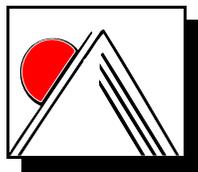
Patrick Collins, Ph.D.

for

CASTLE GATE HOLDING COMPANY

P.O. Box 592

Orangeville, Utah 84537



March 2013

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INTRODUCTION

Study Objectives

This document contains the **Year 1** results of vegetation sampling that will be conducted for two consecutive years at *selected* reclaimed sites of the Castle Gate Mine. Unlike other portions of the mine that have been reclaimed longer and have consequently been studied and sampled for final bond release, the sites reported herein have only now been reclaimed long enough that the mine owner may soon apply for *Final* or *Phase III Bond Release*. For this to happen the reclaimed areas must meet specific revegetation success standards. The post-reclamation/bond release process requires at least 10 years of time to pass following final revegetation activities at the mine site. This time-frame is called the *Responsibility Period*. For reclaimed western lands in this precipitation zone, this duration is considered to be enough time for vegetation to become adequately established so they can be studied for potential bond release applications. Phase III Bond Release is applied for through the State of Utah, Division of Oil, Gas and Mining (DOG M). That said, vegetation sampling in 2012 was conducted as the first step to initiate this process.

The Reclaimed Sites

The reclaimed sites at the Castle Gate Mine that have been selected to be sampled for bond release include: **Hardscabble Substation, Adit No. 1** and the **Sowbelly Substation**. These sites are located apart from each other, and depending on the site, are about 1 to 3 air-miles apart (MAP A).

Reference Area

A Reference Area to be used as a standards for final revegetation success at the reclaimed sites was chosen at a much earlier date. Castle Gate's Mining and Reclamation Plan (MRP) stated that "*the AML Reference Areas shown on Exhibit 9-6 will be used to evaluate previously mined areas*". Because the AML (Abandoned Mined Lands) areas were relatively extensive, at least for use as one reference area, biologists from DOGM along with representatives for the mine, chose a smaller portion of the AML areas as a reference area for reclaimed areas of the Castle Gate Mine. The **Sowbelly Reference Area** is located down-canyon (or south)

of the reclaimed Sowbelly Substation site (MAP A).

METHODS

Methodologies used for sampling were performed in accordance with the *Vegetation Information Guidelines* provided by DOGM.

Transect and Quadrat Placement

Random placement of sample quadrats were designed as an attempt to provide unbiased accuracy of the data compiled. This was accomplished by establishing several randomly-placed transect lines along the entire length of each study site. Random numbers were generated and used to determine placement from the transect lines. The random numbers selected were high enough to position sample quadrats to the extreme lateral limits of the study areas and low enough to cover all areas in-between. This insured that the sample quadrats were placed randomly over the entire study areas.

Cover, Frequency and Composition

Cover estimates were made using ocular methods with meter square quadrats. Species composition and relative frequencies were also assessed from the quadrats. Plant nomenclature follows *A Utah Flora* (Welsh et al. 2008).

Sample Size and Adequacy

Sampling adequacy was calculated using the formula given below.

$$n_{MIN} = \frac{t^2 s^2}{(dx)^2}$$

where,

n_{MIN} = minimum adequate sample
t = appropriate confidence t-value
s = standard deviation

x = sample mean
d = desired change from mean

The values used for “t” and “d” insured that sample adequacy was met with 90% confidence within a 10% deviation from the true mean.

Diversity and Similarity Indices

There are several well-documented methods to assess diversity and similarity in plant communities. The *Motyka Index* is a modified form of the *Sorenson Index*, both similarity indices. This index was used on the data; the equation is shown below:

$$IS_{MO} = \left(\frac{2MW}{MA+MB} \right) \times 100$$

where,

MW = \sum of the smaller quantitative values of species of two communities,
MA = \sum of the quantitative values of all species in one community,
MB = \sum of the quantitative values of all species in another community.

Two diversity indices have been employed to measure the reclaimed and reference areas. *MacArthur's Diversity Index* is an effective diversity measurement and is computed using the following equation:

$$1/\sum pi^2$$

where,

pi is the proportion of sum frequency contributed
by the *i*th species in the sample area of concern.

The proportional contribution of each species is then squared and the values for all species in the sample areas are summed. This index integrates the number of species and the degree to which frequency of occurrence was equitably distributed among those species.

Another diversity measurement was provided that shows the *average number of species* encountered at each quadrat.

Photographs

Color photographs of the sample areas were taken at the time of sampling and submitted with this report.

RESULTS

Reclaimed Hardscrabble Substation

The most common plant species found in the sample quadrats of the reclaimed Hardscrabble Substation were rubber rabbitbrush (*Chrysothamnus nauseosus*), bluebunch wheatgrass (*Elymus spicatus*), Indian ricegrass (*Stipa hymenoides*), western wheatgrass (*Elymus smithii*) and thickspike wheatgrass (*E. lanceolatus*). Table 1 lists all species encountered in the sample quadrats and shows the cover and frequency values of each.

The total living cover of this reclaimed area was estimated at 63.78% (Table 2-A). The lifeform composition of that cover was nearly equally represented by grasses and shrubs at 49.69% and 46.91%, respectively, whereas forbs comprised only 3.39% of the cover (Table 2-B).

Reclaimed Adit No. 1

Table 3 shows the cover and frequency values for the reclaimed Adit No. 1 Area. The most common species here consisted of Gt. Basin wildrye (*Elymus cinereus*), rubber rabbitbrush, bluebunch wheatgrass, thickspike wheatgrass, western wheatgrass and fourwing saltbush (*Atriplex canescens*).

The total living cover for this site was estimated as 60.88% (Table 4-A); the composition of that cover was comprised of 59.40% grasses, 27.81% shrubs and 12.79% forbs (Table 4-B).

Reclaimed Sowbelly Substation

The remaining reclaimed site, the Sowbelly Substation, was dominated by plants similar to the above sites including western wheatgrass, rubber rabbitbrush, bluebunch wheatgrass and fourwing saltbush (Table 5).

Also similar to the above sites, the total living cover at the Sowbelly Substation was estimated at 63.25% (Table 6-A) and had composition values at 54.20% grasses, 33.34% shrubs and 12.46% forbs (Table 6-B).

Reference Area

The Sowbelly Reference Area was the site chosen previously to be used for revegetation success standards at the time of final bond release. The most common species at this site consisted of western wheatgrass, thickspike wheatgrass, rubber rabbitbrush, and Louisiana sagewort (*Artemisia ludoviciana*). For a list of all species found in the sample quadrats along with their cover and frequency values, refer to Table 7.

The total living cover for this reference area was estimated at 54.51%, of which 0.38% came from overstory and 54.13% was understory cover (Table 8-A). The understory composition was comprised of 60.69% grasses, 23.52% forbs and 15.79% shrubs (Table 8-B).

Dataset Comparisons

Total Living Cover

Dataset comparisons were made between the reclaimed sites and reference area. First, statistical tests were employed to compare the total living plant cover of the sites. Student's t-tests were performed on each reclaimed site and compared with the reference. Results indicate that all sites, Hardscabble Substation, Adit No. 1 and Sowbelly Substation, all had more total living cover than the reference area – the differences were statistically significant (Fig. 1).

Diversity and Similarity Indices

Next, similarity and diversity indices were computed and compared. The Motyka Index was recommended to be used to compare species 'diversity' in the Mining and Reclamation Plan (MRP). Although this index is more of a *similarity index* than a *diversity index*, it nonetheless has been employed to compare the datasets. The MRP assigned the following categories to be used for comparisons in the Motyka Index:

Non-Weedy Shrub Cover,
Weedy Shrub Cover,
Native Perennial Grass Cover,
Introduced Perennial Grass Cover,
Non-Weedy Forb & Grass Cover,
Weedy Forb & Grass Cover.

Fig. 2 shows the results of employing the Motyka Index using the above categories for each reclaimed area when compared to the reference area; similarity values were 81.961% (Hardscabble Substation), 92.294% (Adit No. 1) and 90.060% (Sowbelly Substation).

MacArthur's Diversity Index was also employed to the datasets of the reclaimed and reference areas. In all cases, the reclaimed areas were more diverse than the reference area (Fig. 3).

Finally, the Average Number of Species Per Square Meter also suggests greater diversity in the reclaimed areas when compared to the reference area – the reclaimed areas averaged more species per sample quadrat (Fig. 4).

DISCUSSION

Representatives from the Caste Gate Mine and the State of Utah, Division of Oil, Gas and Mining (DOG M) worked together formulating revegetation success standards for the Mining & Reclamation Plan of the site. Because the area was disturbed by mining operations prior to the current revegetation regulations and requirements, standards for revegetation success were modified. State regulation R645-301-356.250 states that: "*for areas previously disturbed by mining that were not reclaimed to the requirements of R645-200 through R645-203 and R645-301 through R645-302 and that are remined or otherwise*

redisturbed by coal mining and reclamation operations, at a minimum, the vegetative ground cover will be not less than the ground cover existing before redisturbance and will be adequate to control erosion”.

The Castle Gate Mine was continuously mined since the time it was first disturbed by mining activities. Because of this there was no vegetative cover data ‘existing before redisturbance’ as mentioned above in the state regulation. Therefore, DOGM and Castle Gate biologists agreed that upon final reclamation the standards for revegetation success would be determined using a specific reference area – but success parameters would be dictated more from the species present, diversity, and similarity indices rather than strictly by cover, productivity and woody species density as the more recent regulations would dictate. Erosion control (as stated in the regulation above) should also be considered for a successful revegetation standard.

With the above considerations, sampling quantitatively for cover would still be necessary in the reclaimed and disturbed areas to adequately address the success standards. That said, and even though such a comparison was not necessary here, the total living cover of the reclaimed areas was better than the reference area in 2012. Moreover, the plant species present in the quadrats in the reclaimed areas were comprised almost exclusively of “desirable” rather than “weedy” species. Not only does this suggest successful revegetation from a cover perspective, but it also suggests that erosion control is probably better in the reclaimed areas when compared to the reference area.

With consideration to Phase III Bond Release, the results in this report suggests that the reclaimed areas sampled in 2012 may soon be candidates. **Year 2** of the two consecutive sample years will be sampled in 2013.

DATA SUMMARY TABLES

Table 1: Castle Gate Mine. Living Cover and Frequency by Plant Species (2012).

Reclaimed Hardscrabble Substation Area			n=40
	Mean Percent	Standard Deviation	Percent Frequency
SHRUBS			
<i>Artemisia nova</i>	0.83	4.07	5.00
<i>Artemisia tridentata</i>	5.15	10.68	25.00
<i>Atriplex canescens</i>	3.50	9.23	15.00
<i>Ceratoides lanata</i>	1.50	6.91	5.00
<i>Cercocarpus ledifolius</i>	1.13	4.11	7.50
<i>Chrysothamnus nauseosus</i>	16.43	14.10	77.50
<i>Rhus aromatica</i>	1.38	5.59	7.50
FORBS			
<i>Achillea millefolium</i>	0.50	2.18	5.00
<i>Linum lewisii</i>	0.25	1.56	2.50
<i>Machaeranthera canescens</i>	0.50	2.18	2.50
<i>Penstemon palmeri</i>	1.00	3.00	10.00
GRASSES			
<i>Bromus carinatus</i>	0.25	1.56	2.50
<i>Elymus cinereus</i>	3.13	6.29	22.50
<i>Elymus lanceolatus</i>	4.63	7.86	30.00
<i>Elymus salinus</i>	1.75	7.03	7.50
<i>Elymus smithii</i>	5.25	8.44	35.00
<i>Elymus spicatus</i>	6.38	12.09	30.00
<i>Poa secunda</i>	3.88	9.32	17.50
<i>Stipa hymenoides</i>	6.38	10.19	37.50

Table 2: Castle Gate Mine. Total Cover and Composition (2012).

Reclaimed Hardscrabble Substation Area			n=40
A. TOTAL COVER	Mean Percent	Standard Deviation	
Total Living Cover	63.78	9.71	
Litter	9.35	3.74	
Bareground	7.43	4.39	
Rock	19.45	9.73	
B. % COMPOSITION			
Shrubs	46.91	23.00	
Forbs	3.39	7.09	
Grasses	49.69	22.27	

Table 3: Castle Gate Mine. Living Cover and Frequency by Plant Species (2012).

Reclaimed Adit No. 1 Area			n=40
	Mean Percent	Standard Deviation	Percent Frequency
SHRUBS			
<i>Artemisia tridentata</i>	0.63	2.78	5.00
<i>Atriplex canescens</i>	5.38	10.15	30.00
<i>Ceratoides lanata</i>	1.13	3.79	10.00
<i>Chrysothamnus nauseosus</i>	9.63	10.69	60.00
<i>Rhus aromatica</i>	0.25	1.56	2.50
FORBS			
<i>Aster chilensis</i>	3.50	7.92	17.50
<i>Halogeton glomeratus</i>	0.50	2.18	5.00
<i>Linum lewisii</i>	0.88	2.93	10.00
<i>Medicago sativa</i>	1.38	8.59	2.50
<i>Melilotus officinalis</i>	0.50	2.45	5.00
<i>Penstemon palmeri</i>	0.63	3.20	5.00
GRASSES			
<i>Elymus cinereus</i>	13.13	15.32	62.50
<i>Elymus elymoides</i>	1.13	7.03	2.50
<i>Elymus lanceolatus</i>	6.13	10.28	32.50
<i>Elymus smithii</i>	5.75	6.94	47.50
<i>Elymus spicatus</i>	9.50	12.64	47.50
<i>Poa pratensis</i>	0.50	3.12	2.50
<i>Stipa hymenoides</i>	0.38	2.34	2.50

Table 4: Castle Gate Mine. Total Cover and Composition (2012).

Reclaimed Adit No. 1 Area			n=40
A. TOTAL COVER	Mean Percent	Standard Deviation	
Total Living Cover	60.88	12.04	
Litter	11.85	5.70	
Bareground	7.03	5.87	
Rock	20.25	12.89	
B. % COMPOSITION			
Shrubs	27.81	21.25	
Forbs	12.79	20.51	
Grasses	59.40	26.31	

Table 5: Castle Gate Mine. Living Cover and Frequency by Plant Species (2012).

Reclaimed Sowbelly Substation Area			n=40
	Mean Percent	Standard Deviation	Percent Frequency
SHRUBS			
<i>Artemisia tridentata</i>	3.63	7.74	25.00
<i>Atriplex canescens</i>	4.25	10.46	17.50
<i>Ceratoides lanata</i>	1.88	6.29	10.00
<i>Chrysothamnus nauseosus</i>	11.00	13.24	60.00
<i>Rhus aromatica</i>	0.75	3.27	7.50
FORBS			
<i>Achillea millefolium</i>	1.25	3.11	15.00
<i>Linum lewisii</i>	1.63	3.43	20.00
<i>Machaeranthera canescens</i>	0.13	0.78	2.50
<i>Mellilotus officinalis</i>	2.25	5.12	20.00
<i>Penstemon palmeri</i>	2.25	3.86	30.00
<i>Viguiera multiflora</i>	0.13	0.78	2.50
GRASSES			
<i>Elymus cinereus</i>	5.13	8.91	30.00
<i>Elymus lanceolatus</i>	4.88	8.18	32.50
<i>Elymus smithii</i>	16.50	11.52	77.50
<i>Elymus spicatus</i>	6.38	11.29	30.00
<i>Stipa hymenoides</i>	1.25	4.58	7.50

Table 6: Castle Gate Mine. Total Cover and Composition (2012).

Reclaimed Sowbelly Substation Area			n=40
A. TOTAL COVER	Mean Percent	Standard Deviation	
Total Living Cover	63.25	7.46	
Litter	9.75	3.34	
Bareground	8.75	3.83	
Rock	18.25	6.76	
B. % COMPOSITION			
Shrubs	33.34	21.25	
Forbs	12.46	13.33	
Grasses	54.20	24.01	

Table 7: Castle Gate Mine. Living Cover and Frequency by Plant Species (2012).

Reclaimed Sowbelly Reference Area			n=40
	Mean Percent	Standard Deviation	Percent Frequency
OVERSTORY			
<i>Acer glabrum</i>	0.38	2.34	2.50
UNDERSTORY			
SHRUBS			
<i>Atriplex canescens</i>	3.00	10.54	10.00
<i>Chrysothamnus nauseosus</i>	5.75	8.98	35.00
<i>Gutierrezia sarothrae</i>	0.13	0.78	2.50
FORBS			
<i>Antennaria sp.</i>	0.25	1.56	2.50
<i>Artemisia ludoviciana</i>	5.25	9.22	35.00
<i>Aster glaucodes</i>	3.63	8.21	20.00
<i>Penstemon palmeri</i>	0.25	1.56	2.50
<i>Sisymbrium altissimum</i>	0.38	2.34	2.50
<i>Taraxacum officinale</i>	0.63	3.90	2.50
<i>Viguiera multiflora</i>	2.25	5.80	15.00
GRASSES			
<i>Bromus tectorum</i>	0.63	2.78	5.00
<i>Elymus lanceolatus</i>	11.13	17.98	35.00
<i>Elymus smithii</i>	18.13	19.86	57.50
<i>Stipa hymenoides</i>	2.75	10.00	10.00

Table 8: Castle Gate Mine. Total Cover and Composition (2012).

Reclaimed Sowbelly Reference Area			n=40
A. TOTAL COVER	Mean Percent	Standard Deviation	
Overstory (O)	0.38	2.34	
Understory (U)	54.13	10.36	
Litter	13.23	7.41	
Bareground	9.65	5.59	
Rock	23.00	12.43	
O + U	54.51	10.65	
B. % COMPOSITION			
Shrubs	15.79	20.37	
Forbs	23.52	23.69	
Grasses	60.69	27.34	

FIGURES

FIG. 1. STUDENT'S T-TEST - A Total Living Cover Comparison Between the Selected Reclaimed and Reference Areas.

Hardscrabble Substation

Reclaimed Area: \bar{x} =63.78; s=9.71; n=40

Reference Area: \bar{x} =54.51; s=10.65; n=40

t = 4.068; df =78 ; SL= p<0.01

Adit No. 1

Reclaimed Area: \bar{x} =60.88; s=12.04; n=40

Reference Area: \bar{x} =54.51; s=10.65; n=40

t =2.506; df =78 ; SL= p<0.05

Sowbelly Substation

Reclaimed Area: \bar{x} =63.25; s=7.46; n=40

Reference Area: \bar{x} =54.51; s=10.65; n=40

t =4.251; df =78 ; SL= p<0.01

\bar{x} = sample mean,
s = sample standard deviation,
n = sample size,
NS = non-significant,
t = Student's t-value,
df = degrees of freedom,
SL = significance level,
p = probability level

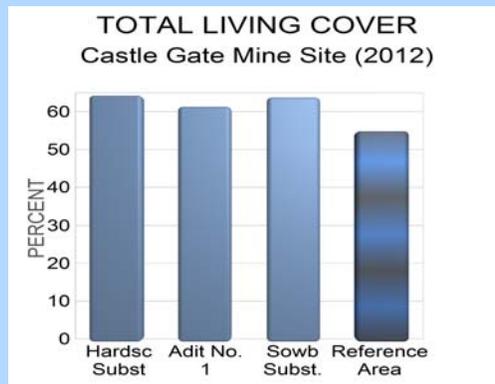


FIG. 2. MOTYKA INDEX - A Comparison Between the Selected Reclaimed and Reference Areas.

Hardscrabble Substation
&
Reference Area

$$IS_{MO} = \left(\frac{2MW}{MA+MB} \right) \times 100 = 81.961$$

Adit No. 1
&
Reference Area

$$IS_{MO} = \left(\frac{2MW}{MA+MB} \right) \times 100 = 92.294$$

Sowbelly Substation
&
Reference Area

$$IS_{MO} = \left(\frac{2MW}{MA+MB} \right) \times 100 = 90.060$$

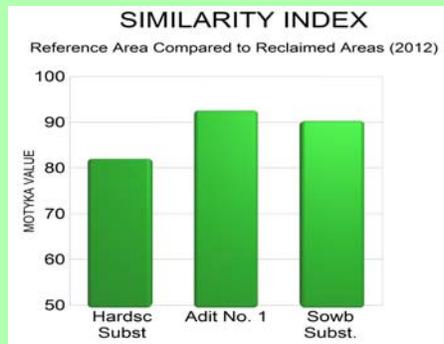


FIG. 3. MacARTHUR'S INDEX - A Comparison Between the Selected Reclaimed and Reference Areas.

$$1/\sum p_i^2 =$$

Hardscrabble Substation

Reclaimed Area: 9.551

Reference Area: 7.174

Adit No. 1

Reclaimed Area: 8.383

Reference Area: 7.174

Sowbelly Substation

Reclaimed Area: 9.660

Reference Area: 7.174

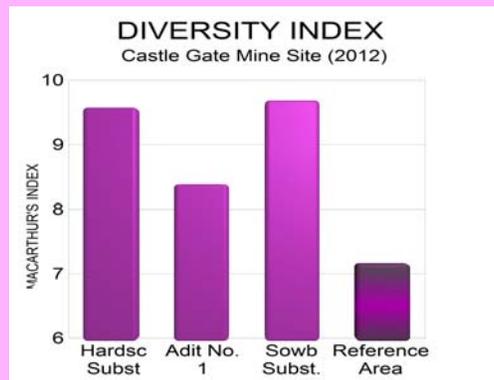


FIG. 4. AVERAGE NUMBER OF SPECIES PER SQUARE METER- A Comparison Between the Selected Reclaimed and Reference Areas.

$$\bar{x} \text{ NO. SPP/M}^2 =$$

Hardscrabble Substation

Reclaimed Area: 3.45

Reference Area: 2.38

Adit No. 1

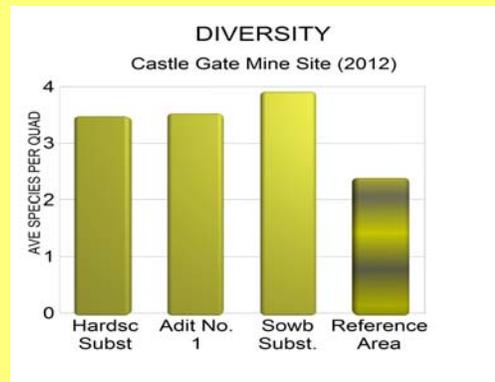
Reclaimed Area: 3.50

Reference Area: 2.38

Sowbelly Substation

Reclaimed Area: 3.88

Reference Area: 2.38

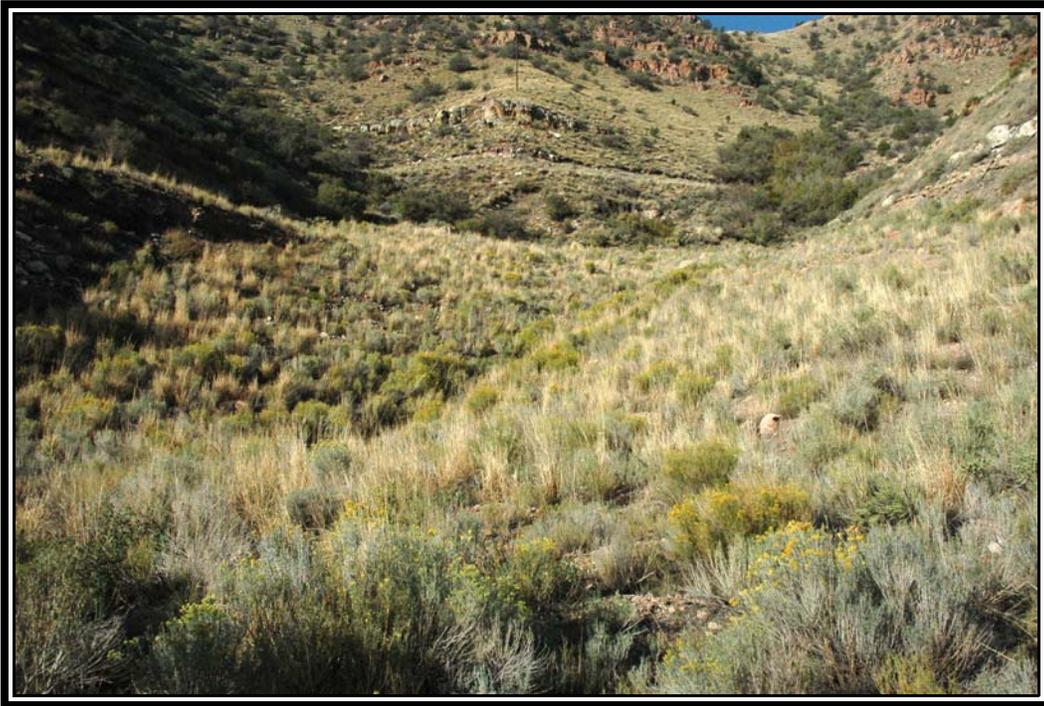


COLOR PHOTOGRAPHS
OF THE
STUDY AREAS

Hardscrabble Substation



Adit No. 1



Sowbelly Substation



Sowbelly Reference Area



