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October 11, 1996

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DIV. OF OIL, GAS & MINING

William W. Engels
Department of Water and Power
City of Los Angeles
111 No. Hope Street, Room 1164
Los Angeles, California 90012

RE: Horse Canyon Revegetation Monitoring Report

Dear Bill:

The revegetation monitoring report for Year 5 at Horse Canyon has been completed. I have enclosed three copies for you and also mailed a copy to Chris Hansen of Earth Fax. Chris will need this information for the Phase II Bond Release.

The results of the survey indicate that while this was a dry year, the revegetation at Horse Canyon is doing well and exceeds the goals for final bond release. The total vegetative cover in the revegetated areas ranged from 47 to 55 percent, well above the 33 percent required for bond release. The shrub density ranged from 2,744 to 6,181 plants per acre which compares favorably with the bond release goal of 3,000 plants per acre. The monitoring in Year 5 also establishes that the shrubs have persisted for five years and probably should be present for Year 9 when the next monitoring is due.

The data for the reference area is also included in this report.

Sincerely,

Joseph M. Jarvis

Joseph M. Jarvis
President

cc: Chris Hansen, Earth Fax

INTERMOUNTAIN POWER AGENCY
HORSE CANYON REFERENCE AREA AND
REVEGETATION AREAS
VEGETATION STUDY

October 11, 1996

Prepared for:

Department of Water and Power
City of Los Angeles
111 North Hope Street, RM 1161
Los Angeles, CA 90012

Prepared by:

JBR Consultants Group
8160 So. Highland Dr. #A-4
Sandy, UT 84093

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HORSE CANYON REFERENCE AREA AND REVEGETATION AREAS VEGETATION STUDY

1.0 Introduction

A vegetation study was conducted by JBR Consultants Group at the Horse Canyon reclamation treatment area and the vegetation reference area in August, 1996. Reclamation of mining related disturbances was done in the fall, 1991. The reference area was established as part of the Utah Division of Oil, Gas and Mining (DOGM) permitting requirements in 1985. The purpose of the study was to quantitatively and qualitatively sample the pinyon-juniper woodland within the reference area and representative revegetated sites with respect to plant species composition, cover, and woody species density. This study was completed to fulfill the sampling requirement for year five of reclamation and to substantiate that the vegetation reclamation requirements were met for Phase II bond release.

Vegetation sampling methods were designed in accordance with the February, 1992 Revised DOGM Vegetation Information Guidelines, and with the prior vegetation study done at the reference area in 1985, 1991 and 1993. These methods are described below. Results of the study are presented as well.

Precipitation information for the Horse Canyon area was obtained from monthly records for the closest weather station at the USDI Bureau of Land Management, Price Office. The average annual precipitation for 1996 was 7.94 inches and monthly precipitation for the 1996 water year, October, 1995 through September, 1996 was as follows:

October, 1995	0.02 inches	April	0.33 inches
November	0.00	May	1.58
December	0.42	June	0.45
January, 1996	0.73	July	0.34
February	0.32	August	0.02
March	1.46	September	2.27

Annual precipitation for 1996 was 79 percent of the 30 year average. The 30 year average annual precipitation is 9.99 inches.

2.0 Vegetation Sampling

2.1 Location of Sample Sites

Transects were located randomly throughout the 3.4-acre reference area and six revegetated areas. Each transect was considered to represent one sample.

The revegetation areas chosen for sampling were selected on the basis of revegetation treatment, slope, aspect and general topographic similarities. The sampled revegetated areas correspond to reclamation treatment areas identified in the Reclamation Plan as follows:

Areas 15 and 17	Former refuse pile and landfill area
Area 16	Borrow pit area
Areas 11,13,and 14	Flat topography near canyon mouth
Area 3	North facing slope
Area 6	South facing slope
Area 7	Rabbitbrush treatment area

Fifteen samples were taken in each area for a total of 75 samples within the revegetation area. This combined data, excluding Area 7 data, was used to determine the overall success of the revegetation area. Sample adequacy was met at the 90% confidence level with a 10% change in the mean as required by DOGM.

2.2 Quantitative Sample Types

The point-intercept method was used to sample cover. Points were observed every two feet along a transect 100 feet in length. Vegetation species, or presence of rock, litter, or bare ground was recorded at each point. Dead, mostly decayed organic matter that was still attached to the ground was counted as litter rather than as live vegetation; organic matter that was dried, attached, but not decayed was counted as vegetation. The fifty-point sample was then used to calculate percent cover statistics for the site. Fifteen cover transects were sampled in each of the revegetation sites, for a total of 90 samples. A total of 31 cover transects was sampled in the reference area.

Shrub densities were estimated using a 0.05-acre macroplot within the revegetation area. These macroplots were in the shape of a Lindsey elbow, with two 10 x 100 foot plots at a right angle

to each other. All individual shrubs rooted in the plots were counted. Fifteen Lindsey elbows were sampled in each of the revegetated sites, (except for Area 7, rabbitbrush treatment area) a total of 90 in the entire revegetation area. The total number of shrub plants per acre was calculated.

2.3 Qualitative Sample Types

Observations were made at each of the six revegetation sampling areas. Notes were made recording growth, species success, soil conditions, erosion, livestock or wildlife use, insect damage, and/or other special conditions. Photo stations were also visited.

2.4 Data Analysis

All data obtained from cover and density sampling were checked for completeness, and statistical information was generated. The Jaccard's Community Coefficient was used to compare similarity of each of the revegetated sites with the reference area.

For each transect sampled, percent cover was recorded separately for each vegetative species, and the ground cover components of litter, rock and bare ground. Additionally, presence of cryptogamic soil was recorded within the reference area. The 50 points along a transect were considered to represent one sample. The data for all transects within the reference area and revegetated sites were averaged to provide mean cover values.

3.0 Discussion of the Results

Appendix I provides color photos of photo stations. Appendix II provides location maps of sample transects. Appendices III-V provide sampling results for both cover and shrub density for the revegetation area and cover data for the reference area, as listed below. Following is a summary of these results.

Appendix I	Photo Stations
Appendix II	Horse Canyon Revegetation and Reference Areas - Sample Location Maps
Appendix III	Horse Canyon Revegetation Areas - Percent Cover Data
Appendix IV	Horse Canyon Reference Area - Percent Cover Data
Appendix V	Horse Canyon Revegetation Areas - Shrub Density Data

3.1 Revegetation Areas

The average vegetation cover in the six revegetation areas ranged from 47 to 55 percent, with species makeup generally quite consistent among the six sites. Grasses were the dominant plant form, followed by shrubs. Forbs were very low in numbers due to the abnormally low precipitation during the early growing season. Also, introduced species such as *Melilotus officinalis* and *Medicago sativa* have been reduced greatly as expected under native range climatic conditions. It should be noted that Area 7 was left out of combined data calculations due to the different treatment of this area. Area 7 is the rabbitbrush treatment area and was handled separately when calculations were combined for an overall cover and shrub density figure for the revegetation area.

Atriplex canescens and *Artemisia tridentata tridentata* shared dominance as the shrub species. *Agropyron spicatum* was the dominant grass.

Shrub density ranged from 2744-6181 plants per acre with a mean of 4773 plants per acre. Dominant shrubs did have young recruitment, *Artemisia tridentata tridentata* and *Atriplex canescens* plants.

<u>Area 15-17</u>

Total vegetation cover averaged 53.5 percent for the 15 sample sites within Area 15-17. Of this amount grasses comprised of 61 percent of total vegetation, shrubs 39 percent and forbs <1 percent.

Shrub density averaged 5248 plants/acre, with the dominance being shared by *Artemisia tridentata* and *Atriplex canescens*.

<u>Area 16</u>

Total vegetation cover averaged 53.4 percent for the 15 sample sites within Area 16. Of this amount, grasses comprised of 72 percent of the total vegetation, shrubs 27 and forbs 1 percent.

Shrub density averaged 5116 plants/acre, with the dominance being shared by *Artemisia tridentata* and *Atriplex canescens*.

Area 3

Total vegetation cover averaged 54.5 percent for the 15 sample sites within Area 3. Of this amount grasses comprised 59 percent of the total vegetation, shrubs 40 percent and forbs 1 percent.

Shrub density average 2744 plants/acre, with the dominant being *Atriplex canescens*.

Area 6

Total vegetation cover averaged 47.1 percent for the 15 sample sites within Area 6. Of this amount, grasses comprised 63 of the total vegetation, shrubs 35 percent and forbs 2 percent.

Shrub density averaged 6181 plants/acre, with the dominant being *Artemisia tridentata tridentata*.

Area 7

Total vegetation cover averaged 51.2 percent for the 15 sample sites within Area 7. Of this amount, shrubs comprised of 65 percent of the total vegetation, grasses 35 percent and shrubs <1 percent.

Areas 11, 13 & 14

Total vegetation cover averaged 47.5 percent for the 15 sample sites within Areas 11, 13 & 14. Of this amount, grasses comprised of 54 percent of the total vegetation, shrubs 44 percent and forbs 2 percent.

Shrub density averaged 4144 plants/acre, with the dominant being *Atriplex canescens*.

3.2 Reference Area

Total vegetation cover at the reference area averaged 36.3 percent. Of this amount, trees comprised 56.4 percent, shrubs 5.6 percent, forbs 1.8 percent, grasses 36.0 percent and succulents 0.4 percent. *Juniperus osteosperma* was the dominant tree species, *Xanthocephalum sarothrae* was the dominant shrub species, and *Elymus salinus* was the dominant grass species recorded during the survey. There was no dominant forb or succulent species.

As a target of 3000 shrub plants per acre was established for the reference area, it was not necessary to sample shrub/tree density as an index for comparison with revegetation areas.

3.3 Comparison of Revegetation Areas with Reference Area

The Jaccard's Community Coefficient was calculated as a measure of the similarity of each of the revegetated sites with the reference area. The index can range from 1 to 100, with an index of 0 representing sites with no species in common and thus very dissimilar, and an index of 100 representing sites that have all the same species and thus are very similar. As the data table shows, the similarity ranged from 6.9 to 14.3, indicating that the sites have some species in common, but not a majority. This is expected given the differences in species in the recently seeded area with those present in the native reference area.

A comparison of vegetative cover in the six revegetated sites (ranging from 47.1 to 54.5 percent) with the 1996 reference area survey (36.3 percent) shows that a much greater cover is present on the revegetated sites. As specified in the reclamation plan, the revegetation will be considered successful when vegetative cover and diversity are within 90% of the undisturbed communities at a 90% statistical confidence. The vegetative cover mean for the reference area at the 90% confidence level is 36.3 percent cover. The vegetative cover mean for the combined data for the revegetated areas at the 90% confidence level is 51.4 percent cover.

$$36.3\% \times (90\%) = 32.7\%$$

The 51.4 percent vegetative cover in the revegetation areas is greater than the required 32.7 percent vegetative cover in the reference area (90 percent of the undisturbed communities). Therefore vegetation cover has been met by the reclamation effort on the revegetation areas at Horse Canyon.

A comparison of shrub density in the six revegetated sites (ranging from 2744 to 6181 plants/acre, with a mean of 4773 plants/acre) with the target of 3000 plants per acre in the reclamation plan indicates that the target has been met for shrub density in the reclamation site, except for Area 3 (2,744 plants/acre). Further, success of this site is illustrated by the establishment for five years, the majority of the plants are mature, producing seed and plants have survived both good and poor precipitation years. Shrub density on the revegetated sites met the goal of 3,000 plants/acre at a 90% statistical confidence in order to be considered successful.

3.4 Qualitative Samples

Overall qualitative observations indicate that there is little or no soil movement due to erosion. This is due to the high percentage of ground cover, soil binding plants that have been established such as grasses and the relatively low precipitation that has taken place during the previous spring and summer months.

For the most part grasses and shrubs have very little seed production due to the drought over the growing season. Few shrubs have been able to produce seed, however these are isolated plants that have a microclimate that would have concentrated any available moisture. Overall, grass and shrub species are healthy and stable. Due to the lack of moisture and the present drought year, plants have very low annual production.

The forbs are for the most part absent. The low precipitation eliminated much of the introduced species over the last couple of years, such as *Melilotus officinalis* and *Medicago sativa*. *Melilotus officinalis* is generally a part of a revegetation mixture for quick establishment and site stabilization, however, as a biannual, is soon eliminated and out competed by natives and more adapted introduced species. *Medicago sativa* is a long-lived species and its decline may be due to the dense grass cover.

Shrub density has been greatly reduced over the years, as expected. The early establishment years were high in seedling numbers, however, stronger individuals out competed and established fewer mature plants on the site.

Overall there has been a decrease in *Chrysothamnus viscidiflorus* and *Chrysothamnus nauseosus*, the leaves show signs of some sort of insect damage, however this is not conclusive. Further, these sites are not typical *Chrysothamnus* spp. sites and these plants are apparently out competed by better adapted species such as *Artemisia tridentata tridentata* and *Atriplex canescens*.

Litter is lower in some areas due to the lack of annual production. In past years *Bromus tectorum* contributed significantly to annual litter production.

Area 6

An odd utilization pattern that follows the old road in this site indicates that grazing has taken place by a feral cow and/or calf. Cow manure is present on site as well.

3.5 Sample Adequacy Calculations

To determine the number of transects required to adequately sample the vegetation in the reference area, the formula presented in the DOGM guidelines was used.

A 90 percent confidence level, with a 10 percent change in the mean was used to determine sample adequacy levels for both cover and density parameters. Results of the adequacy tests are shown in the following tables. Only the vegetation cover values were used in the cover parameter sample adequacy calculations.

SAMPLE ADEQUACY INFORMATION HORSE CANYON REVEGETATION AREA 15-17				
Parameter	n	Mean	Std	n_{min}
Cover	15	53.5	10.8	6.4
Shrub Density	15	5247.5	2293.9	34.9

SAMPLE ADEQUACY INFORMATION HORSE CANYON REVEGETATION AREA 16				
Parameter	n	Mean	Std	n_{min}
Cover	15	53.4	6.8	2.9
Shrub Density	15	5115.6	2744.3	54.3

SAMPLE ADEQUACY INFORMATION HORSE CANYON REVEGETATION AREA 3				
Parameter	n	Mean	Std	n_{min}
Cover	15	54.5	14.2	12.4
Shrub Density	15	2744.4	1169.2	32.8

SAMPLE ADEQUACY INFORMATION HORSE CANYON REVEGETATION AREA 6				
Parameter	n	Mean	Std	n_{min}
Cover	15	47.1	13.4	14.5
Shrub Density	15	6181.2	1626.5	12.6

SAMPLE ADEQUACY INFORMATION HORSE CANYON REVEGETATION AREA 7				
Parameter	n	Mean	Std	n_{min}
Cover	15	51.2	9.2	5.8
Shrub Density	None	n/a	n/a	n/a

SAMPLE ADEQUACY INFORMATION HORSE CANYON REVEGETATION AREA 11,13,14				
Parameter	n	Mean	Std	n_{min}
Cover	15	47.5	13.2	13.8
Shrub Density	15	4144.0	3217.8	110.5

SAMPLE ADEQUACY INFORMATION HORSE CANYON REVEGETATION AREA COMBINED DATA				
Parameter	n	Mean	Std	n_{min}
Cover	75	51.4	12.1	13.8
Shrub Density	75	4773.0	2549.6	50.3

SAMPLE ADEQUACY INFORMATION HORSE CANYON REFERENCE AREA				
Parameter	n	Mean	Std	n_{min}
Cover	31	36.3	12.4	19.7
Tree/Shrub	None	n/a	n/a	n/a

3.6 Similarity Index

The Jaccard's Community Coefficient was used to compare similarity of each of the revegetated sites with the reference area.

JACCARD'S COMMUNITY COEFFICIENT Horse Canyon Revegetation				
Revegetation Community	a	b	c	Similarity Index
Area 15-17	16	16	3	10.3
Area 16	12	16	2	7.7
Area 3	12	16	2	7.7
Area 6	15	16	2	6.9
Area 7	16	16	4	14.3
Area 11, 13, & 14	11	16	2	8.0
Combined Data	20	16	3	9.1

Jaccard's Community Coefficient:

$$\text{Similarity Index} = \frac{\text{common species}}{\text{total species}} \times 100 \quad \text{or SI} = \frac{c}{a + b - c} \times 100$$

Where:

SI = Similarity Index

a = Total number of species in revegetated community

b = Total number of species in reference community

c = Number of species common to both communities

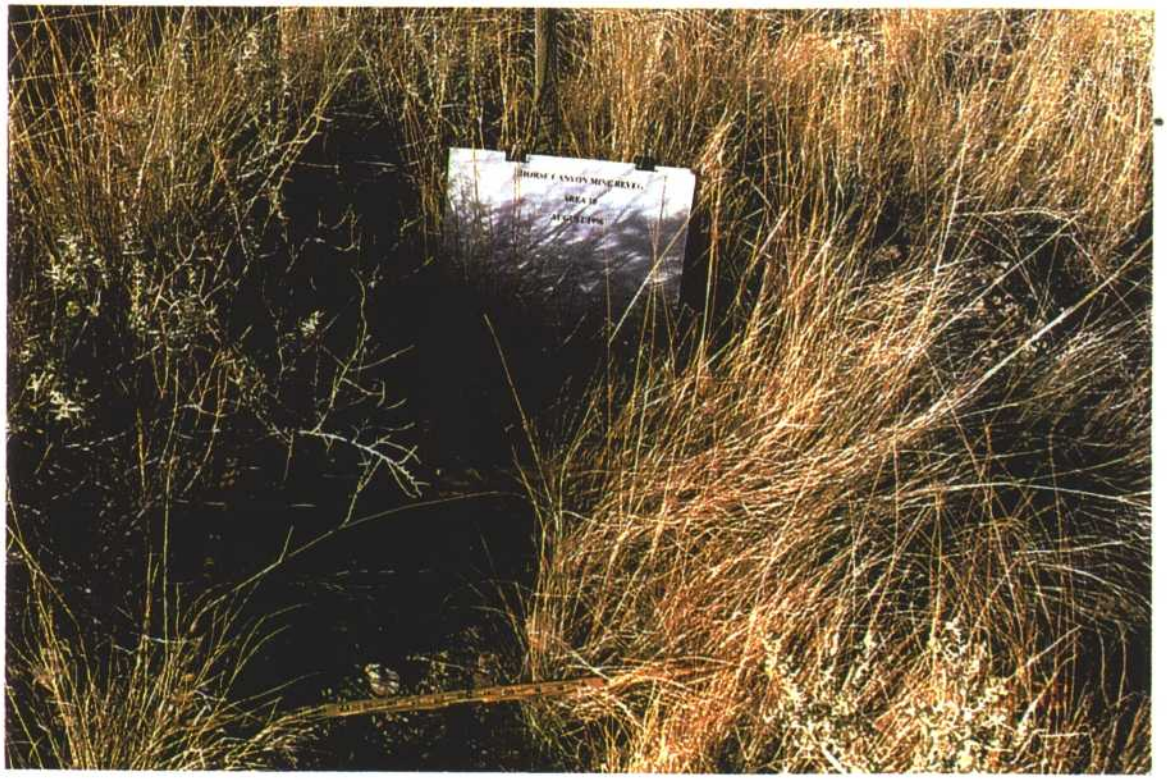
APPENDIX I

Horse Canyon
1996 Photo Stations

HORSE CANYON AREA 3

HORSE CANYON AREA 6

HORSE CANYON AREA 10

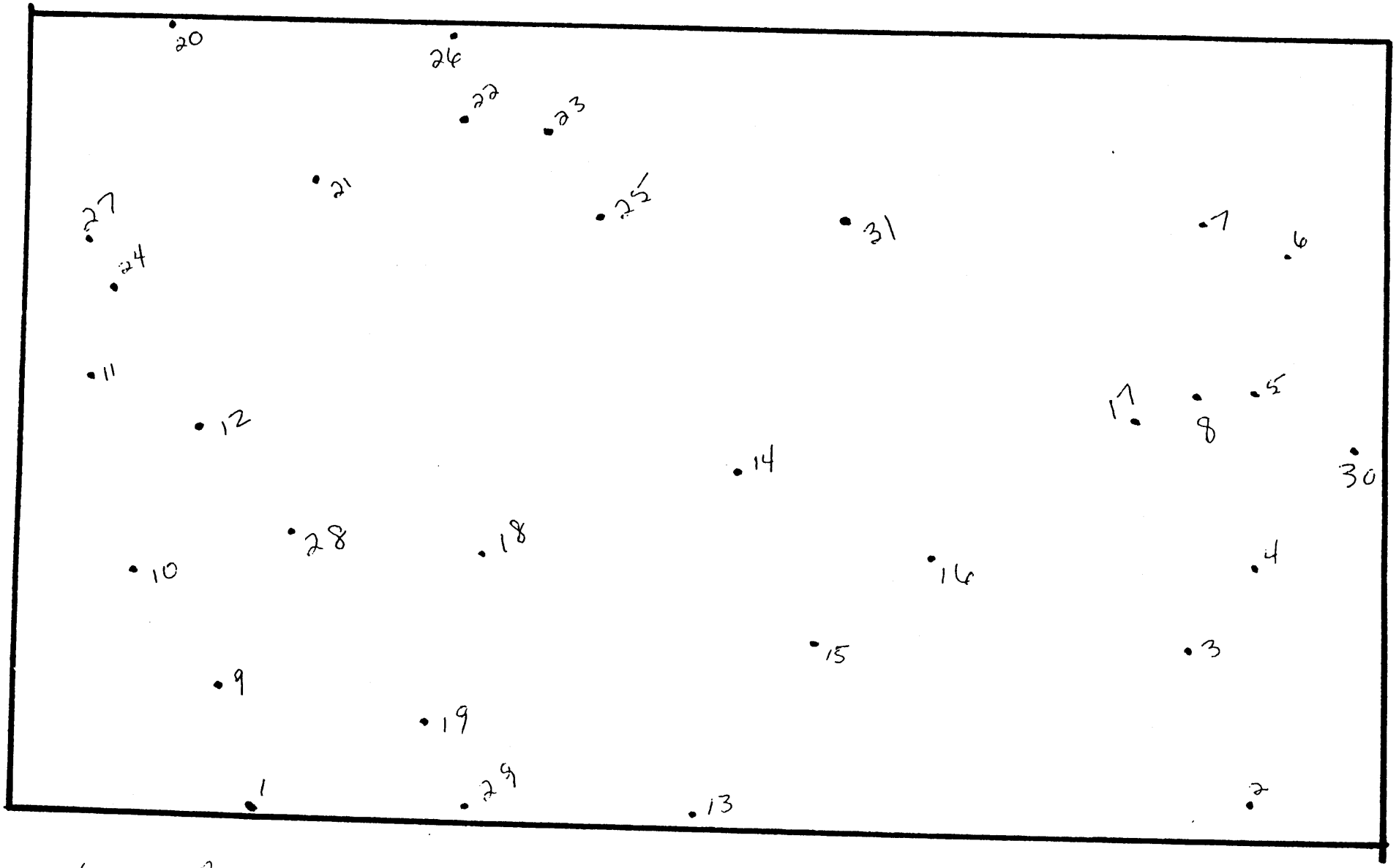


HORSE CANYON BORROW PIT SLOPE

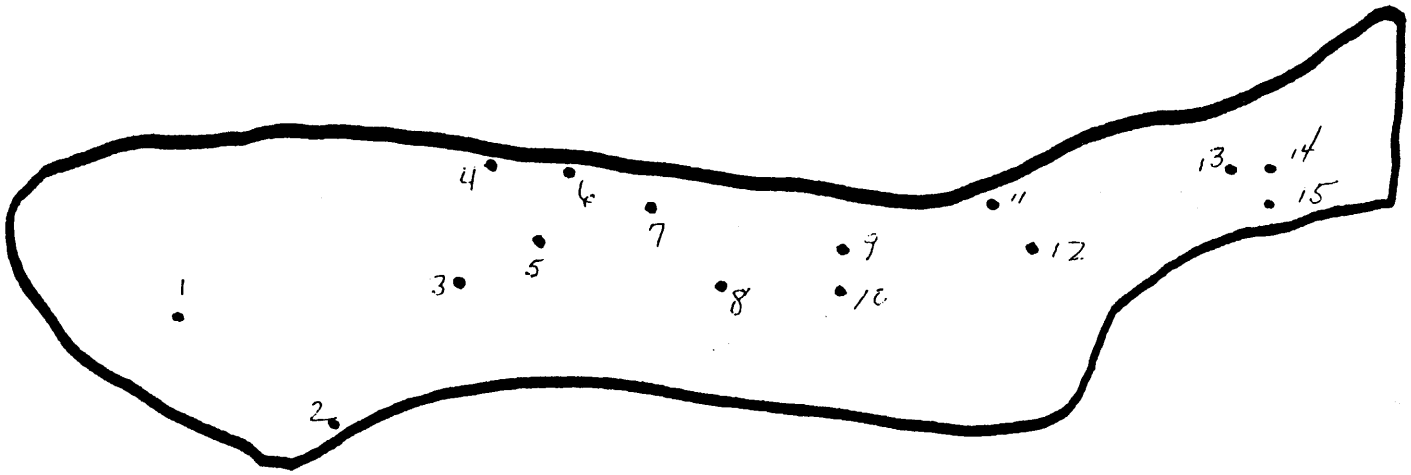
HORSE CANYON BORROW PIT FLAT

APPENDIX II

Horse Canyon Reference Area and Revegetation Area Sample Location Maps



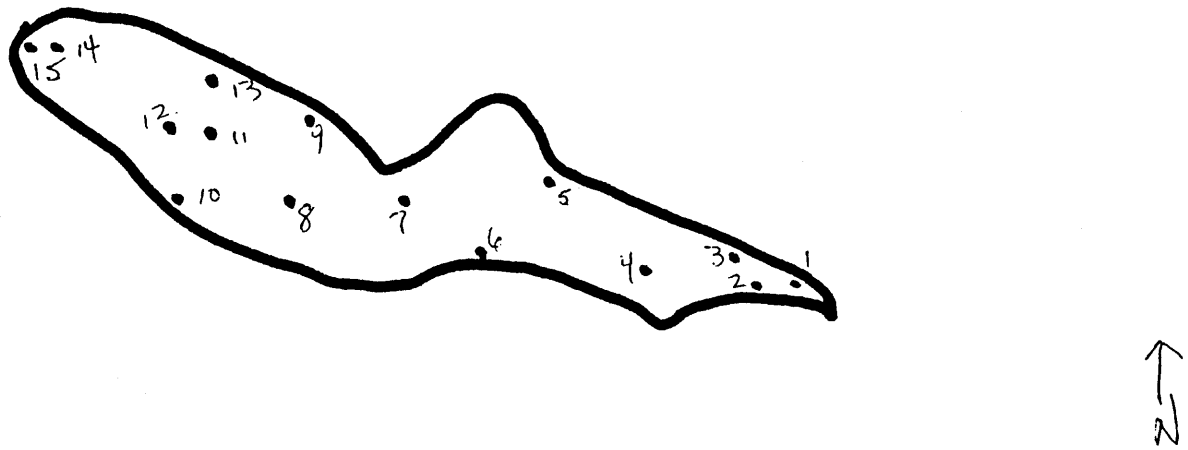
Horse Canyon
Reference Area
1996 Sample Sites



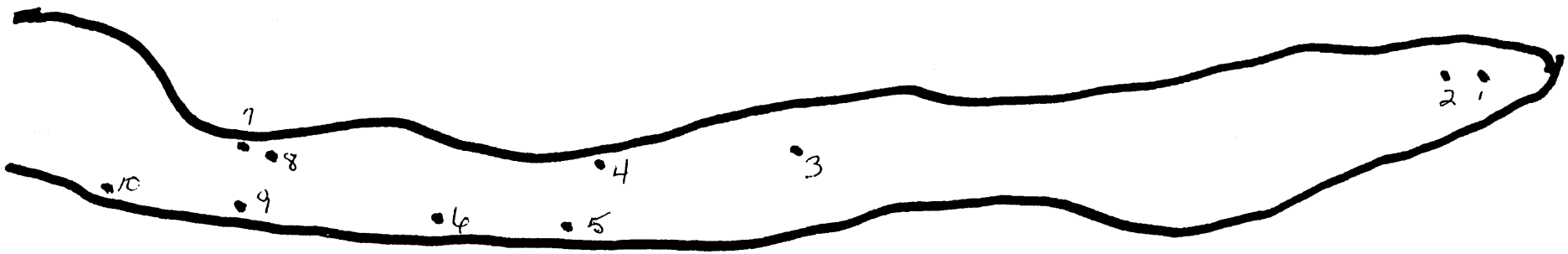
N ↑

Horse Canyon
Revegetation Area 3

1996 Sampling Points

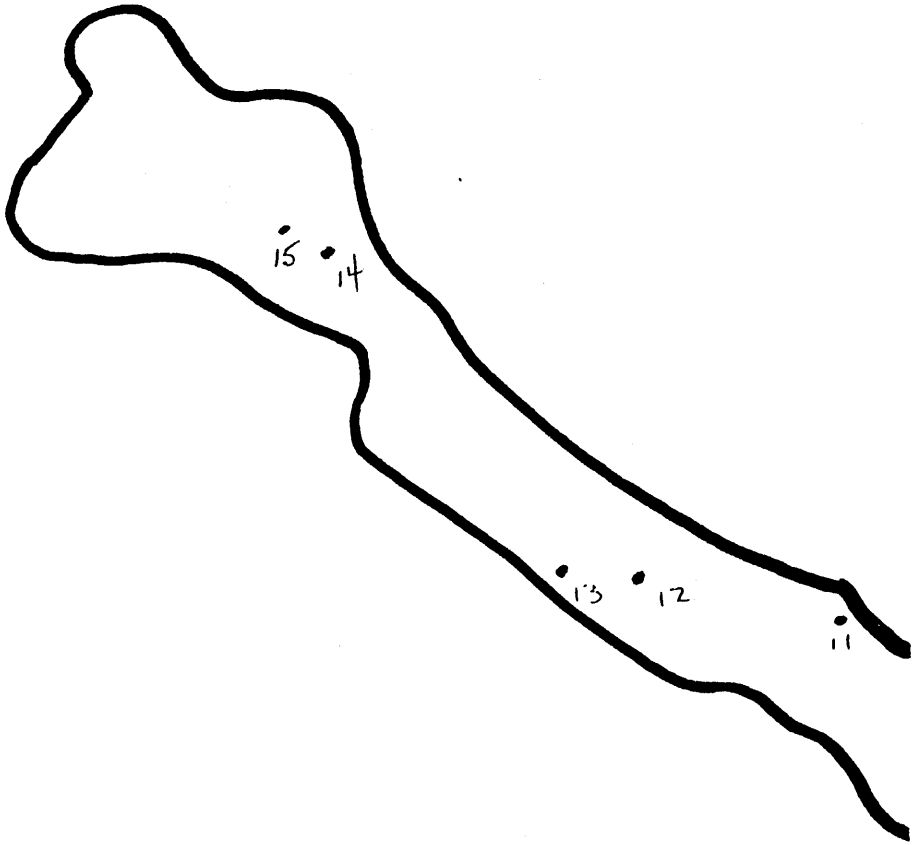


Horse Canyon
Revegetation Area 6
1996 Sample Sites

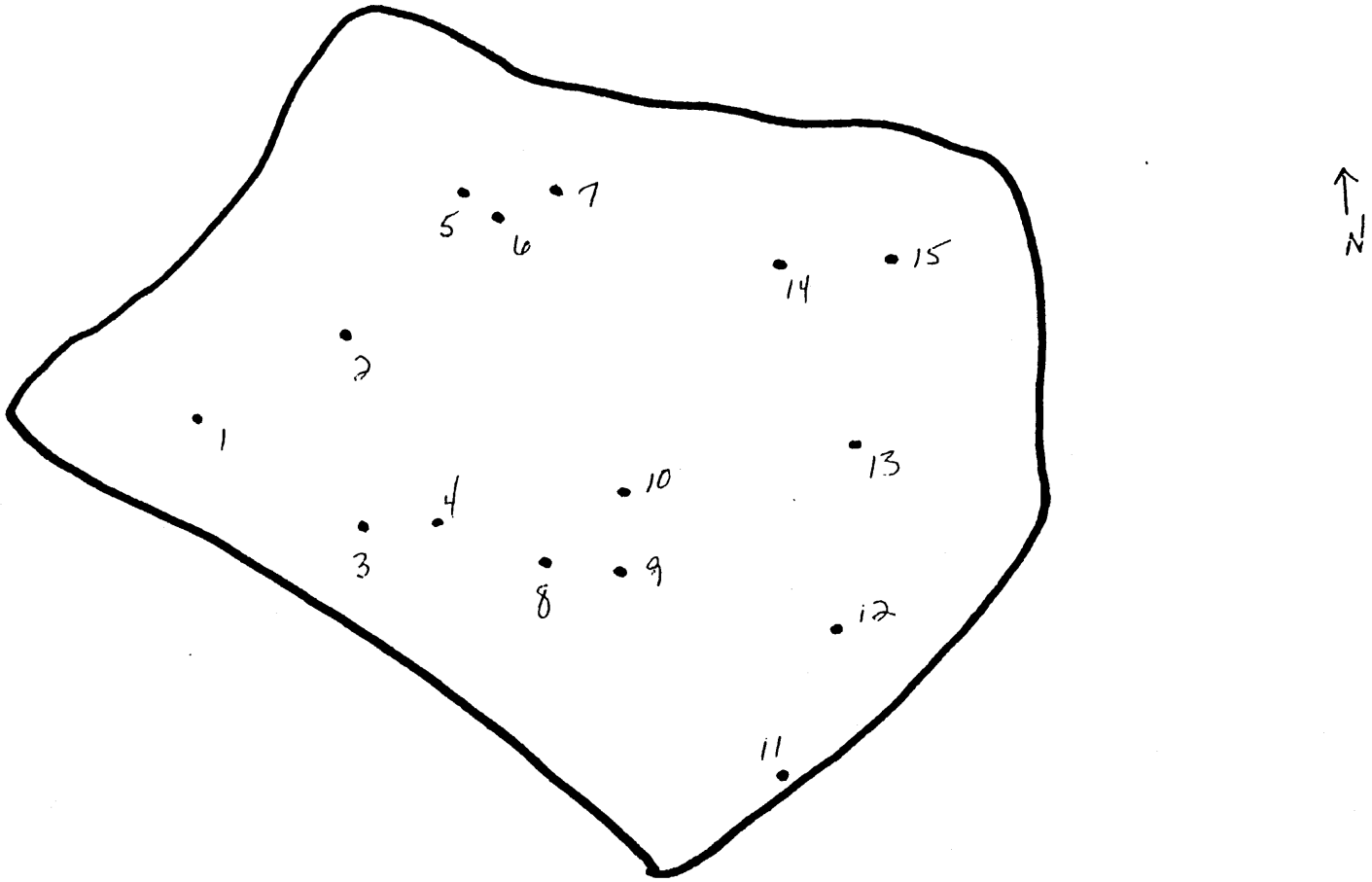


HORSE CANYON
REVEGETATION AREA 11, 13 & 14
1996 SAMPLE SITES

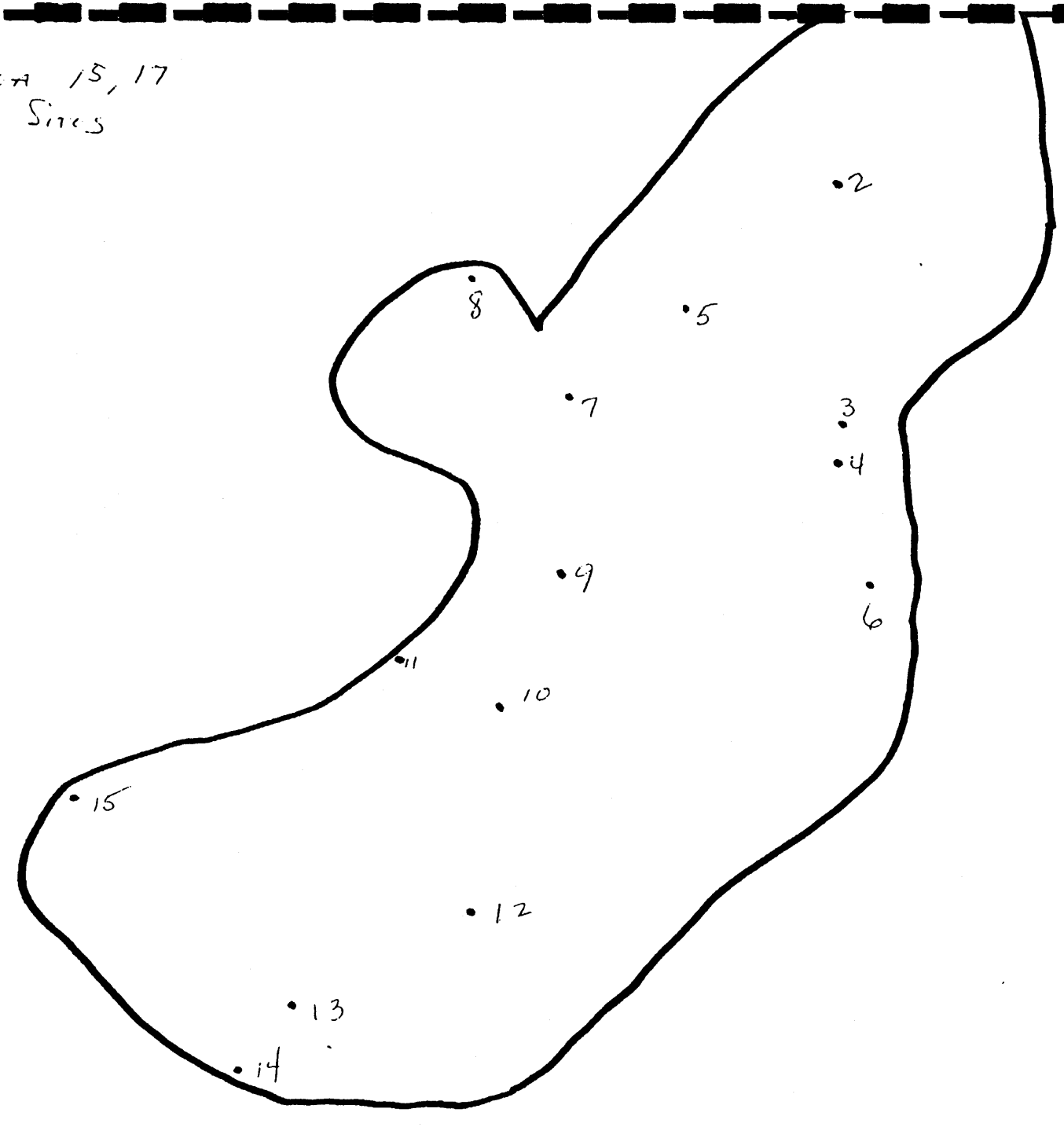
N

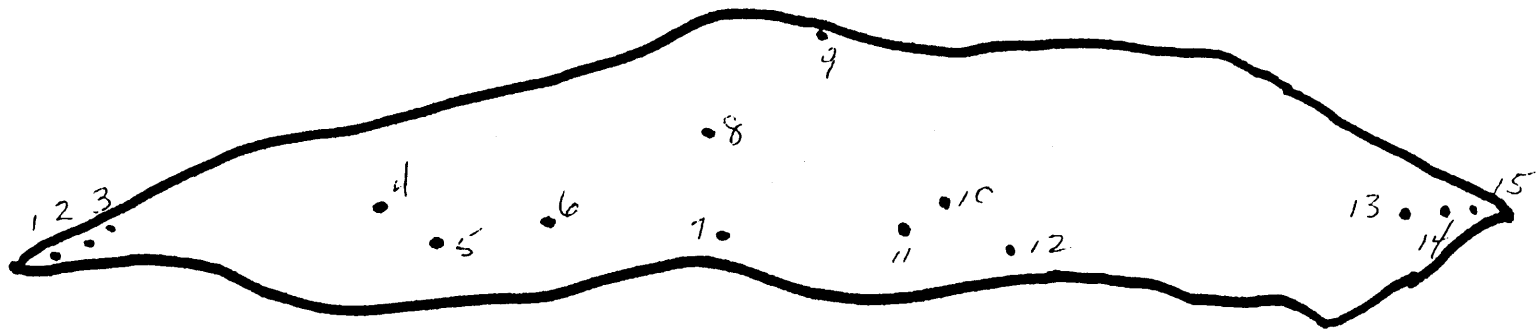

15
14
13
12
11

Revegetation Area 16
1996 Sample Sites



Horse Canyon
Revegetation Area 15, 17
1996 Sample Sites





Horse Canyon
Revegetation Area 7
Rabbit Brush Treatment Area
1996 Sample Sites

APPENDIX III

Horse Canyon Revegetation Areas
Percent Cover Data

Horse Canyon Revegetation Area
Percent Cover Data (Area 11, 13 & 14)

PLANT SPECIES			STAND					
	1	2	3	4	5	6	7	8
Shrubs								
Atriplex canescens	14	22	34	18	12	4	8	18
Artemisia tridentata tridentata	0	0	2	0	6	0	0	0
Chrysothamnus nauseosus	0	2	2	0	0	0	0	0
Chrysothamnus viscidiflorus	0	0	0	0	0	4	0	0
Total Shrubs Cover	14	24	38	18	18	8	8	18
Forbs								
Melilotus officinalis	0	0	4	0	2	4	0	0
Total Forb Cover	0	0	4	0	2	4	0	0
Graminoid								
Agropyron spicatum	26	30	6	24	6	4	44	22
Agropyron cristatum	0	2	0	0	0	0	0	0
Agropyron trachycaulum	0	0	0	0	0	0	2	0
Elymus cinereus	0	0	0	0	2	0	0	4
Oryzopsis hymenoides	2	0	0	2	0	0	0	0
Sitanion hystrix	2	0	0	0	0	0	0	0
Total Graminoid Cover	30	32	6	26	8	4	46	26
Total Vegetation Cover	44	56	48	44	28	16	54	44
Litter	46	30	50	42	68	80	42	52
Rock	0	2	0	0	0	2	0	0
Bare Ground	10	12	2	14	4	2	4	4

Horse Canyon Revegetation Area
Percent Cover Data (Area 11, 13 & 14)

PLANT SPECIES			STAND				
	9	10	11	12	13	14	15
Shrubs							
Atriplex canescens	6	28	26	24	24	26	10
Artemisia tridentata tridentata	6	0	0	4	0	2	12
Chrysothamnus nauseosus	0	0	0	2	0	0	2
Chrysothamnus viscidiflorus	0	0	0	0	0	0	0
Total Shrubs Cover	12	28	26	30	24	28	24
Forbs							
Melilotus officinalis	0	0	0	0	2	0	0
Total Forb Cover	0	0	0	0	2	0	0
Graminoid							
Agropyron spicatum	28	16	42	34	12	30	32
Agropyron cristatum	2	2	0	0	0	0	0
Agropyron trachycaulum	0	2	0	0	2	0	0
Elymus cinereus	0	0	0	0	2	0	0
Oryzopsis hymenoides	2	0	0	0	0	0	0
Sitanion hystrix	2	0	0	0	0	0	0
Total Graminoid Cover	34	20	42	34	16	30	32
Total Vegetation Cover	46	48	68	64	42	58	56
Litter	52	56	30	32	44	22	34
Rock	0	0	0	2	6	16	10
Bare Ground	2	6	2	2	8	4	0

Horse Canyon Revegetation Area
Percent Cover Data (Area 15, 17)

PLANT SPECIES			STAND					
	1	2	3	4	5	6	7	8
Shrubs								
Atriplex canescens	6	12	26	26	18	6	24	18
Atriplex confertifolia	0	0	0	0	0	0	2	0
Atriplex corrugata	0	0	0	0	0	2	0	0
Artemisia tridentata tridentata	10	4	0	0	2	2	0	0
Chrysothamnus nauseosus	0	0	0	0	0	0	0	0
Chrysothamnus viscidiflorus	0	0	0	0	0	0	0	2
Ceratoides lanata	0	0	0	0	0	0	0	0
Sarcobatus vermiculatus	0	4	0	0	0	0	0	2
Total Shrubs Cover	16	20	26	26	20	10	26	22
Forbs								
Melilotus officinalis	0	0	0	0	0	0	0	2
Total Forb Cover	0	0	0	0	0	0	0	2
Graminoid								
Agropyron spicatum	16	32	38	44	42	44	40	18
Agropyron cristatum	0	0	0	0	0	0	0	0
Agropyron trachycaulum	0	0	0	0	0	0	0	0
Elymus cinereus	0	0	2	0	0	0	0	0
Oryzopsis hymenoides	0	0	0	0	2	0	0	2
Poa species	0	0	0	0	0	0	0	2
Sitanion histrix	0	0	0	0	0	0	0	0
Total Graminoid Cover	16	32	40	44	44	44	40	22
Total Vegetation Cover	32	52	66	70	64	54	66	46
Litter	38	24	26	24	26	46	24	30
Rock	26	2	4	0	0	0	0	10
Bare Ground	4	22	4	6	10	0	10	14

Horse Canyon Revegetation Area
Percent Cover Data (Area 15, 17)

PLANT SPECIES			STAND				
	9	10	11	12	13	14	15
Shrubs							
Atriplex canescens	20	18	2	12	16	10	14
Atriplex confertifolia	2	0	0	0	0	0	0
Atriplex corraguta	0	0	0	0	0	0	0
Artemisia tridentata tridentata	0	4	6	10	6	12	2
Chrysothamnus nauseosus	0	2	0	0	0	0	0
Chrysothamnus viscidiflorus	0	2	0	2	0	2	0
Ceratoides lanata	0	2	0	0	0	0	0
Sarcobatus vermiculatus	2	0	0	0	0	0	0
Total Shrubs Cover	24	28	8	24	22	24	16
Forbs							
Melilotus officinalis	0	0	0	0	0	0	0
Total Forb Cover	0	0	0	0	0	0	0
Graminoid							
Agropyron spicatum	32	22	32	30	30	10	26
Agropyron cristatum	2	0	0	0	0	0	0
Agropyron trachycaulum	0	0	2	0	0	0	0
Elymus cinereus	0	2	0	0	2	0	4
Oryzopsis hymenoides	0	0	0	0	2	0	4
Poa species	0	0	2	0	2	0	0
Sitanion hystrix	0	2	2	0	0	0	0
Total Graminoid Cover	34	26	38	30	36	10	34
Total Vegetation Cover	58	54	46	54	58	34	50
Litter	36	32	42	44	34	60	32
Rock	0	6	4	2	2	4	0
Bare Ground	6	8	8	0	6	2	18

Horse Canyon Revegetation Area
Percent Cover Data (Area 16)

PLANT SPECIES			STAND					
	1	2	3	4	5	6	7	8
Shrubs								
Atriplex canescens	14	16	14	14	2	4	4	4
Atriplex confertifolia	0	0	0	0	0	6	2	0
Artemisia tridentata tridentata	4	2	0	4	6	2	0	0
Chrysothamnus nauseosus	0	0	0	0	0	0	2	0
Chrysothamnus viscidiflorus	0	0	0	0	0	4	8	2
Ceratoides lanata	4	0	4	0	0	0	0	0
Total Shrubs Cover	221 8	18	18	18	8	16	16	6
Forbs								
Melilotus officinalis	0	2	0	0	10	0	0	0
Total Forb Cover	0	2	0	0	10	0	0	0
Graminoid								
Agropyron spicatum	38	20	28	22	30	38	40	28
Agropyron cristatum	0	0	0	4	0	0	0	0
Agropyron trachycaulum	0	0	0	0	0	0	0	18
Elymus cinereus	0	0	2	0	0	2	2	0
Oryzopsis hymenoides	0	0	2	0	2	2	4	0
Total Graminoid Cover	38	20	32	26	32	42	46	46
Total Vegetation Cover	60	40	50	44	50	58	62	52
Litter	28	32	18	44	32	26	26	24
Rock	0	14	4	2	8	2	0	6
Bare Ground	12	14	28	10	10	14	12	18

Horse Canyon Revegetation Area
Percent Cover Data (Area 16)

PLANT SPECIES			STAND				
	9	10	11	12	13	14	15
Shrubs							
Atriplex canescens	10	10	8	0	0	22	14
Atriplex confertifolia	2	0	0	0	6	0	0
Artemisia tridentata tridentata	0	0	0	0	0	0	0
Chrysothamnus nauseosus	0	0	2	2	8	0	0
Chrysothamnus viscidiflorus	2	0	2	0	2	2	0
Ceratoides lanata	0	0	0	0	0	0	0
Total Shrubs Cover	14	10	12	2	16	24	14
Forbs							
Melilotus officinalis	0	0	0	0	0	0	0
Total Forb Cover	0	0	0	0	0	0	0
Graminoid							
Agropyron spicatum	22	40	40	38	40	42	24
Agropyron cristatum	2	0	0	0	0	0	0
Agropyron trachycaulum	2	0	0	2	0	0	8
Elymus cinereus	6	0	0	2	2	0	4
Oryzopsis hymenoides	4	2	2	6	0	0	4
Total Graminoid Cover	36	42	42	48	42	42	40
Total Vegetation Cover	50	52	54	50	58	66	54
Litter	30	38	18	34	24	22	18
Rock	0	6	2	0	6	0	6
Bare Ground	20	4	26	16	12	12	22

Horse Canyon Revegetation Area
Percent Cover Data (Area 3)

PLANT SPECIES			STAND					
	1	2	3	4	5	6	7	8
Shrubs								
Atriplex canescens	14	20	22	2	16	4	10	2
Artemisia tridentata tridentata	2	6	0	2	0	0	0	0
Chrysothamnus nauseosus	0	0	4	0	0	0	0	0
Chrysothamnus viscidiflorus	2	0	2	4	12	12	14	10
Total Shrubs Cover	18	26	28	8	28	16	24	12
Forbs								
Melilotus officinalis	0	0	0	0	0	0	0	2
Penstemon palmeri	0	0	0	0	0	0	0	0
Total Forb Cover	0	0	0	0	0	0	0	2
Graminoid								
Agropyron spicatum	34	22	38	24	38	10	28	12
Agropyron cristatum	0	0	0	0	0	0	4	0
Agropyron trachycaulum	2	0	2	12	6	2	4	0
Elymus cinereus	0	6	2	0	4	2	0	2
Elymus giganteous	0	0	0	0	0	0	0	0
Oryzopsis hymenoides	0	0	0	0	0	0	0	0
Total Graminoid Cover	36	28	42	36	48	14	36	14
Total Vegetation Cover	54	54	70	44	76	30	60	28
Litter	26	44	26	50	22	58	32	60
Rock	18	0	2	0	0	2	0	0
Bare Ground	2	2	2	6	2	10	8	12

Horse Canyon Revegetation Area
Percent Cover Data (Area 3)

PLANT SPECIES			STAND				
	9	10	11	12	13	14	15
Shrubs							
Atriplex canescens	0	14	10	20	28	8	2
Artemisia tridentata tridentata	0	0	12	4	0	8	2
Chrysothamnus nauseosus	0	0	4	4	0	0	0
Chrysothamnus viscidiflorus	26	22	0	4	0	0	0
Total Shrubs Cover	26	36	26	32	28	16	4
Forbs							
Melilotus officinalis	0	0	0	0	0	0	0
Penstemon palmeri	0	0	0	0	0	0	2
Total Forb Cover	0	0	0	0	0	0	2
Graminoid							
Agropyron spicatum	10	20	28	36	26	38	38
Agropyron cristatum	0	0	0	0	0	0	0
Agropyron trachycaulum	0	0	2	0	0	2	6
Elymus cinereus	0	0	0	0	6	8	8
Elymus giganteous	0	0	0	0	0	0	2
Oryzopsis hymenoides	0	0	0	0	2	0	0
Total Graminoid Cover	10	20	30	36	34	48	54
Total Vegetation Cover	36	56	56	68	62	64	60
Litter	44	28	30	16	34	28	32
Rock	2	4	10	8	0	2	4
Bare Ground	18	12	4	8	4	6	4

Horse Canyon Revegetation Area
Percent Cover Data (Area 6)

PLANT SPECIES			STAND					
	1	2	3	4	5	6	7	8
Shrubs								
Atriplex canescens	8	16	2	12	6	12	2	12
Artemisia tridentata tridentata	0	2	2	4	4	0	4	4
Chrysothamnus nauseosus	0	0	0	2	0	0	0	0
Chrysothamnus viscidiflorus	2	2	4	14	0	2	0	0
Ceratoides lanata	0	0	2	0	0	0	4	4
Total Shrubs Cover	10	20	10	32	10	14	10	20
Forbs								
Medicago sativa	0	0	0	0	0	0	0	2
Melilotus officinalis	2	0	0	0	0	0	0	0
Penstemon palmeri	0	2	0	0	0	0	0	2
Salsola kali	0	2	2	0	0	2	0	0
Total Forb Cover	2	4	2	0	0	2	0	42
Graminoid								
Agropyron spicatum	28	26	10	6	30	14	18	24
Agropyron cristatum	0	0	0	0	0	0	0	0
Agropyron trachycaulum	0	2	2	0	0	0	0	0
Elymus cinereus	0	0	0	0	4	0	0	2
Oryzopsis hymenoides	0	0	0	4	0	0	0	0
Sitanion histrix	0	0	0	0	0	0	0	0
Total Graminoid Cover	28	28	12	10	34	14	18	26
Total Vegetation Cover	40	52	24	42	44	28	28	50
Litter	42	32	38	30	42	36	26	20
Rock	6	4	2	4	0	4	28	18
Bare Ground	12	12	36	24	14	32	18	12

Horse Canyon Revegetation Area
Percent Cover Data (Area 7)

PLANT SPECIES			STAND					
	1	2	3	4	5	6	7	8
Shrubs								
Atriplex canescens	18	10	14	10	12	24	18	26
Artemisia tridentata tridentata	4	4	6	4	10	6	10	2
Chrysothamnus nauseosus	0	2	0	0	0	0	0	0
Chrysothamnus viscidiflorus	0	12	18	16	16	14	14	12
Ceratoides lanata	0	0	0	0	0	0	0	0
Total Shrubs Cover	22	28	38	30	38	44	42	40
Forbs								
Machaeranthera canescens	0	0	0	0	0	0	0	2
Penstemon palmeri	0	0	0	0	0	0	0	0
Total Forb Cover	0	0	0	0	0	0	0	2
Graminoid								
Agropyron spicatum	24	18	10	20	22	10	4	12
Agropyron cristatum	2	0	0	0	0	0	0	0
Bromus tectorum	2	0	0	0	0	0	0	0
Elymus cinereus	0	0	0	0	0	0	0	0
Oryzopsis hymenoides	2	6	2	0	6	0	0	0
Poa species	4	0	0	0	0	0	0	2
Sitanion hystrix	0	0	0	0	0	0	0	0
Sporobolus cryptandrus	0	2	0	0	4	6	6	2
Stipa comata	0	0	0	0	0	0	0	0
Total Graminoid Cover	34	26	12	20	32	16	10	16
Total Vegetation Cover	56	54	50	50	70	60	52	58
Litter	44	44	42	0	0	0	42	34
Rock	0	0	0	0	0	0	0	0
Bare Ground	0	2	8	50	30	40	6	8

Horse Canyon Revegetation Area
Percent Cover Data (Area 7)

PLANT SPECIES			STAND				
	9	10	11	12	13	14	15
Shrubs							
Atriplex canescens	0	10	8	6	0	0	0
Artemisia tridentata tridentata	6	12	12	14	14	10	12
Chrysothamnus nauseosus	0	0	2	0	0	0	0
Chrysothamnus viscidiflorus	26	4	16	16	18	12	16
Ceratoides lanata	0	0	0	2	0	0	0
Total Shrubs Cover	32	26	38	38	32	22	28
Forbs							
Machaeranthera canescens	0	0	0	0	0	0	0
Penstemon palmeri	0	2	0	0	0	0	0
Total Forb Cover	0	2	0	0	0	0	0
Graminoid							
Agropyron spicatum	0	8	12	16	12	8	6
Agropyron cristatum	0	0	0	0	0	0	0
Bromus tectorum	0	0	0	0	0	0	0
Elymus cinereus	0	0	0	0	2	0	0
Oryzopsis hymenoides	0	6	2	0	4	6	2
Poa species	0	0	0	0	0	0	0
Sitanion hystrix	0	8	0	0	2	0	2
Sporobolus cryptandrus	0	0	0	0	0	0	2
Stipa comata	2	0	0	0	0	0	0
Total Graminoid Cover	2	22	14	16	20	14	12
Total Vegetation Cover	34	50	52	54	52	36	40
Litter	60	44	38	44	32	40	40
Rock	0	0	0	0	10	12	0
Bare Ground	6	6	10	2	6	12	20

Horse Canyon Revegetation Area Percent Cover Data (Area 11, 13 & 14)				
PLANT SPECIES	STATISTICS			
	Mean	Std	Relative Cover	Constancy
Shrubs				
Atriplex canescens	18.1	8.9	38.1	100
Artemisia tridentata tridentata	2.1	3.5	4.5	40
Chrysothamnus nauseosus	0.5	0.9	1.1	26.7
Chrysothamnus viscidiflorus	0.3	1	0.6	6.7
Total Shrubs Cover	21	8.5	44.3	
Forbs				
Melilotus officinalis	0.8	1.5	1.7	26.7
Total Forb Cover	0.8	1.5	1.7	
Graminoid				
Agropyron spicatum	23.7	12.7	49.9	100
Agropyron cristatum	0.4	0.8	0.8	20
Agropyron trachycaulum	0.4	0.8	0.8	20
Elymus cinereus	0.5	1.2	1.1	20
Oryzopsis hymenoides	0.4	0.8	0.8	20
Sitanion hystrix	0.3	0.7	0.6	13.3
Total Graminoid Cover	25.7	12.6	54	
Total Vegetation Cover	47.5	13.2		
Litter	44.7	15		
Rock	2.5	4.7		
Bare Ground	5.1	4.1		

Horse Canyon Revegetation Area Percent Cover Data (Area 15-17)				
PLANT SPECIES	STATISTICS			
	Mean	Std	Relative Cover	Constancy
Shrubs				
Atriplex canescens	15.2	7.3	28.4	100
Atriplex confertifolia	0.3	0.7	0.5	13.3
Atriplex corraguta	0.1	0.5	0.2	6.7
Artemisia tridentata tridentata	3.9	4.1	7.2	66.7
Chrysothamnus nauseosus	0.1	0.5	0.2	6.7
Chrysothamnus viscidiflorus	0.5	0.9	1	26.7
Ceratoides lanata	0.1	0.5	0.2	6.7
Sarcobatus vermiculatus	0.5	1.2	1	20
Total Shrubs Cover	20.7	5.9	38.7	
Forbs				
Melilotus officinalis	0.1	0.5	0.2	6.7
Total Forb Cover	0.1	0.5	0.2	
Graminoid				
Agropyron spicatum	30.4	10.6	56.7	100
Agropyron cristatum	0.1	0.5	0.2	6.7
Agropyron trachycaulum	0.1	0.5	0.2	6.7
Elymus cinereus	0.7	1.2	1.3	26.7
Oryzopsis hymenoides	0.7	1.2	1.3	26.7
Poa species	0.4	0.8	0.8	20
Sitanion hystrix	0.3	0.7	0.5	13.3
Total Graminoid Cover	32.7	10.3	61	
Total Vegetation Cover	53.5	10.8		
Litter	34.5	10.2		
Rock	4.3	6.7		
Bare Ground	7.6	6.4		

Horse Canyon Revegetation Area Percent Cover Data (Area 16)				
PLANT SPECIES	STATISTICS			
	Mean	Std	Relative Cover	Constancy
Shrubs				
Atriplex canescens	9.1	6.67	17	86.7
Atriplex confertifolia	1.1	2.1	2	26.7
Artemisia tridentata tridentata	1.2	2	2.3	33.3
Chrysothamnus nauseosus	0.9	2.1	1.7	26.7
Chrysothamnus viscidiflorus	1.5	2.2	2.8	46.7
Ceratoides lanata	0.5	1.4	1	13.3
Total Shrubs Cover	14.3	5.9	26.8	
Forbs				
Melilotus officinalis	0.8	2.6	1.5	13.3
Total Forb Cover	0.8	2.6	1.5	
Graminoid				
Agropyron spicatum	32.7	8	61.3	100
Agropyron cristatum	0.4	1.1	0.8	13.3
Agropyron trachycaulum	2	4.9	3.8	26.7
Elymus cinereus	1.3	1.8	2.5	46.7
Oryzopsis hymenoides	1.9	1.9	3.5	60
Total Graminoid Cover	38.3	7.8	71.9	
Total Vegetation Cover	53.4	6.8		
Litter	28.9	8.9		
Rock	3.7	4		
Bare Ground	15.3	6.4		

Horse Canyon Revegetation Area
Percent Cover Data (Area 3)

PLANT SPECIES	STATISTICS			
	Mean	Std	Relative Cover	Constancy
Shrubs				
Atriplex canescens	11.5	8.6	21	93.3
Artemisia tridentata tridentata	2.4	3.6	4.4	46.7
Chrysothamnus nauseosus	0.8	1.7	1.5	20
Chrysothamnus viscidiflorus	7.2	8.5	13.2	10
Total Shrubs Cover	21.9	8	40.1	
Forbs				
Melilotus officinalis	0.1	0.5	0.2	6.7
Penstemon palmeri	0.1	0.5	0.2	6.7
Total Forb Cover	0.2	0.7	0.4	
Graminoid				
Agropyron spicatum	26.9	10.5	49.3	100
Agropyron cristatum	0.3	1	0.5	6.7
Agropyron trachycaulum	2.5	3.3	4.6	60
Elymus giganteous	0.1	0.5	0.2	6.7
Elymus cinereus	2.5	3.1	4.6	53.3
Oryzopsis hymenoides	0.1	0.5	0.2	6.7
Total Graminoid Cover	32.4	13.2	59.4	
Total Vegetation Cover	54.5	14.2		
Litter	35.3	13		
Rock	3.5	5		
Bare Ground	6.7	4.7		

Horse Canyon Revegetation Area Percent Cover Data (Area 7)				
PLANT SPECIES	STATISTICS			
	Mean	Std	Relative Cover	Constancy
Shrubs				
Atriplex canescens	10.3	8.4	20.1	73.3
Artemisia tridentata tridentata	8.4	4	16.4	100
Chrysothamnus nauseosus	0.3	0.7	0.5	13.3
Chrysothamnus viscidiflorus	14	6	27.3	93.3
Ceratoides lanata	0.1	0.5	0.3	6.7
Total Shrubs Cover	33.1	7.1	64.6	
Forbs				
Machaeranthera canescens	0.1	0.5	0.3	6.7
Penstemon palmeri	0.1	0.5	0.2	6.7
Total Forb Cover	0.2	0.7	0.5	
Graminoid				
Agropyron spicatum	12.1	6.8	23.7	93.3
Agropyron cristatum	0.3	0.7	0.5	13.3
Bromus tectorum	0.1	0.5	0.3	6.7
Oryzopsis hymenoides	2.4	2.5	4.7	60
Poa species	0.4	1.1	0.8	13.3
Sitanion hystrix	0.8	2.1	1.6	30
Sporobolus cryptandrus	1.5	2.2	2.9	40
Stipa comata	0.3	0.7	0.5	13.3
Total Graminoid Cover	17.9	8.3	35	
Total Vegetation Cover	51.2	9.2		
Litter	41.6	7.3		
Rock	1.5	3.9		
Bare Ground	5.7	5.6		

Horse Canyon Revegetation Area Percent Cover Data (Area 6)				
PLANT SPECIES	STATISTICS			
	Mean	Std	Relative Cover	Constancy
Shrubs				
Atriplex canescens	10.5	6.3	22.4	100
Artemisia tridentata tridentata	2.3	1.5	4.8	80
Chrysothamnus nauseosus	0.3	0.7	0.6	20
Chrysothamnus viscidiflorus	2.9	4.1	6.2	53.3
Ceratoides lanata	0.7	1.5	1.4	20
Total Shrubs Cover	16.7	7.7	35.4	
Forbs				
Medicago sativa	0.1	0.5	0.3	6.7
Melilotus officinalis	0.1	0.5	0.3	6.7
Penstemon palmeri	0.3	0.7	0.6	13.3
Salsola kali	0.4	0.8	0.9	20
Total Forb Cover	0.9	1.5	2.1	
Graminoid				
Agropyron spicatum	27.2	11.1	58	100
Agropyron cristatum	0.1	0.5	0.3	6.7
Agropyron trachycaulum	0.4	0.8	0.9	20
Elymus cinereus	0.4	0.8	0.9	20
Oryzopsis hymenoides	1.3	1.8	2.8	40
Sitanion hystrix	0.1	0.5	0.3	6.7
Total Graminoid Cover	29.5	11.6	63.2	
Total Vegetation Cover	47.1	13.4		
Litter	33.7	7.3		
Rock	4.4	8		
Bare Ground	15.2	9		

Horse Canyon Revegetation Area
Percent Cover Data Combined Data
(Excluding Area 7 Data)

PLANT SPECIES	STATISTICS			
	Mean	Std	Relative Cover	Constancy
Shrubs				
Atriplex canescens	12.9	8.2	25.1	96
Atriplex confertifolia	0.3	1.2	0.5	8
Atriplex corraguta	<0.1	0.2	<0.1	1.3
Artemisia tridentata tridentata	2.4	3.2	4.7	53.3
Chrysothamnus nauseosus	0.6	1.3	1.1	20
Chrysothamnus viscidiflorus	2.5	5	4.8	40
Ceratoides lanata	0.3	1	0.5	8
Sarcobatus vermiculatus	0.1	0.6	0.2	4
Total Shrubs Cover	19.1	8.3	36.9	
Forbs				
Medicago sativa	<0.1	0.2	<0.1	1.3
Melilotus officinalis	0.4	1.4	0.8	12
Penstemon palmeri	0.1	0.4	0.2	4
Salsola kali	0.1	0.4	0.2	4
Total Forb Cover	0.6	1.5	1.2	
Graminoid				
Agropyron spicatum	28.2	10.8	54.9	100
Agropyron cristatum	0.3	0.8	0.5	10.7
Agropyron trachycaulum	1.1	2.8	2.1	26.7
Elymus cinereus	1.1	2	2.2	33.3
Elymus giganteous	<0.1	0.2	<0.1	1.33
Oryzopsis hymenoides	0.9	1.5	1.7	30.7
Poa species	<0.1	0.4	0.2	4
Sitanion hystrix	0.1	0.5	0.3	6.7
Total Graminoid Cover	31.7	11.7	61.9	
Total Vegetation Cover	51.4	12.1		
Litter	35.4	12.1		
Rock	3.7	5.8		
Bare Ground	10	7.6		

APPENDIX IV

Horse Canyon Reference Area
Percent Cover Data

Horse Canyon Reference Area
Percent Cover Data

PLANT SPECIES			STAND					
	1	2	3	4	5	6	7	8
Trees								
Juniperus osteoperma	28	4	16	0	2	20	44	24
Pinus edulis	0	0	0	0	0	0	0	28
Total Tree Cover	28	4	16	0	2	20	44	52
Shrubs and Subshrubs								
Atriplex canescens	0	0	0	0	0	0	0	0
Ephedra viridis	2	2	0	0	0	0	0	0
Xanthocephalum sarothra	0	0	4	10	2	2	2	0
Total Shrubs/Subshrubs cover	2	2	4	10	2	2	2	0
Forbs								
Hackelia spp.	0	0	0	0	0	0	0	0
Phlox spp.	2	0	0	0	0	0	0	0
Astragalus spp.	0	0	0	0	0	0	0	0
Haplopappus acaulis	0	0	0	0	0	0	0	0
Total Forb Cover	2	0	0	0	0	0	0	0
Graminoid								
Boutelous gracilis	0	0	0	4	0	2	0	0
Elymus salinus	12	26	12	14	6	4	2	2
Hilaria jamesii	0	2	0	0	2	0	0	0
Oryzopsis hymenoides	0	0	4	12	0	0	0	0
Poa species	2	0	0	0	0	0	0	0
Stipa comata	0	0	0	0	2	0	0	0
Total Graminoid Cover	14	28	16	30	10	6	2	2
Echinocereus trilochidiatus	0	0	0	0	0	0	0	0
Total Succulent Cover	0	0	0	0	0	0	0	0
Total Vegetation Cover	46	34	36	40	14	28	48	54
Litter	10	2	14	10	2	18	12	6
Cryptogamic soil	10	28	16	6	2	12	6	4
Rock	22	8	24	12	50	24	16	30
Bare Ground	12	28	10	32	32	18	18	6

Horse Canyon Reference Area
Percent Cover Data

PLANT SPECIES			STAND					
	9	10	11	12	13	14	15	16
Trees								
Juniperus osteoperma	6	38	8	24	34	26	16	0
Pinus edulis	0	0	0	0	0	0	0	0
Total Tree Cover	6	38	8	24	34	26	16	0
Shrubs and Subshrubs								
Atriplex canescens	0	0	0	0	0	0	0	0
Ephedra viridis	0	0	0	0	0	0	0	0
Xanthocephalum sarothra	2	0	4	2	0	2	0	16
Total Shrubs/Subshrubs cover	2	0	4	2	0	2	0	16
Forbs								
Hackelia spp.	0	0	0	0	0	0	0	0
Phlox spp.	0	0	0	0	0	0	0	0
Astragalus spp.	0	0	0	0	0	0	0	0
Haplopappus acaulis	0	0	0	0	0	0	0	0
Total Forb Cover	0	0	0	0	0	0	0	0
Graminoid								
Boutelous gracilis	0	0	10	0	0	0	0	0
Elymus salinus	14	20	12	22	2	16	16	4
Hilaria jamesii	2	0	0	2	0	0	0	0
Oryzopsis hymenoides	6	0	0	0	0	0	0	6
Poa species	0	0	0	0	0	0	0	0
Stipa comata	0	0	0	0	0	0	0	0
Total Graminoid Cover	22	20	22	24	2	16	16	10
Echinocereus trilochidiatus	0	0	0	2	0	0	0	2
Total Succulent Cover	0	0	0	2	0	0	0	2
Total Vegetation Cover	30	58	34	52	36	44	32	28
Litter	22	20	12	10	12	10	16	24
Cryptogamic soil	6	2	10	2	12	2	4	10
Rock	18	16	26	20	22	24	34	22
Bare Ground	24	4	18	16	18	20	14	16

Horse Canyon Reference Area
Percent Cover Data

PLANT SPECIES			STAND					
	17	18	19	20	21	22	23	24
Trees								
Juniperus osteoperma	4	10	34	26	12	10	8	4
Pinus edulis	0	0	0	18	0	8	0	8
Total Tree Cover	4	10	34	44	12	18	8	12
Shrubs and Subshrubs								
Atriplex canescens	4	0	0	0	0	0	0	0
Ephedra viridis	0	0	0	0	0	0	0	0
Xanthocephalum sarothra	2	0	0	0	0	0	0	0
Total Shrubs/Subshrubs cover	6	0	0	0	0	0	0	0
Forbs								
Hackelia spp.	0	0	0	0	0	0	0	0
Phlox spp.	0	0	2	0	2	4	0	0
Astragalus spp.	0	0	0	0	0	0	0	4
Haplopappus acaulis	0	0	0	0	0	6	0	0
Total Forb Cover	0	0	2	0	2	10	0	4
Graminoid								
Boutelous gracilis	0	6	6	0	0	0	0	0
Elymus salinus	4	28	14	0	10	4	6	10
Hilaria jamesii	2	0	0	0	0	0	4	0
Oryzopsis hymenoides	6	0	0	0	0	2	2	0
Poa species	0	0	0	0	0	0	0	0
Stipa comata	0	0	0	0	0	0	0	0
Total Graminoid Cover	12	34	20	0	10	6	12	10
Echinocereus trilochidiatus	0	0	0	0	0	0	0	0
Total Succulent Cover	0	0	0	0	0	0	0	0
Total Vegetation Cover	22	44	56	44	24	34	20	26
Litter	10	20	10	8	6	18	2	20
Cryptogamic soil	8	6	14	2	2	0	6	2
Rock	34	20	12	38	54	32	42	44
Bare Ground	26	10	8	8	14	16	30	8

Horse Canyon Reference Area
Percent Cover Data

PLANT SPECIES			STAND					
	25	26	27	28	29	30	31	
Trees								
Juniperus osteoperma	28	26	32	46	10	20	8	
Pinus edulis	0	0	0	0	0	10	0	
Total Tree Cover	28	26	32	46	10	30	8	
Shrubs and Subshrubs								
Atriplex canescens	0	0	0	0	0	0	0	
Ephedra viridis	0	0	0	0	0	0	0	
Xanthocephalum sarothra	0	2	0	2	2	0	0	
Total Shrubs/Subshrubs cover	0	2	0	2	2	0	0	
Forbs								
Hackelia spp.	0	0	0	0	2	0	2	
Phlox spp.	0	0	0	0	0	0	0	
Astragalus spp.	0	0	0	0	0	0	0	
Haplopappus acaulis	0	0	0	0	0	0	0	
Total Forb Cover	0	0	0	0	2	0	2	
Graminoid								
Boutelous gracilis	2	0	0	4	0	0	2	
Elymus salinus	6	8	8	8	10	2	2	
Hilaria jamesii	0	0	0	0	0	0	0	
Oryzopsis hymenoides	4	2	0	2	0	0	0	
Poa species	0	0	0	0	0	0	0	
Stipa comata	0	0	0	0	0	0	0	
Total Graminoid Cover	12	10	8	14	10	2	4	
Echinocereus trilochidiatus	0	0	0	0	0	0	0	0
Total Succulent Cover	0	0	0	0	0	0	0	0
Total Vegetation Cover	40	38	40	62	24	32	14	
Litter	14	6	12	14	14	28	8	
Cryptogamic soil	10	8	0	4	24	2	20	
Rock	14	28	38	12	24	24	50	
Bare Ground	22	20	10	8	14	14	8	

Horse Canyon Reference Area
Percent Cover Data

PLANT SPECIES	STATISTICS			
	Mean	Std	Relative Cover	Constancy
Trees				
Juniperus osteosperma	17.9	13.0	49.6	90.3
Pinus edulis	2.5	6.6	6.8	12.9
Total Tree Cover	20.4	14.9	56.4	
Shrubs				
Atriplex canescens	0.1	0.7	0.4	3.2
Ephedra viridis	0.1	0.5	0.4	6.5
Xanthocephalum sarothrae	1.7	3.3	4.8	45.2
Total Shrubs Cover	1.9	3.4	5.6	
Forbs				
Astragalus spp.	0.1	0.7	0.4	3.2
Hackelia spp.	0.3	1.1	0.7	6.5
Haplopappus acaulis	0.2	1.1	0.5	3.2
Phlox spp.	0.1	0.4	0.2	3.2
Total Forb Cover	0.7	2.0	1.8	
Graminoid				
Bouteloua gracilis	1.2	2.4	3.2	22.6
Elymus salinus	9.8	7.3	27.1	96.8
Hilaria jamesii	0.5	1.0	1.2	19.4
Oryzopsis hymenoides	1.5	2.8	4.1	32.3
Poa species	0.1	0.4	0.2	3.2
Stipa comata	0.1	0.4	0.2	3.2
Total Graminoid Cover	13.2	8.7	36.0	
Succulents				
Echinocereus trilochiditus	0.1	0.5	0.4	3.2
Total Succulent Cover	0.1	0.5	0.4	3.2
Total Vegetation Cover	36.3	12.4		
Cryptogamic soil	7.7	6.9		
Litter	12.5	6.3		
Rock	26.9	12.1		
Bare Ground	16.2	7.8		

APPENDIX V

Horse Canyon Revegetation Areas
Shrub Density Data

Horse Canyon Revegetation Area
Density Data for Shrubs/Subshrubs Plants per Acre
Area 15-17

PLANT SPECIES			STAND			
	1	2	3	4	5	6
Shrubs and Subshrubs						
Atriplex canescens	915	719	5075	1481	3637	4639
Atriplex confertifolia	0	0	0	0	0	65
Atriplex corrugata	0	0	0	0	0	0
Artemisia nova	0	0	0	0	0	0
Artemisia tridentata tridentata	1307	1764	588	871	1851	3027
Chrysothamnus nauseosus	87	65	22	87	0	0
Chrysothamnus viscidiflorus	436	283	22	370	109	0
Ceratoides lanata	65	65	131	174	305	370
Sarcobatus vermiculatus	109	131	44	1764	22	131
Xanthocephalum sarothrae	0	0	0	0	0	0
Total Shrubs	2919	3027	5882	4747	5924	8232

	7	8	9	10	11	12
Shrubs and Subshrubs						
Atriplex canescens	2723	937	1045	2418	2047	1154
Atriplex confertifolia	22	0	87	0	0	0
Atriplex corrugata	0	0	0	0	0	0
Artemisia nova	0	22	0	0	0	0
Artemisia tridentata tridentata	3746	2243	2853	2788	6447	893
Chrysothamnus nauseosus	109	22	261	0	44	44
Chrysothamnus viscidiflorus	675	196	436	109	218	196
Ceretoides lanata	588	348	65	131	152	44
Sarcobatus vermiculatus	697	0	240	0	109	0
Xanthocephalum sarothrae	0	0	22	0	65	44
Total Shrubs	8560	3768	5009	5446	9082	2375

Horse Canyon Revegetation Area
Density Data for Shrubs/Subshrubs Plants per Acre
Area 15-17

PLANT SPECIES	STAND			STATISTICS	
	13	14	15	Mean	Std
Shrubs and Subshrubs					
Atriplex canescens	2810	2069	2352	2268.0	1345.6
Atriplex confertifolia	65	0	0	16.0	30.3
Atriplex corrugata	131	44	0	11.6	34.9
Artemisia nova	0	0	0	1.5	5.7
Artemisia tridentata tridentata	4443	980	261	2270.9	1674.9
Chrysothamnus nauseosus	0	0	0	47.9	70.4
Chrysothamnus viscidiflorus	44	87	43	214.9	192.8
Ceratoides lanata	240	65	65	183.0	151.8
Sarcobatus vermiculatus	87	22	0	223.6	460.9
Xanthocephalum sarothrae	22	0	0	10.1	20.0
Total Shrubs	7842	3267	2721	5247.5	2293.9

Horse Canyon Revegetation Area
Density Data for Shrubs/Subshrubs Plants per Acre
Area 11, 13 & 14

PLANT SPECIES			STAND			
	1	2	3	4	5	6
Shrubs and Subshrubs						
Atriplex canescens	2875	1742	1024	3354	3833	3964
Artemisia tridentata tridentata	3267	1241	218	1307	2047	9322
Chrysothamnus nauseosus	22	22	109	0	0	240
Chrysothamnus viscidiflorus	196	22	22	22	22	370
Ceratoides lanata	196	240	22	152	152	632
Sarcobatus vermiculatus	0	0	0	196	0	0
Xanthocephalum sarothrae	0	22	0	0	0	0
Total Shrubs	6556	3289	1395	5031	6054	14528
	7	8	9	10	11	12
Shrubs and Subshrubs						
Atriplex canescens	1133	2069	2069	1503	457	1590
Artemisia tridentata tridentata	545	2069	893	1111	196	1590
Chrysothamnus nauseosus	22	87	65	196	0	65
Chrysothamnus viscidiflorus	109	65	0	22	0	22
Ceretoides lanata	152	0	0	22	22	22
Sarcobatus vermiculatus	0	0	0	22	0	44
Xanthocephalum sarothrae	0	0	22	0	0	0
Total Shrubs	1961	4290	3049	2876	675	3333

Horse Canyon Revegetation Area
Density Data for Shrubs/Subshrubs Plants per Acre
Area 11, 13 & 14

PLANT SPECIES	STAND			STATISTICS	
	13	14	15	Mean	Std
Shrubs and Subshrubs					
Atriplex canescens	1786	2069	1938	2111.1	993.6
Artemisia tridentata tridentata	1241	588	523	1743.2	2248.6
Chrysothamnus nauseosus	44	0	22	59.5	73.0
Chrysothamnus viscidiflorus	109	22	65	73.4	98.2
Ceratoides lanata	22	44	22	113.3	164.0
Sarcobatus vermiculatus	87	261	0	40.7	81.0
Xanthocephalum sarothrae	0	0	0	2.8	7.6
Total Shrubs	3289	2984	2570	4144.0	3217.8

Horse Canyon Revegetation Area
Density Data for Shrubs/Subshrubs Plants per Acre
Area 16

PLANT SPECIES			STAND			
	1	2	3	4	5	6
Shrubs and Subshrubs						
Atriplex canescens	1176	3485	2178	2222	370	457
Atriplex confertifolia	0	109	87	152	174	545
Atriplex corrugata	0	22	0	0	0	0
Artemisia tridentata tridentata	327	3528	697	2897	958	0
Chrysothamnus nauseosus	283	0	0	958	915	1568
Chrysothamnus viscidiflorus	218	22	44	1721	762	697
Ceratoides lanata	22	87	44	370	87	152
Xanthocephalum sarothrae	0	0	0	0	0	0
Total Shrubs	2026	7253	3050	8320	3266	3419
	7	8	9	10	11	12
Shrubs and Subshrubs						
Atriplex canescens	3855	2984	3267	1960	2004	1917
Atriplex confertifolia	0	65	44	131	588	828
Atriplex corrugata	0	0	0	0	0	0
Artemisia tridentata tridentata	5728	2287	2439	3115	715	457
Chrysothamnus nauseosus	44	87	152	44	327	414
Chrysothamnus viscidiflorus	261	261	348	523	1176	544
Ceretoides lanata	762	283	893	566	152	305
Xanthocephalum sarothrae	22	0	0	0	0	0
Total Shrubs	10672	5967	7143	6339	4962	4465

Horse Canyon Revegetation Area
Density Data for Shrubs/Subshrubs Plants per Acre
Area 16

PLANT SPECIES	STAND			STATISTICS	
	13	14	15	Mean	Std
Shrubs and Subshrubs					
Atriplex canescens	1721	849	44	1899.2	1168.1
Atriplex confertifolia	566	414	370	271.6	260.1
Atriplex corrugata	0	0	0	1.5	5.7
Artemisia tridentata tridentata	109	22	0	1565.3	1697.8
Chrysothamnus nauseosus	1481	283	1481	535.8	583.7
Chrysothamnus viscidiflorus	632	370	849	561.9	448.0
Ceratoides lanata	196	87	174	278.8	265.1
Xanthocephalum sarothrae	0	0	0	1.5	5.7
Total Shrubs	4705	2025	2918	5115.6	2744.3

Horse Canyon Revegetation Area
Density Data for Shrubs/Subshrubs Plants per Acre
Area 3

PLANT SPECIES			STAND			
	1	2	3	4	5	6
Shrubs and Subshrubs						
Atriplex canescens	283	937	1285	1089	1154	479
Artemisia nova	0	0	22	0	0	0
Artemisia tridentata tridentata	479	1503	436	1394	2156	240
Chrysothamnus nauseosus	44	44	87	218	349	196
Chrysothamnus viscidiflorus	22	0	87	218	501	1764
Ceratoides lanata	0	0	0	22	0	0
Total Shrubs	828	2484	1917	2941	4160	2679
	7	8	9	10	11	12
Shrubs and Subshrubs						
Atriplex canescens	1154	305	653	327	719	588
Artemisia nova	0	0	0	0	0	0
Artemisia tridentata tridentata	1089	153	131	349	153	240
Chrysothamnus nauseosus	174	174	65	22	65	22
Chrysothamnus viscidiflorus	1372	1242	1982	1895	436	523
Ceretoides lanata	0	0	0	0	0	0
Total Shrubs	3789	1874	2831	2593	1373	1373

Horse Canyon Revegetation Area
Density Data for Shrubs/Subshrubs Plants per Acre
Area 3

PLANT SPECIES	STAND			STATISTICS	
	13	14	15	Mean	Std
Shrubs and Subshrubs					
Atriplex canescens	2309	1546	2243	1004.8	643.0
Artemisia nova	0	0	0	1.5	5.7
Artemisia tridentata tridentata	719	2134	2047	881.4	772.8
Chrysothamnus nauseosus	44	65	65	108.9	93.2
Chrysothamnus viscidiflorus	174	218	523	730.4	715.8
Ceratoides lanata	65	87	87	17.4	33.1
Total Shrubs	3311	4050	4965	2744.4	1169.2

Horse Canyon Revegetation Area
Density Data for Shrubs/Subshrubs Plants per Acre
Area 6

PLANT SPECIES			STAND			
	1	2	3	4	5	6
Shrubs and Subshrubs						
Atriplex canescens	1721	1525	958	1830	1655	327
Artemisia nova	0	44	65	44	0	44
Artemisia tridentata tridentata	3964	2069	2243	1786	1590	1525
Chrysothamnus nauseosus	65	131	22	87	0	44
Chrysothamnus viscidiflorus	348	566	479	1307	893	1045
Ceratoides lanata	1525	327	3354	1133	741	2352
Sarcobatus vermiculatus	0	0	0	0	0	0
Xanthocephalum sarothrae	65	196	65	0	0	44
Total Shrubs	7688	4858	7186	6187	4879	5381
	7	8	9	10	11	12
Shrubs and Subshrubs						
Atriplex canescens	1568	1721	2222	1873	2047	1655
Artemisia nova	87	22	0	0	22	0
Artemisia tridentata tridentata	2265	1350	4291	1481	3681	1721
Chrysothamnus nauseosus	152	22	261	22	131	0
Chrysothamnus viscidiflorus	240	370	958	174	1938	1481
Ceretoides lanata	5140	3637	196	392	131	152
Sarcobatus vermiculatus	22	22	0	0	0	0
Xanthocephalum sarothrae	0	0	22	0	0	0
Total Shrubs	9474	7144	7950	3942	7950	5009

Horse Canyon Revegetation Area
Density Data for Shrubs/Subshrubs Plants per Acre
Area 6

PLANT SPECIES	STAND			STATISTICS	
	13	14	15	Mean	Std
Shrubs and Subshrubs					
Atriplex canescens	2352	2592	2897	1796.1	623.6
Artemisia nova	0	0	0	21.9	28.5
Artemisia tridentata tridentata	1634	1263	1721	2172.2	985.1
Chrysothamnus nauseosus	44	22	0	66.8	73.8
Chrysothamnus viscidiflorus	1634	240	152	788.4	584.8
Ceratoides lanata	196	152	174	1306.8	1590.2
Sarcobatus vermiculatus	0	0	0	2.9	7.7
Xanthocephalum sarothrae	0	0	0	26.1	52.8
Total Shrubs	5860	4269	4944	6181.2	1626.5

Horse Canyon Revegetation Area
Density Data for Shrubs/Subshrubs Plants per Acre
Area 7

PLANT SPECIES			STAND			
	1	2	3	4	5	6
Shrubs and Subshrubs						
Atriplex canescens	2026	1067	1416	1634	1634	1568
Atriplex confertifolia	0	0	0	0	0	0
Artemisia nova	0	0	0	0	0	0
Artemisia tridentata tridentata	4356	3202	4704	4922	4704	4269
Chrysothamnus nauseosus	22	87	0	0	44	22
Chrysothamnus viscidiflorus	784	1568	1002	1024	1394	1503
Ceratoides lanata	0	0	44	65	44	65
Xanthocephalum sarothrae	0	174	0	0	0	0
Total Shrubs	7188	5924	7166	7645	7820	7427
	7	8	9	10	11	12
Shrubs and Subshrubs						
Atriplex canescens	1024	2004	1045	1394	784	726
Atriplex confertifolia	0	0	0	22	0	0
Artemisia nova	0	0	0	22	22	87
Artemisia tridentata tridentata	7253	6098	7166	11434	14941	16945
Chrysothamnus nauseosus	324	283	283	109	305	261
Chrysothamnus viscidiflorus	1568	1786	2113	1590	1546	1525
Ceretoides lanata	44	0	0	0	0	22
Xanthocephalum sarothrae	109	22	261	348	370	44
Total Shrubs	10325	10193	10868	14919	17986	19610

Horse Canyon Revegetation Area
Density Data for Shrubs/Subshrubs Plants per Acre
Area 7

PLANT SPECIES	STAND			STATISTICS	
	13	14	15	Mean	Std
Shrubs and Subshrubs					
Atriplex canescens	937	370	414	1205.2	516.6
Atriplex confertifolia	0	0	0	2.90	7.6
Artemisia nova	0	65	0	13.1	27.0
Artemisia tridentata tridentata	16531	18557	18644	9583.2	5892.1
Chrysothamnus nauseosus	436	327	87	172.8	148.1
Chrysothamnus viscidiflorus	2831	2047	3942	1748.2	783.2
Ceratoides lanata	44	0	22		
Xanthocephalum sarothrae	305	0	22	23.2	25.3
Total Shrubs	21084	22041	23915		6215.8

Horse Canyon Revegetation Area
Density Data for Shrubs/Subshrubs Plants per Acre
Combined Data (excluding Area 7)

PLANT SPECIES	STATISTICS	
	Mean	Std
Shrubs and Subshrubs		
Atriplex canescens	1816.0	1064.6
Atriplex confertifolia	57.5	156.8
Atriplex corrugata	2.6	15.9
Artemisia nova	109.1	15.5
Artemisia tridentata tridentata	1726.7	1606.1
Chrysothamnus nauseosus	163.8	323.4
Chrysothamnus viscidiflorus	466.8	541.0
Ceratoides lanata	369.2	842.7
Sarcobatus vermiculatus	53.5	221.5
Xanthocephalum sarothrae	7.8	26.6
Total Shrubs	4773.0	2549.6