

Reclamation Area 34 Vegetation Cover Data (continued)

Scientific Name	Common Name	19	20	21	22	23	24	25	26	27	28	29	30	Total Hits	Absolute Cover (%)	Relative Cover (%)	Relative Cover (%)
Grass: Annual Introduced																	
<i>Bromus tectorum</i>	cheatgrass	1	2	1	2	1	2	1	2	1	2	1	2	16	0.0	0.0	0.0
Subtotal														0	0	0.0	0.0
Grass: Perennial Desirable (Cool)																	
<i>Achnatherum hymenoides</i>	Indian ricegrass													2	0.1	0.4	0.4
<i>Agropyron cristatum</i>	crested wheatgrass				P									1	0.1	0.2	0.2
<i>Cyperus schweinitzii</i>	Schweinitz's flatsedge												P	0	0.0	0.0	0.0
<i>Hesperostipa comata</i>	needle and thread	1												1	0.1	0.2	0.2
<i>Pascopyrum smithii</i>	western wheatgrass													1	0.1	0.2	0.2
<i>Thaopyrum intermedium</i>	intermediate wheatgrass													0	0.0	0.0	0.0
Subtotal		1			P				1	P			P	5	0.3	1.1	1.1
Grass: Perennial Desirable (Warm)																	
<i>Andropogon hallii</i>	sand bluestem													7	0.5	1.7	1.7
<i>Aristida purpurea</i>	purple threeawn	P		1					1				1	0	0.0	0.0	0.0
<i>Bouteloua curtipendula</i>	sidecoats grama													1	0.1	0.2	0.2
<i>Bouteloua dactyloides</i>	buffalograss	P												0	0.0	0.0	0.0
<i>Bouteloua gracilis</i>	blue grama	P	P	1	P				P	P	P		P	8	0.5	2.0	2.0
<i>Calamovilla longifolia</i>	prairie sandreed	7	P	6	1	2	1		5	4	2	1		47	3.1	10.7	10.7
<i>Panicum virgatum</i>	switchgrass													0	0.0	0.0	0.0
<i>Schizachyrium scoparium</i>	little bluestem	1		P	P									3	0.2	0.7	0.7
<i>Sorghastrum nutans</i>	Indiangrass	P												1	0.1	0.2	0.2
<i>Sporobolus cryptandrus</i>	sand dropseed	1	2	P	1	1	1	P	1	P	1	2	1	44	2.9	10.5	10.5
Subtotal		9	2	8	2	4	2	P	7	4	3	2	3	111	7.4	25.9	25.9
Total Grass Cover		10	0	2	0	4	0	0	4	0	3	0	3	116	7.7	27.0	27.0
Forbs: Annual & Biennial Native																	
<i>Ambrosia acanthicarpa</i>	fatspine bur ragweed													4	0.3	0.9	0.9
<i>Argemone polyanthemis</i>	crested pricklypoppy		P											0	0.0	0.0	0.0
<i>Croton texensis</i>	Texas croton													4	0.3	0.9	0.9
<i>Dysphania graveolens</i>	fetid goosefoot		P		P				P					8	0.5	1.7	1.7
<i>Helianthus annuus</i>	common sunflower	1	3	P	2	8	3	5	1	P	2	8	3	100	6.7	22.0	22.0
<i>Machaeranthera sp.</i>	tansyaster				P									1	0.1	0.2	0.2
Subtotal		1	3	P	3	8	5	5	1	P	3	8	3	117	7.8	25.7	25.7
Forbs: Annual & Biennial Introduced																	
<i>Lactuca scariola</i>	prickly lettuce													0	0.0	0.0	0.0
<i>Oropogon acanthium</i>	Scotch cottonsate	2	10	1	5	10	1	17	1	6	1	10	2	0	0.0	0.0	0.0
<i>Salsola tragus</i>	prickly Russian thistle													201	13.4	45.5	45.5
Subtotal		2	10	1	5	10	1	17	1	6	1	10	2	201	13.4	45.5	45.5

[illegible]

Reclamation Area 35 Vegetation Cover Data

Scientific Name	Common Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total Hits 1st All	Absolute Cover (%)	Relative Cover (%)	Relative Cover (%)	
Grass: Annual Native		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15					
<i>Munroa squarrosa</i>	false buffalograss																0	0	0.0	0.0	
Subtotal							P										0	0	0.0	0.0	
Grass: Perennial Desirable (Cool)																					
<i>Achnatherum hymenoides</i>	Indian ricegrass	4	3	1	P	2											22	24	2.9	11.3	
<i>Cyperus schweinitzii</i>	Schweinitz's flaxseed					P											0	0	0.0	0.0	
<i>Pascopyrum smithii</i>	western wheatgrass	P															0	0	0.0	0.0	
Subtotal		4	3	1	P	2				P	1	3	3	P	3	P	22	24	2.9	11.3	
Grass: Perennial Desirable (Warm)																					
<i>Sporobolus cryptandrus</i>	sand dropseed	1	1		P	1			1	4		P	P	4			12	12	1.6	5.6	
Subtotal		1	1		P	1			1	4		P	P	4			12	12	1.6	5.6	
Total Grass Cover		5	0	4	1	0	0	2	0	1	0	1	1	2	0	1	0	34	36	4.5	16.9
Forbs: Annual & Biennial Native																					
<i>Dysphania graveolens</i>	field goosefoot																1	1	0.1	0.5	
<i>Helianthus annuus</i>	common sunflower	2	1	5	P	6	4	P	5	6	1	P	P	1	P	2	33	33	4.4	15.5	
Subtotal		2	1	5	P	6	5	P	5	6	1	P	P	1	P	2	34	34	4.5	16.0	
Forbs: Annual & Biennial Introduced																					
<i>Bassia scoparia</i>	burningbush	1															1	1	0.1	0.5	
<i>Dysphania borys</i>	Jerusalem oak goosefoot	1		P	2												1	1	0.1	0.5	
<i>Salsola collina</i>	slender Russian thistle	1	2		P	3	3	2	2	P	1						11	11	1.5	5.2	
<i>Salsola tragus</i>	prickly Russian thistle	8	19	1	6	3	2	1	1	7	9	8	1	12	8	11	16	1	16.7	61.0	
Subtotal		10	19	1	3	8	6	1	1	14	3	1	7	10	8	11	16	1	18.4	67.1	
Forbs: Perennial Native																					
<i>Ambrosia psilostachya</i>	Cuman ragweed			P													0	0	0.0	0.0	
<i>Cuscuta indecora</i>	bi-seed alfalfa dodder					P											0	0	0.0	0.0	
<i>Cuscuta indecora</i>	bi-seed alfalfa dodder						P										0	0	0.0	0.0	
Subtotal																	0	0	0.0	0.0	
Total Forb Cover		12	0	20	1	8	0	8	0	9	0	11	1	14	0	8	1	172	177	22.9	83.1
Rock																					
Litter		5	13	8	8	2											2	2	0.3		
Bare Ground		28	13	34	30	30	26	15	29	16	30	17	20	25	22	20	187	187	24.9		
Total Hits		50	0	50	2	50	0	50	0	50	0	50	1	50	0	50	1	750	757	100.0	
Total Vegetation Cover		34	0	48	4	16	0	20	0	20	0	24	4	32	0	18	2	34	0	27.5	100.0
Non-Noxious Vegetation Cover		34	0	48	4	16	0	20	0	20	0	24	4	32	0	18	2	34	0	27.5	100.0
Total Ground Cover		44	74	32	40	40	48	70	42	68	40	66	60	50	56	60			52.7		
Allowable Vegetation Cover		13.8	27.8	0.0	0.0	0.0	3.8	11.8	0.0	13.8	3.8	1.8	9.8	5.8	7.8	15.8			7.7		

Reclamation Area 43 Vegetation Cover Data

Scientific Name	Common Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Grass: Annual Native		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Munroa squarrosa	false buffalograss																		
Subtotal																			
Grass: Annual Introduced																			
Bromus arvensis	field brome																		
Bromus tectorum	cheatgrass	1	p		p	p	p	p	p	p	p	p		p	p		p		p
Subtotal		1	p		p	p	p	p	p	p	p	p		p	p		p		p
Grass: Perennial Desirable (Cool)																			
Achnatherum hymenoides	Indian ricegrass			p					p	p	p					p	p		
Cyperus schweinitzii	Schweinitz's flatsedge		p						p	p	p								
Pascopyrum smithii	western wheatgrass		p	p					p	p	p					p	p		
Subtotal			p	p					p	p	p					p	p		
Grass: Perennial Desirable (Warm)																			
Calamovilfa longifolia	prairie sandreed																		
Panicum virgatum	switchgrass					p			p							p			
Schizachyrium scoparium	little bluestem					p		p	p										
Sorghastrum nutans	Indiangrass																		
Sporobolus cryandrus	sand dropseed	3	6	7	4	4	2	4	2	8	2	11	2	6	8	9	4	2	7
Subtotal		3	6	7	4	4	2	4	2	8	2	11	2	6	8	9	4	2	7
Total Grass Cover		4	0	6	0	7	0	4	0	4	0	2	0	4	0	8	0	9	0
Forbs: Annual & Biennial Native																			
Argemone polythermos	crested pricklypoppy																		
Chenopodium leptophyllum	narrowsleaf goosefoot																		
Croton texensis	Texas croton			p															
Eriogonum annuum	annual buckwheat			p															
Helianthus annuus	common sunflower	p	6	4	4	8	1	1	p	p	p	p	3	p	9	1	1	3	1
Machaeranthera canescens	hoary tansyaster	p	p	p											p	2			
Plantago palagonica	wooly plantain	p					p	p								p			
Subtotal		p	6	4	4	8	1	1	p	p	4	p	3	p	9	1	3	2	1
Forbs: Annual & Biennial Introduced																			
Ambrosia artemisiifolia	annual ragweed																		
Basia scoparia	burningbush	p	p	p	p	p										p			
Dysphania boorys	Jerusalem oak goosefoot			p															
Lactuca scariola	prickly lettuce	8	p			p	p												
Salsola tragus	prickly Russian thistle	8		p			p		1	1	p						1		
Subtotal		8	p	p	p	p	p	p	1	1	p						1		

Reclamation Area 43 Vegetation Cover Data (continued)

Scientific Name	Common Name		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Forbs: Perennial Native			1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
<i>Ambrosia psilostachya</i>	Cumcut ragweed																			
<i>Mentzelia nuda</i>	bractless blazingstar																			
<i>Physalis hispida</i>	prairie groundcherry																			
<i>Psoraleum tenuiflorum</i>	slimflower scurfpea																			
<i>Oenothera</i> sp.	evening primrose																			
<i>Ratibida columnifera</i>	upright prairie coneflower																			
Subtotal																				
Total Forb Cover			8	0	7	0	4	0	5	0	8	0	9	0	2	0	0	0	0	0
Subshrubs/Shrubs/Succulents: Perennial Native																				
<i>Yucca glauca</i>	soapweed yucca																			
<i>Opuntia phaeacantha</i>	tuft pricklypear																			
Subtotal																				
Total Shrub Cover			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rock																				
Litter			29	31	25	15	22	32	30	2	37	23	30	27	37	22	28	26	22	1
Bare Ground			9	6	14	26	16	7	14	23	4	21	9	17	7	11	8	15	17	16
Total Hits			50	0	50	0	50	0	50	0	50	0	50	0	50	0	50	0	50	0
Total Vegetation Cover			24	0	26	0	22	0	18	0	24	0	22	0	12	0	4	0	18	0
Non-Noxious Vegetation Cover			22	0	26	0	22	0	18	0	24	0	22	0	12	0	4	0	18	0
Total Ground Cover			82	88	72	48	68	86	72	54	92	58	82	66	86	78	84	70	66	68
Allowable Vegetation Cover			16.6	20.6	16.6	12.6	18.6	16.6	6.6	0.0	12.6	6.6	16.6	6.6	6.6	28.6	22.6	12.6	16.6	16.6
Non-Noxious Annual Cover																				
Excess Annual Cover																				

Reclamation Area 43 Vegetation Cover Data (continued)

Scientific Name	Common Name	19	20	21	22	23	24	25	26	27	28	29	30	Total Hits 1st All	Absolute Cover (%)	Relative Cover (%)	Relative Cover (%)
Grass: Annual Native																	
Munroa squarrosa	false buffalograss													0	0	0.0	0.0
Subtotal														0	0	0.0	0.0
Grass: Annual Introduced																	
Bromus arvensis	field brome													0	0	0.0	0.0
Bromus tectorum	cheatgrass	P		P	P	P			P	P				1	1	0.1	0.4
Subtotal		P		P	P	P			P	P				1	1	0.1	0.4
Grass: Perennial Desirable (Cool)																	
Achnatherum byzantinoides	Indian ricegrass																
Cyperus schweinitzii	Schweinitz's flatsedge																
Pascopyrum smithii	western wheatgrass																
Subtotal																	
Grass: Perennial Desirable (Warm)																	
Calamagrostis longifolia	prairie sandreed		P											0	0	0.0	0.0
Panicum virgatum	switchgrass									P		P		0	0	0.0	0.0
Schizachyrium scoparium	little bluestem													0	0	0.0	0.0
Sorghastrum nutans	Indiangrass													0	0	0.0	0.0
Sporobolus cryptandrus	sand dropseed	5	2	4	4	2	3	5	3	5	4	2	2	132	133	8.8	47.2
Subtotal		5	2	4	4	2	3	5	3	5	4	2	2	132	133	8.8	47.2
Total Grass Cover		5	2	4	4	2	3	5	3	5	4	2	2	132	133	8.8	47.2
Forbs: Annual & Biennial Native																	
Argemone polyanthemus	crested pricklypoppy	P												0	0	0.0	0.0
Chenopodium leptophyllum	narrowleaf goosefoot													0	0	0.0	0.0
Croton texensis	Texas croton	P		P										0	0	0.0	0.0
Eriogonum annuum	annual buckwheat			P										0	0	0.0	0.0
Helianthus annuus	common sunflower	8	P	6	1	1	2	3	9	2	P	4	6	89	90	5.9	31.9
Machaeranthera canescens	hoary tansyaster			1						P		P	P	3	3	0.2	1.1
Plantago patagonica	woolly plantain													0	0	0.0	0.0
Subtotal		8	P	7	1	1	2	3	9	2	P	4	6	92	93	6.1	33.0
Forbs: Annual & Biennial Introduced																	
Ambrosia artemisiifolia	annual ragweed	1							1				P	4	4	0.3	1.4
Bassia scoparia	burningbush			P										0	0	0.0	0.0
Dysphania boerha	Jerusalem oak goosefoot													0	0	0.0	0.0
Lactuca scariola	prickly lettuce	P												0	0	0.0	0.0
Salsola tragus	prickly Russian thistle	P		P		P	3		1			P	P	13	13	0.9	4.6
Subtotal		1		P		1	3		1			1	P	17	17	1.1	6.0

Reclamation Area 43 Vegetation Cover Data (continued)

Scientific Name	Common Name	19	20	21	22	23	24	25	26	27	28	29	30	Total His 1st All	Absolute Cover (%)	Relative Cover (%)	Relative Cover (%)
Forbs: Perennial Native		1	2	1	2	1	2	1	2	1	2	1	2				
<i>Ambrosia psikolachya</i>	Curran ragweed	1	3		p	6		p	p	p	p	p	p	35	2.3	12.8	12.8
<i>Mertensia nuda</i>	bractless blazingstar								1		p		2	2	0.1	0.7	0.7
<i>Physalis hispida</i>	prairie groundcherry					p							0	0	0.0	0.0	0.0
<i>Pteris aquilina</i>	slimflower scurfspea												0	0	0.0	0.0	0.0
<i>Oenothera sp.</i>	evening primrose		p					p					0	0	0.0	0.0	0.0
<i>Ratibida columnifera</i>	upright prairie coneflower							p					0	0	0.0	0.0	0.0
Subtotal		1	3		p	6		p	1		p		1	37	2.5	13.5	13.5
Total Forb Cover		10	0	3	0	7	0	1	0	8	0	5	0	3	0	0	0
Subshrubs/Shrubs/Succulents: Perennial Native																	
<i>Yucca glauca</i>	soapweed yucca			p											0	0.0	0.0
<i>Opuntia phaeacantha</i>	tuft pricklypear			p											0	0.0	0.0
Subtotal				p											0	0.0	0.0
Total Shrub Cover		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0
Rock																	
Litter		23	24	20	29	24	34	1	24	26	26	30	18	4	4	0.3	
Bare Ground		12	21	19	16	16	8	21	13	16	20	13	23	438	29.2		
Total His		50	0	50	0	50	0	50	0	50	0	50	1	50	0	1500	1503
Total Vegetation Cover		30	0	10	0	22	0	10	0	20	0	16	0	26	0	16	0
Non-Noxious Vegetation Cover		30	0	10	0	22	0	10	0	20	0	16	0	26	0	16	0
Total Ground Cover		76	58	62	68	68	84	58	74	68	60	74	54			70.8	
Allowable Vegetation Cover		24.6	4.6	16.6	4.6	14.6	10.6	10.6	20.6	10.6	2.6	8.6	12.6			13.2	
Non-Noxious Annual Cover																	7.3
Excess Annual Cover																	5.4

Reclamation Area 44 Vegetation Cover Data

Scientific Name	Common Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total Hts 1a All	Absolute Cover (%)	Relative Cover (%)	Relative Cover (%)
Grass: Annual Native		1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2			
<i>Munroa squarrosa</i>	fake buffalograss															1	1	0.1	0.7	0.7
<i>Panicum capillare</i>	witchgrass															0	0	0.0	0.0	0.0
Subtotal																1	1	0.1	0.7	0.7
Grass: Annual Introduced																				
<i>Bromus tectorum</i>	cheatgrass																	0.0	0.0	0.0
Subtotal																		0.0	0.0	0.0
Grass: Perennial Desirable (Cool)																				
<i>Achnatherum hymenodes</i>	Indian ricegrass																			
<i>Cyperus schweinitzii</i>	Schweinitz's flsedge																			
<i>Elymus trachycabulis</i>	slender wheatgrass																			
Subtotal																				
Grass: Perennial Desirable (Warm)																				
<i>Bouteloua gracilis</i>	blue grama																			
<i>Sporobolus cynosuroides</i>	sand dropseed																			
Subtotal																				
Total Grass Cover		2	0	0	0	1	0	5	0	1	0	3	0	2	0	2	0	0	0	0
Forbs: Annual & Biennial Native																				
<i>Amaranthus retroflexus</i>	redroot amaranth																	0.0	0.0	0.0
<i>Argemone polyarrhenos</i>	crested pricklypoppy																	0.0	0.0	0.0
<i>Chenopodium leptophyllum</i>	narrowleaf goosefoot																	0.0	0.0	0.0
<i>Croton texensis</i>	Texas croton																	0.0	0.0	0.0
<i>Eriogonum annuum</i>	annual buckwheat																	0.0	0.0	0.0
<i>Helianthus annuus</i>	common sunflower																	0.0	0.0	0.0
<i>Machaeranthera canescens</i>	hoary tansyaster																	0.0	0.0	0.0
<i>Plantago patagonica</i>	wooly plantain																	0.0	0.0	0.0
Subtotal																		0.0	0.0	0.0
Forbs: Annual & Biennial Introduced																				
<i>Ambrosia artemisiifolia</i>	annual ragweed																	0.0	0.0	0.0
<i>Bassia scoparia</i>	burningbush																	0.0	0.0	0.0
<i>Chenopodium album</i>	lambsquarters																	0.0	0.0	0.0
<i>Dysphania borys</i>	Jernsalem oak goosefoot																	0.0	0.0	0.0
<i>Medicago officinalis</i>	sweetclover																	0.0	0.0	0.0
<i>Salsola collina</i>	slender Russian thistle																	0.0	0.0	0.0
<i>Salsola tragus</i>	prickly Russian thistle																	0.0	0.0	0.0
Subtotal																		0.0	0.0	0.0
Total		4	13	19	1	12	4	4	4	4	6	9	13	7	5	2	111	14.8	75.5	75.5

Reclamation Area 44 Vegetation Cover Data (continued)

Scientific Name	Common Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total Hits 1st All	Absolute Cover (%)	Relative Cover (%)	Relative Cover (%)	
Forbs: Perennial Native		1 2	1 2	1 2	1 2	1 2	1 2	1 2	1 2	1 2	1 2	1 2	1 2	1 2	1 2	1 2					
<i>Ambrosia psilostachya</i>	Common ragweed				1												1	1	0.1	0.7	
<i>Physalis hispida</i>	prairie groundcherry				P		P										0	0	0.0	0.0	
<i>Oenothera</i> sp.	evening primrose										P						0	0	0.0	0.0	
Subtotal					1		P				P						1	1	0.1	0.7	
Total Forb Cover		4	0	13	0	19	0	2	0	13	0	10	0	5	0	4	0	126	16.8	85.7	85.7
Subshrubs/Shrubs/Succulents: Perennial Native																					
<i>Yucca glauca</i>	soapweed yucca																				
Subtotal																		0	0	0.0	0.0
Total Shrub Cover		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	
Rock																					
Litter		15	6	19	12	11	20	31	19	35	33	27	18	24	2	9	0	0	0.0		
Bare Ground		29	31	11	31	25	17	14	24	9	11	14	16	18	37	35	281	281	37.5		
Total Hits		50	0	50	0	50	0	50	0	50	0	50	0	50	0	50	0	750	750	100.0	
Total Vegetation Cover		12	0	26	0	40	0	14	0	28	0	26	0	10	0	14	0	32	0	19.6	100.0
Non-Noxious Vegetation Cover		12	0	26	0	40	0	14	0	28	0	26	0	10	0	14	0	32	0	19.6	
Total Ground Cover		42	38	78	38	50	66	72	52	82	78	72	68	64	26	30			57.1		
Allowable Vegetation Cover		0.0	11.2	25.2	0.0	13.2	11.2	0.0	0.0	0.0	0.0	3.2	17.2	1.2	7.2	0.0			6.0		
Non-Noxious Annual Cover																			16.8		
Excess Annual Cover																			14.8		

Appendix B: Herbaceous Production Data

Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 29 Herbaceous Production Data

Sample	Herbaceous Production (g/m2)			
	Annual Species	Perennial Species	Total	Allowable
1	9.1	38	47.1	0.0
2	72.1	80	152.1	89.9
3	0	67.3	67.3	5.1
4	290.1	12.9	303	240.8
5	112.4	21.8	134.2	72.0
6	87.3	15.4	102.7	40.5
7	88.1	11.7	99.8	37.6
8	76.4	23.6	100	37.8
9	187.7	9.8	197.5	135.3
10	48.2	14.1	62.3	0.1
11	9.4	7.3	16.7	0.0
12	56.4	17	73.4	11.2
13	7.8	13.1	20.9	0.0
14	11.5	155.6	167.1	104.9
15	65.1	3.9	69	6.8
16	158.6	1.5	160.1	97.9
17	98	19.6	117.6	55.4
18	185.6	12.3	197.9	135.7
19	33.3	11.4	44.7	0.0
20	11.4	93.2	104.6	42.4
21	96.2	1.4	97.6	35.4
22	107.1	12.1	119.2	57.0
23	2.2	22.1	24.3	0.0
24	15.3	54	69.3	7.1
25	88.8	11.2	100	37.8
26	42.1	50	92.1	29.9
27	12.4	7.3	19.7	0.0
28	64.8	25.7	90.5	28.3
29	22.7	28.9	51.6	0.0
30	107.8	15.1	122.9	60.7
Average	72.3	28.6	100.8	45.7

Excess Annual Production	62.2
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If average annual production is greater than 10%, subtract the average excess

Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 30 Herbaceous Production Data

Sample	Herbaceous Production (g/m2)			
	Annual Species	Perennial Species	Total	Allowable
1	0	30.1	30.1	2.6
2	12	38	50	22.5
3	27.5	22.2	49.7	22.2
4	15.8	32.8	48.6	21.1
5	43.1	11.3	54.4	26.9
6	22	28	50	22.5
7	47.9	11.9	59.8	32.3
8	24.3	55.2	79.5	52.0
9	80.7	13.4	94.1	66.6
10	110.2	27.2	137.4	109.9
11	127.8	17.6	145.4	117.9
12	12.6	45.3	57.9	30.4
13	29.4	17.1	46.5	19.0
14	0	46	46	18.5
15	41.5	7.2	48.7	21.2
16	45.8	9.2	55	27.5
17	0	28	28	0.5
18	0	82.9	82.9	55.4
19	25.7	45.3	71	43.5
20	10.5	3.6	14.1	0.0
21	3.8	4.5	8.3	0.0
22	0	41.7	41.7	14.2
23	86.6	8	94.6	67.1
24	6.5	35.7	42.2	14.7
25	0	41.2	41.2	13.7
26	0.3	13.5	13.8	0.0
27	46.1	5.1	51.2	23.7
28	75.7	9	84.7	57.2
29	54.6	23.2	77.8	50.3
30	53.1	18	71.1	43.6
Average	33.5	25.7	59.2	33.2

Excess Annual Production	27.5
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If average annual production is greater than 10%, subtract the average excess

Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 31 Herbaceous Production Data

Sample	Herbaceous Production (g/m2)			
	Annual Species	Perennial Species	Total	Allowable
1	0	16.6	16.6	5.2
2	6.9	5.6	12.5	1.1
3	0.1	21.7	21.8	10.4
4	102	38.3	140.3	128.9
5	0	29.8	29.8	18.4
6	41.8	4.3	46.1	34.7
7	0	21.2	21.2	9.8
8	0	41.3	41.3	29.9
9	6.2	7.8	14	2.6
10	1.2	56.7	57.9	46.5
11	0	13.1	13.1	1.7
12	3.7	11.1	14.8	3.4
13	0	34.3	34.3	22.9
14	0	49.8	49.8	38.4
15	0	55.9	55.9	44.5
16	0	66.7	66.7	55.3
17	25.6	0	25.6	14.2
18	25.8	25.5	51.3	39.9
19	16.2	8.5	24.7	13.3
20	87	18.8	105.8	94.4
21	0	43	43	31.6
22	0	57.7	57.7	46.3
23	4.6	129.1	133.7	122.3
24	0.7	19.3	20	8.6
25	50.3	17.9	68.2	56.8
26	0	36.1	36.1	24.7
27	0	26.1	26.1	14.7
28	8.3	13.5	21.8	10.4
29	35.8	30.2	66	54.6
30	65.4	8	73.4	62.0
Average	16.1	30.3	46.3	34.9

Excess Annual Production	11.4
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If average annual production is greater than 10%, subtract the average excess

Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 32 Herbaceous Production Data

Sample	Herbaceous Production (g/m2)			
	Annual Species	Perennial Species	Total	Allowable
1	0	27.3	27.3	21.5
2	98.4	1	99.4	93.6
3	12.9	0	12.9	7.1
4	5.8	40.7	46.5	40.7
5	1.4	40.8	42.2	36.4
6	5.9	37.2	43.1	37.3
7	0	14	14	8.2
8	0	13.5	13.5	7.7
9	0	58.6	58.6	52.8
10	0	39.9	39.9	34.1
11	0	18.9	18.9	13.1
12	13.3	22.1	35.4	29.6
13	0	25.1	25.1	19.3
14	0	18.3	18.3	12.5
15	3.3	35.7	39	33.2
Average	9.4	26.2	35.6	29.8

Excess Annual Production	5.8
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If average annual production is greater than 10%, subtract the average excess

Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 33 Herbaceous Production Data

Sample	Herbaceous Production (g/m2)			
	Annual Species	Perennial Species	Total	Allowable
1	0	27.1	27.1	27.1
2	0	27.9	27.9	27.9
3	0	19.2	19.2	19.2
4	0	9.1	9.1	9.1
5	0	22.5	22.5	22.5
6	0	49.1	49.1	49.1
7	0	12.4	12.4	12.4
8	0	25.3	25.3	25.3
9	4	5	9	9.0
10	0	14.6	14.6	14.6
11	0	16.5	16.5	16.5
12	0	14.7	14.7	14.7
13	0	20.3	20.3	20.3
14	2.2	0	2.2	2.2
15	0	35.5	35.5	35.5
Average	0.4	19.9	20.4	20.4

Excess Annual Production	0.0
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If average annual production is greater than 10%, subtract the average excess

Keenesburg Mine 2022 Vegetation Monitoring Report

Appendix C: Complete Species List

Keenesburg Mine 2022 Vegetation Monitoring Report

Keenesburg Mine Reclamation Species List 2022

Scientific Name	Common Name	Area 25	Area 29	Area 30	Area 31	Area 32	Area 33	Area 34	Area 35	Area 43	Area 44
Grass: Annual Native											
Munroa squarrosa	false buffalograss	6.7		50.0	33.3	40.0	10.0		6.7	6.7	13.3
Panicum capillare	wichgrass										6.7
Vulpia octoflora	sixweeks fescue		13.3	20.8	4.8						
Grass: Annual Introduced											
Bromus arvensis	field brome									3.3	
Bromus tectorum	cheatgrass	26.7	63.3	83.3	38.1	70.0	60.0	3.3		60.0	66.7
Grass: Perennial Desirable (Cool)											
Achnatherum hymenoides	Indian ricegrass	46.7		4.2	9.5	20.0	10.0	23.3	93.3	30.0	100.0
Agropyron cristatum	crested wheatgrass			4.2	4.8		20.0	3.3			
Bromus inermis	smooth brome	3.3									
Cyperus schweinitzii	Schweinitz's flatsedge							16.7	6.7	13.3	13.3
Elymus trachycaulus	slender wheatgrass	3.3			4.8			3.3			40.0
Hesperostipa comata	needle and thread										
Pascopyrum smithii	western wheatgrass	3.3	10.0	4.2		30.0	10.0	3.3	6.7	6.7	
Thinopyrum intermedium	intermediate wheatgrass	3.3						3.3			
Grass: Perennial Desirable (Warm)											
Andropogon hallii	sand bluestem	53.3	76.7	91.7	90.5		10.0	40.0			
Aristida purpurea	purple threawn	3.3						3.3			
Bouteloua curtipendula	sideoats grama	10.0	13.3	45.8	23.8	40.0		13.3			
Bouteloua dactyloides	buffalograss							3.3			
Bouteloua gracilis	blue grama	23.3	96.7	70.8	85.7	100.0	100.0	93.3			6.7
Calamovilfa longifolia	prairie sandreed	100.0	63.3	54.2	100.0	100.0	100.0	66.7		13.3	
Panicum virgatum	switchgrass	10.0	36.7	33.3	23.8	40.0	60.0	6.7		10.0	
Schizachyrium scoparium	little bluestem	6.7	13.3	29.2		10.0	10.0	33.3		13.3	
Sorghastrum nutans	Indiangrass	6.7	10.0			50.0	60.0	10.0		3.3	
Sporobolus airoides	alkali sacaton		10.0		23.8						
Sporobolus cryptandrus	sand dropseed	63.3	86.7	100.0	90.5	70.0	80.0	96.7	73.3	100.0	86.7

Keenesburg Mine 2022 Vegetation Monitoring Report

Keenesburg Mine Reclamation Species List 2022 (continued)

Scientific Name	Common Name	Area 25	Area 29	Area 30	Area 31	Area 32	Area 33	Area 34	Area 35	Area 43	Area 44
Forbs: Annual & Biennial Native											
Amaranthus retroflexus	redroot amaranth	30.0	63.3	87.5	85.7	70.0					13.3
Ambrosia acanthicarpa	flatspine bur ragweed							30.0			
Argemone polyanthemus	crested pricklypoppy	30.0	10.0	8.3				10.0		23.3	13.3
Chenopodium leptophyllum	narrowleaf goosefoot		3.3		9.5					10.0	26.7
Chenopodium sp.	goosefoot		3.3								
Conyza canadensis	Canadian horseweed		76.7	100.0	33.3	10.0					
Croton texensis	Texas croton	3.3		4.2				43.3		46.7	6.7
Dysphania graveolens	feid goosefoot							40.0	20.0	23.3	6.7
Eriogonum annuum	annual buckwheat									100.0	100.0
Helianthus annuus	common sunflower	66.7	90.0	50.0	57.1	40.0	10.0	100.0	100.0	30.0	6.7
Machaeranthera canescens	hoary tansyaster				4.8						
Machaeranthera sp.	tansyaster							26.7		16.7	6.7
Plantago patagonica	woolly plantain										
Forbs: Annual & Biennial Introduced											
Amaranthus blitoides	mat amaranth			8.3							
Ambrosia artemisiifolia	annual ragweed	3.3	3.3	4.2	4.8					40.0	33.3
Bassia scoparia	burningbush	56.7	13.3	4.2	23.8		10.0		33.3	10.0	33.3
Chenopodium album	lambsquaters										26.7
Dysphania botrys	Jerusalem oak goosefoot								20.0	3.3	26.7
Lactuca scariola	prickly lettuce	20.0	73.3	25.0	42.9	10.0		3.3		6.7	6.7
Melilotus officinalis	sweetclover				4.8						
Onopordum acanthium	Scotch cottonthistle							6.7			
Salsola collina	slender Russian thistle								53.3		6.7
Salsola tragus	prickly Russian thistle	100.0	100.0	100.0	85.7	90.0	30.0	100.0	100.0	33.3	100.0
Tragopogon dubius	yellow salsify		3.3								

Keenesburg Mine 2022 Vegetation Monitoring Report

Keenesburg Mine Reclamation Species List 2022 (continued)

Scientific Name	Common Name	Area 25	Area 29	Area 30	Area 31	Area 32	Area 33	Area 34	Area 35	Area 43	Area 44
Forbs: Perennial Native											
Ambrosia psilostachya	Cuman ragweed	20.0	16.7	20.8	38.1	10.0		16.7	6.7	66.7	20.0
Asclepias speciosa	showy milkweed	3.3			4.8						
Cuscuta indecora	bigseed alfalfa dodder								6.7		
Lygodesmia juncea	rush skeletonplant			4.2							
Mentzelia nuda	bractless blazingstar	3.3	3.3		4.8					26.7	
Mirabilis hirsuta	hairy four o'clock				23.8			20.0		13.3	6.7
Physalis hispida	prairie groundcherry	6.7	10.0	4.2			10.0	10.0		3.3	
Psoraleidum tenuiflorum	slimflower scurfpea							10.0			
Cuscuta indecora	bigseed alfalfa dodder								6.7		
Mentzelia nuda	bractless blazingstar	3.3	3.3							26.7	
Oenothera sp.	evening primrose									10.0	6.7
Physalis hispida	prairie groundcherry	6.7	10.0	4.2	23.8		10.0	20.0		13.3	6.7
Symphytotrichum falcatum	white prairie aster		3.3					3.3			
Ratibida columnifera	upright prairie coneflower									20.0	
Rumex venosus	veiny dock	6.7						3.3			
Forbs: Perennial Introduced											
Convolvulus arvensis	field bindweed	3.3					10.0				
Subshrubs/Shrubs/Succulents: Perennial Native											
Artemisia filifolia	sand sagebrush	6.7	20.0	12.5	19.0			3.3			
Yucca glauca	soapweed yucca			4.2	9.5			3.3		3.3	
Opuntia phaeacantha	tulip pricklypear	16.7	30.0	58.3	57.1	10.0		20.0		13.3	6.7

Keenesburg Mine 2022 Vegetation Monitoring Report

Appendix D: Precipitation Data 1993 – 2022

Keenesburg Mine 2022 Vegetation Monitoring Report

Keenesburg Mine Precipitation Data 1993-2022

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Sept-Jul	% from Avg Yr	% from Avg Sept-Jul
1993	1	0.05	0.05	2.37	1.2	3	0.38	0.2	1.9	1.2	0.8	0	12.15			
1994	0.4	0.21	0.17	1.24	0.59	0.45	1.01	1.49	0.99	1.7	0.6	0.33	9.18	7.97	-32%	-34%
1995	0.13	0.3	0.57	2.49	4.53	4.55	0.58	0.47	1.07	0.3	0.21	0.04	15.24	16.77	13%	39%
1996	0.32	0.29	0.77	0.2	2.44	2.4	2.25	0.52	2.22	0.67	0.35	0	12.43	10.29	-8%	-15%
1997	0.7	0.58	0.46	1.18	1.17	1.32	1.06	3.51	0.68	1.17	0.84	0.39	13.06	9.71	-3%	-20%
1998	0.14	0.2	0.67	1.34	2.33	2.53	1.09	2.03	0.08	1.95	0.44	0.51	13.31	11.38	-1%	-6%
1999	0.49	0	0.12	4.62	4.21	1.29	2.02	3.16	2.12	0.13	0.4	0.06	18.62	15.73	38%	30%
2000	0.05	0	1.35	0.55	2.64	0.78	1.62	0.9	1.42	0.21	1.1	0.31	10.93	9.7	-19%	-20%
2001	0.61	0.45	0.73	2.41	4.12	1.4	2.92	0.83	0.84	0.51	0.76	0.07	15.65	15.68	16%	30%
2002	0.55	0	0.68	0.3	1.04	1.22	0.49	1.15	0.91	1	0.38	0.05	7.77	6.46	-42%	-47%
2003	0	0.5	2.77	1.93	3.12	1.57	0.35	1.18	0	0.1	0.3	0.45	12.27	12.58	-9%	4%
2004	0.5	0.41	0.04	1.69	1.25	1.55	0.56	0.89	1.31	0.96	0.73	0	9.89	6.85	-26%	-43%
2005	0.23	0.1	0.46	2.25	1.45	2.78	0.51	1.12	0.2	3.01	0.72	0.31	13.14	10.78	-2%	-11%
2006	0.07	0	0.67	0.52	0.21	0.16	2.12	0.95	0.45	1.6	0.45	3.42	10.62	7.99	-21%	-34%
2007	0.79	0.07	0.4	1.58	4.48	0.3	1.44	3.68	0.57	0.53	0.3	1.08	15.22	14.98	13%	24%
2008	0	0.16	0.43	1.03	1.74	1.66	0.56	6.3	1.06	0.63	0.19	0.61	14.37	8.06	7%	-33%
2009	0.07	0.02	0.62	3.51	1.81	2.02	3.17	0.65	1.07	1.92	0.75	0.89	16.5	13.71	23%	14%
2010	0.1	0.34	0.89	2.62	2.28	2.13	1.52	0.75	0.04	0.75	0.12	0.24	11.78	14.51	-12%	20%
2011	0.18	0.51	0	1.43	6.31	1.34	2.45	1.11	0.78	2.86	0.5	0.66	18.13	13.37	35%	11%
2012	0	0.56	0	1.3	1.87	0.63	0.73	0.14	1.56	1.22	0.47	0.22	8.7	9.89	-35%	-18%
2013	0.11	0.62	0.95	1.39	1.67	0.6	1.04	1.55	3.69	1.08	0.19	0.09	12.98	9.85	-4%	-18%
2014	1.24	0.26	0.83	0.48	4.9	2.67	2.03	1.61	1.96	0.45	0.41	0.45	17.29	17.46	29%	45%
2015	0.31	0.34	0.36	2.45	6.79	2.03	1.11	0.42	0.16	1.56	0.83	0.82	17.18	16.66	28%	38%
2016	0.28	0.74	0.64	3.57	2.81	1.99	3.04	0.69	0.45	0.37	0	0	14.58	16.44	8%	36%
2017	0.53	0.08	0.95	1.51	4.5	1.13	0.72	2.62	1.1	1.19	0.15	0.05	14.53	10.63	8%	-12%
2018	0.21	0.29	1	0.65	3.01	4.77	2.13	0.83	0.33	0.56	0.1	0	13.88	14.55	3%	21%
2019	0.48	0.42	2.36	1.22	2.62	2.03	1.36	1.42	0.72	0.67	0.84	0.31	14.45	11.48	7%	-5%
2020	0.05	0.57	2.44	0.78	1.24	1	1.21	0.47	0.61*	0.36*	0.21*	0.42*	9.35	7.29	9.83	-31%
2021	0.19*	0.22	1.06	1.15	2.84	0.95	0.89	1.29	0.47	0.24	0.01	0.05	9.36	8.89	-30%	-26%
2022	0.62	0.31	1.28	0.36	2.08	0.4	0.76	0.29	0.88	0.38				6.58	-45%	-45%
Mean (1993-2020)	0.34	0.29	0.76	1.66	2.73	1.76	1.41	1.45	1.01	1.02	0.48	0.43	13.34	11.97		

* CoCoRaHS (2021) data substituted for on-site data.

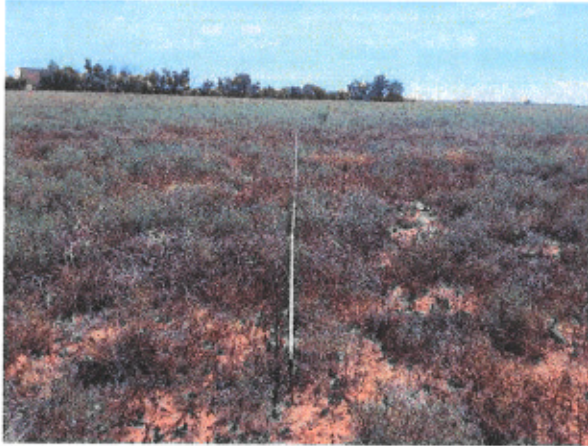
Keenesburg Mine 2022 Vegetation Monitoring Report

Appendix E: Cover Transect Photographs

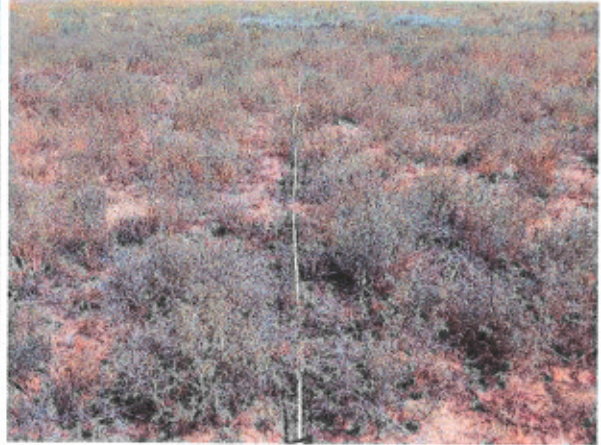
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Reclamation Area 25

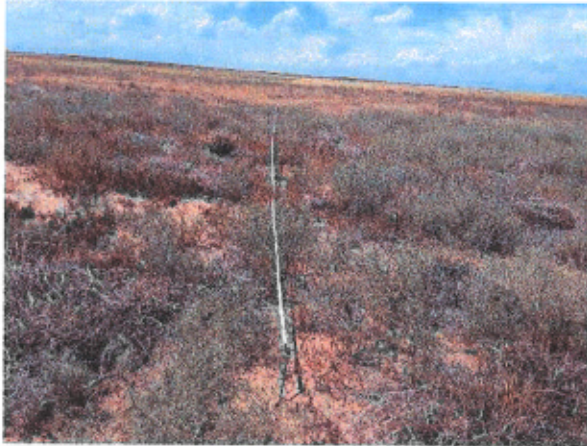
Transect 1



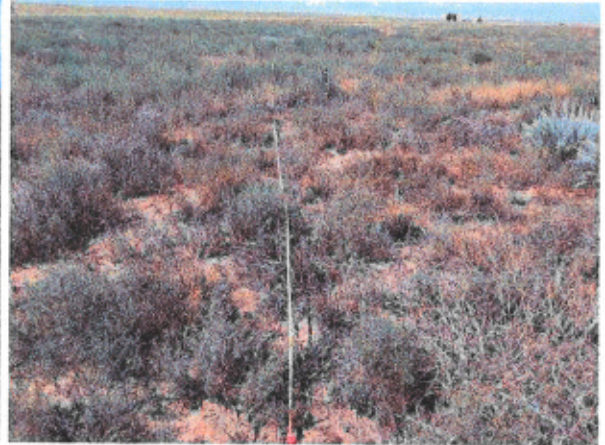
Transect 2



Transect 3



Transect 4



Transect 5



Transect 6



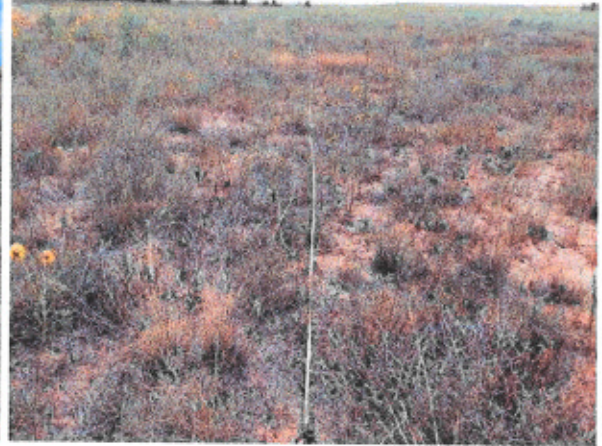
Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 25

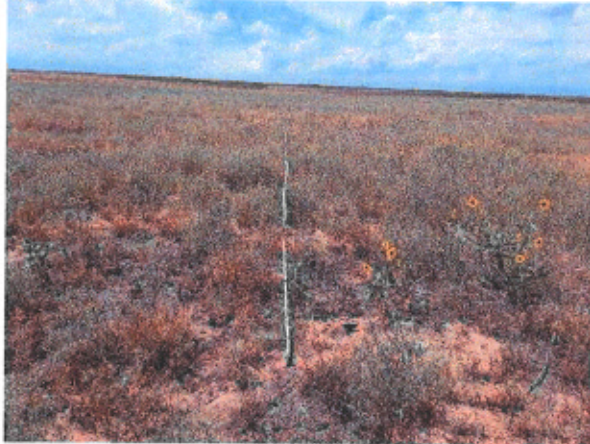
Transect 7



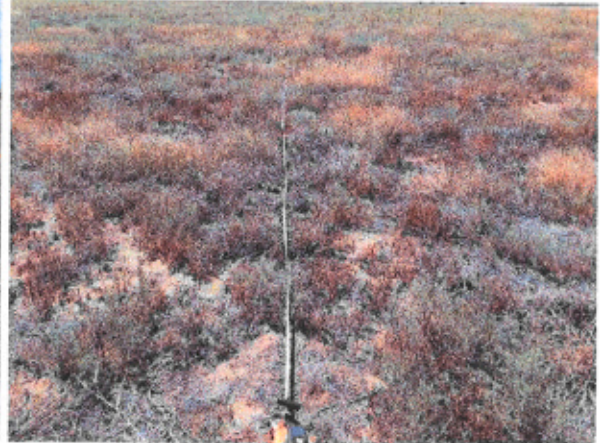
Transect 8



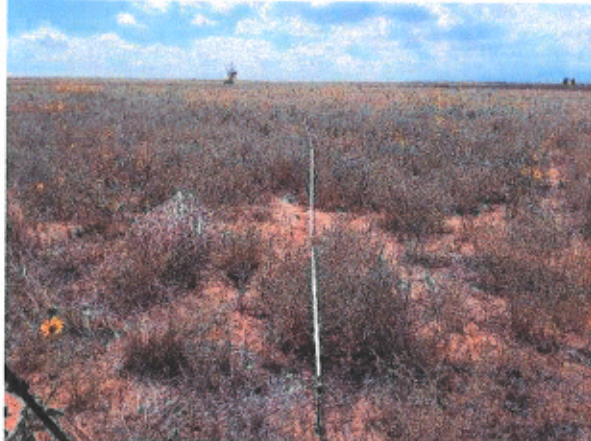
Transect 9



Transect 10



Transect 11



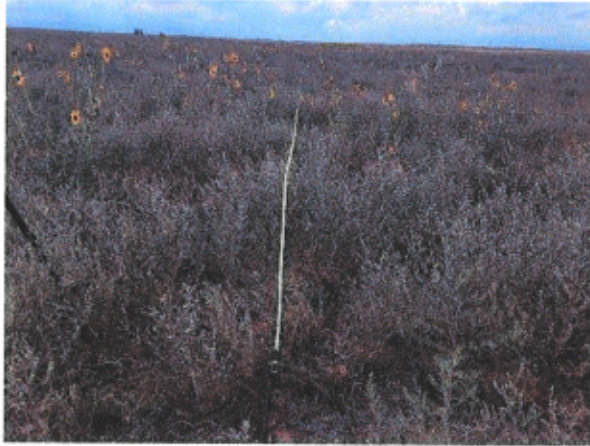
Transect 12



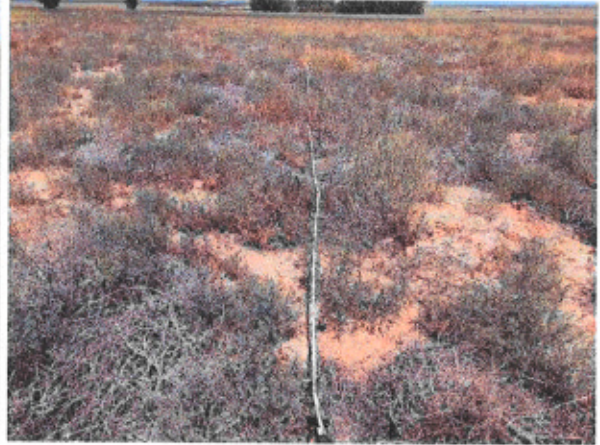
Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 25

Transect 13



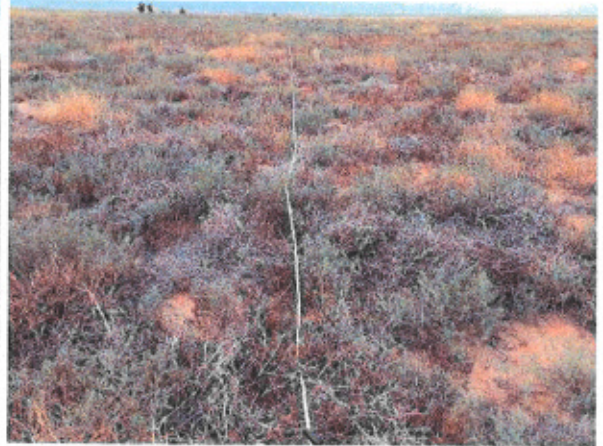
Transect 14



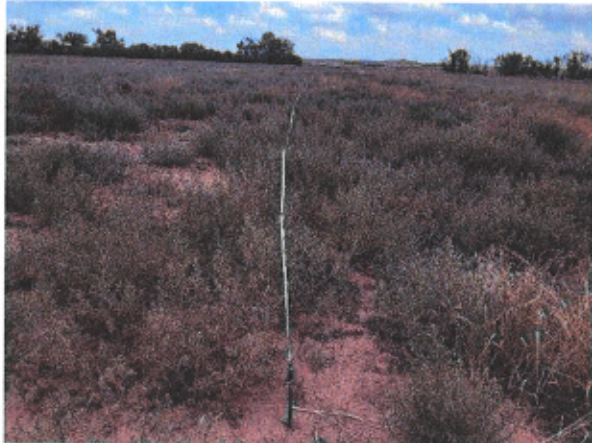
Transect 15



Transect 16



Transect 17



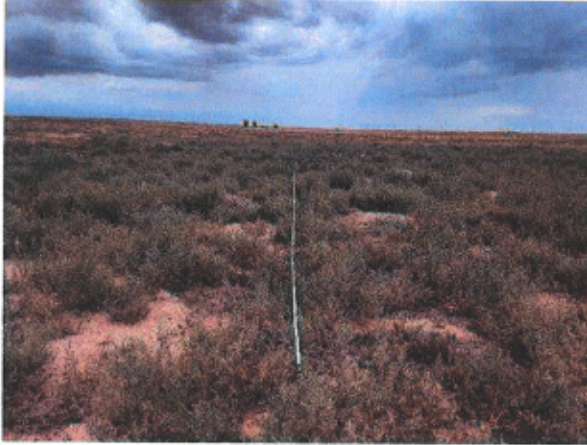
Transect 18



Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 25

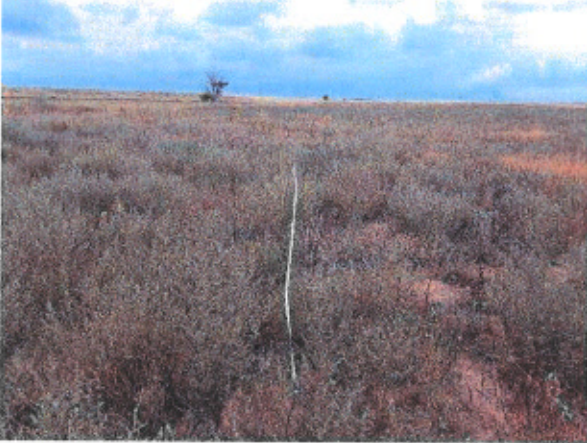
Transect 19



Transect 20



Transect 21



Transect 22



Transect 23



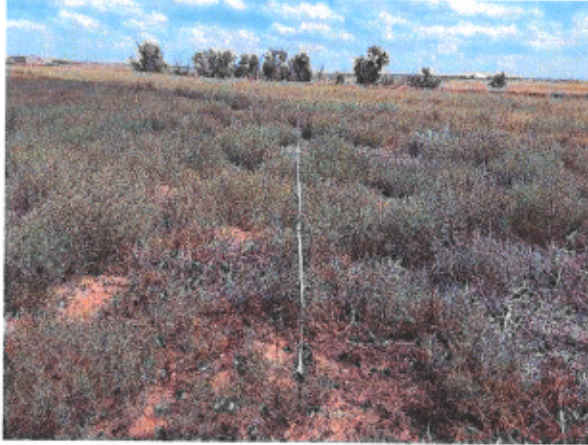
Transect 24



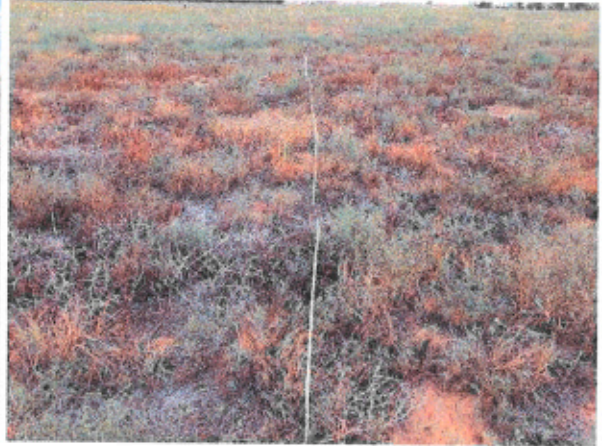
Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 25

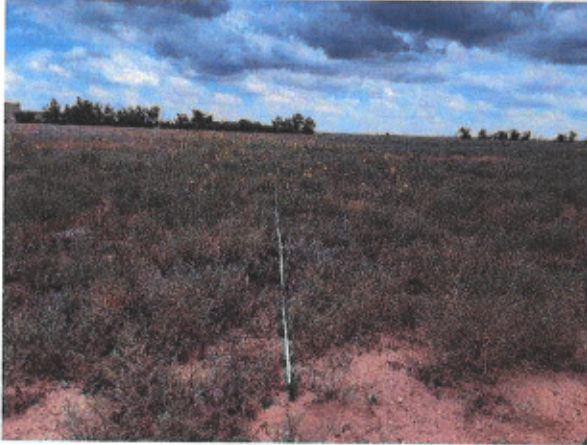
Transect 25



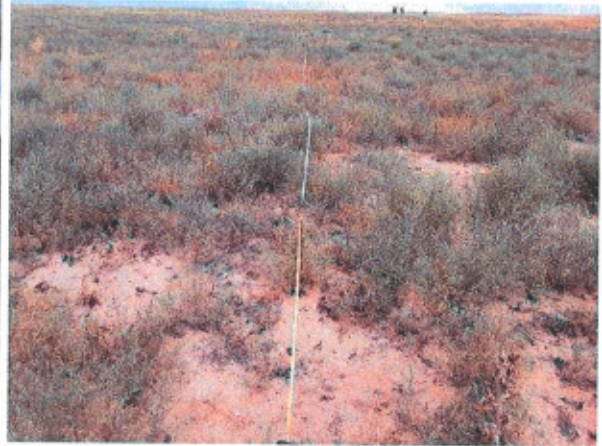
Transect 26



Transect 27



Transect 28



Transect 29



Transect 30



Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 29

Transect 1



Transect 2



Transect 3



Transect 4



Transect 5



Transect 6



Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 29

Transect 7



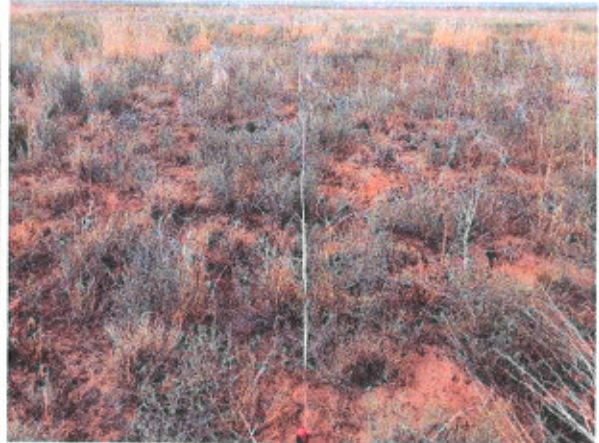
Transect 8



Transect 9



Transect 10



Transect 11



Transect 12



Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 29

Transect 13



Transect 14



Transect 15



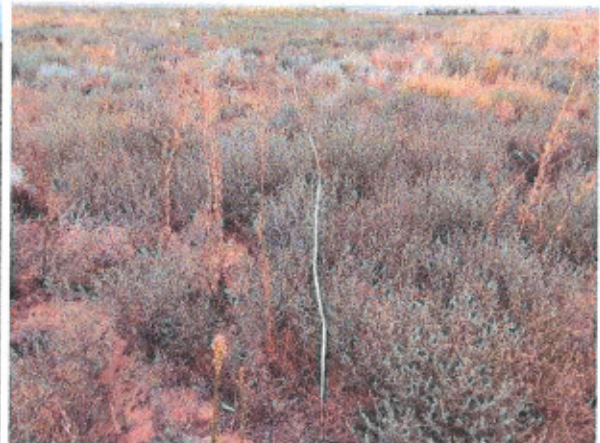
Transect 16



Transect 17



Transect 18



Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 29

Transect 19



Transect 20



Transect 21



Transect 22



Transect 23



Transect 24



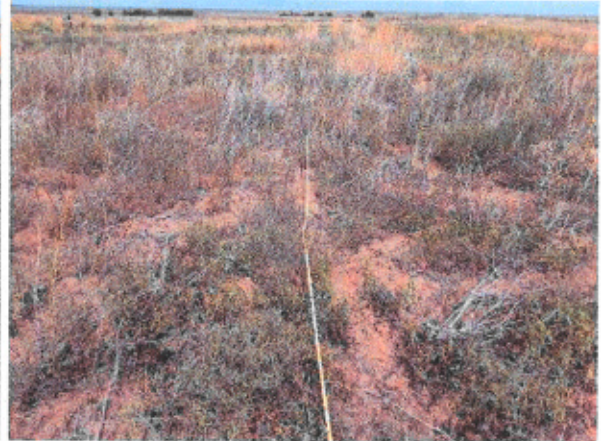
Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 29

Transect 25



Transect 26



Transect 27



Transect 28



Transect 29



Transect 30



Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 30

Transect 1



Transect 2



Transect 3



Transect 4



Transect 5



Transect 6



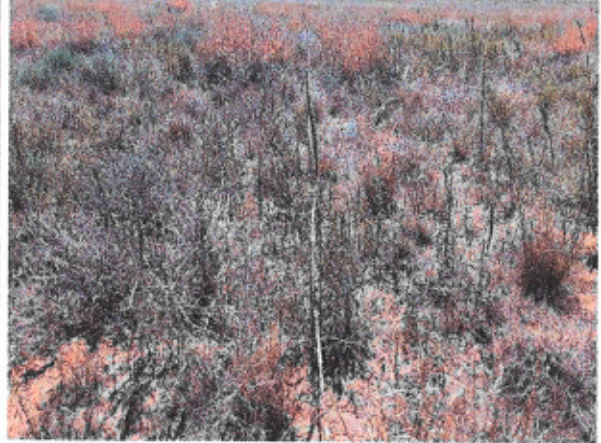
Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 30

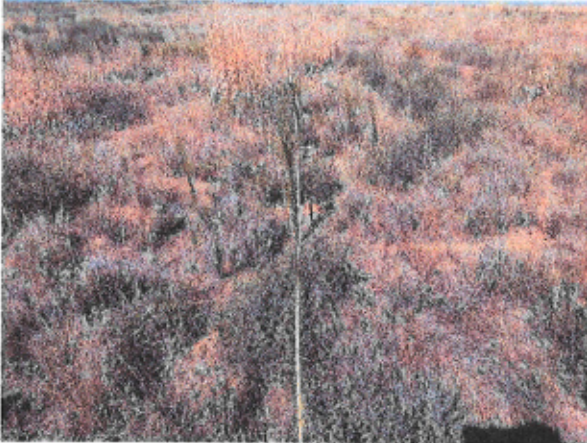
Transect 7



Transect 8



Transect 9



Transect 10



Transect 11



Transect 12



Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 30

Transect 13



Transect 14



Transect 15



Transect 16



Transect 17



Transect 18



Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 30

Transect 19



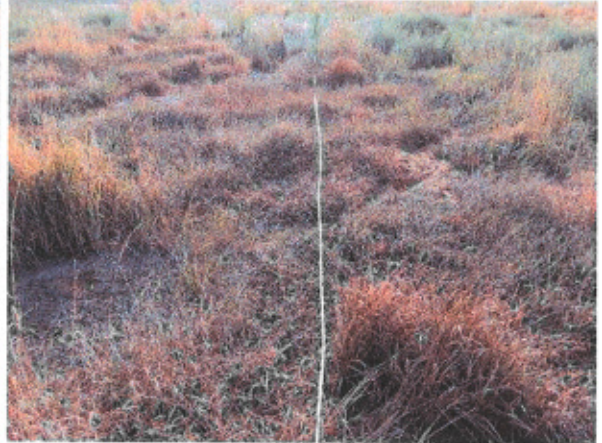
Transect 20



Transect 21



Transect 22



Transect 23



Transect 24



Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 31

Transect 1



Transect 2



Transect 3



Transect 4



Transect 5



Transect 6



Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 31

Transect 7



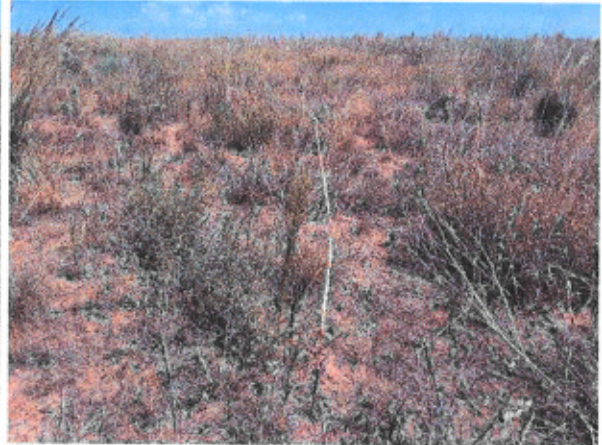
Transect 8



Transect 9



Transect 10



Transect 11



Transect 12



Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 31

Transect 13



Transect 14



Transect 15



Transect 16



Transect 17



Transect 18



Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 31

Transect 19



Transect 20



Transect 21



Reclamation Area 32

Transect 1



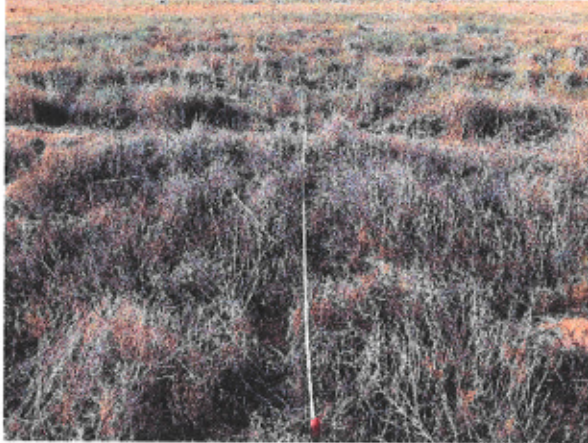
Transect 2



Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 32

Transect 3



Transect 4



Transect 5



Transect 6



Transect 7



Transect 8



Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 32

Transect 9



Transect 10



Reclamation Area 33

Transect 1



Transect 2



Transect 3



Transect 4



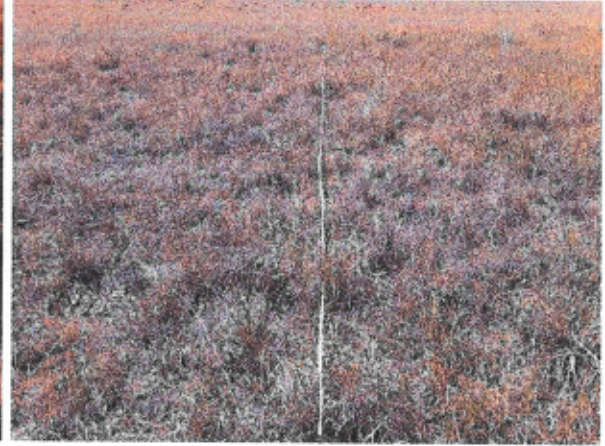
Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 33

Transect 5



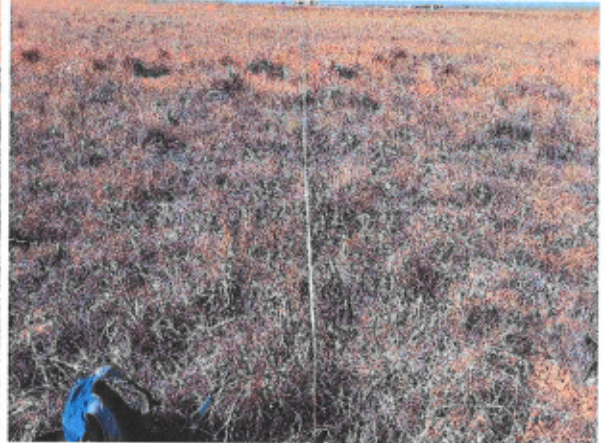
Transect 6



Transect 7



Transect 8



Transect 9



Transect 10



Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 34

Transect 1



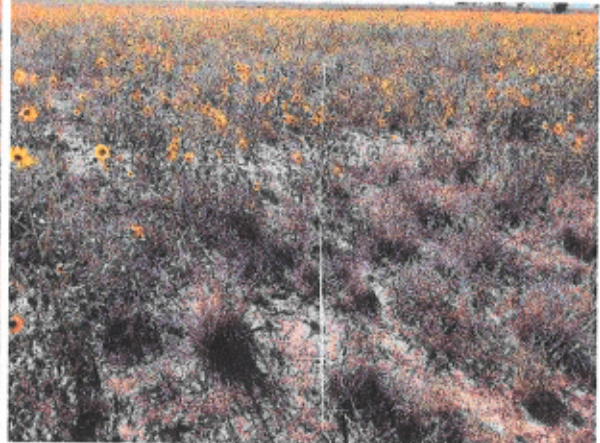
Transect 2



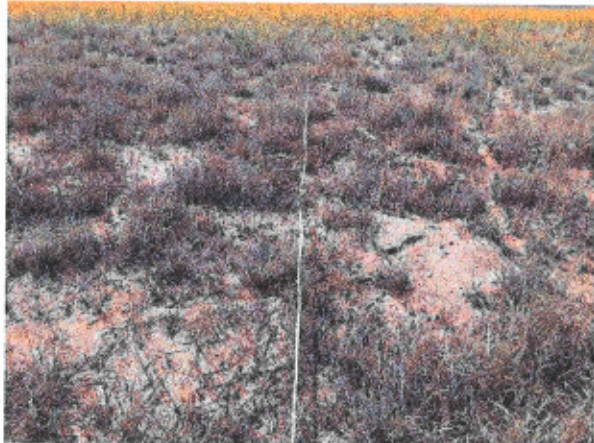
Transect 3



Transect 4



Transect 5



Transect 6



Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 34

Transect 7



Transect 8



Transect 9



Transect 10



Transect 11



Transect 12



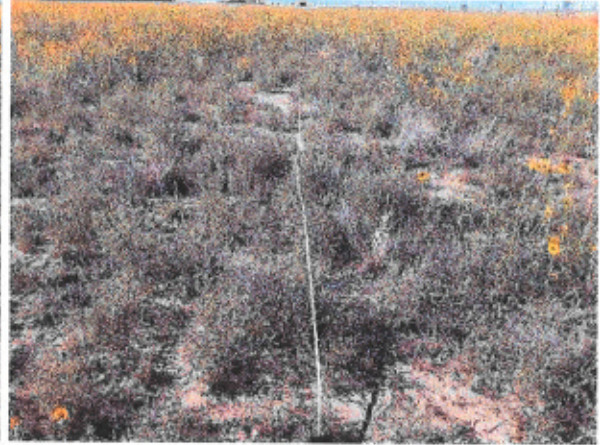
Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 34

Transect 13



Transect 14



Transect 15



Transect 16



Transect 17



Transect 18



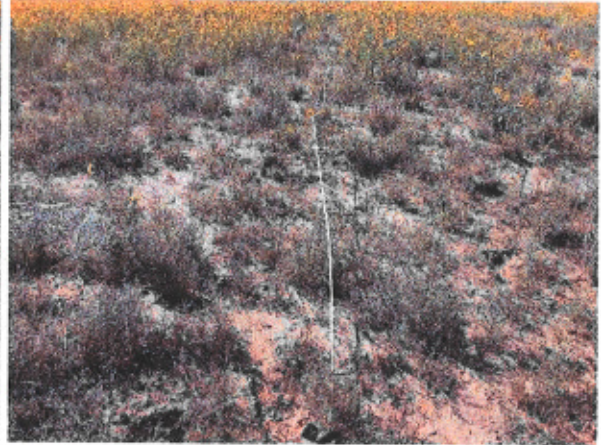
Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 34

Transect 19



Transect 20



Transect 21



Transect 22



Transect 23



Transect 24



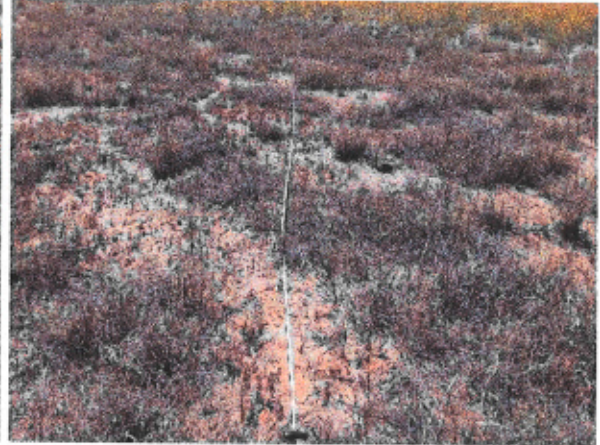
Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 34

Transect 25



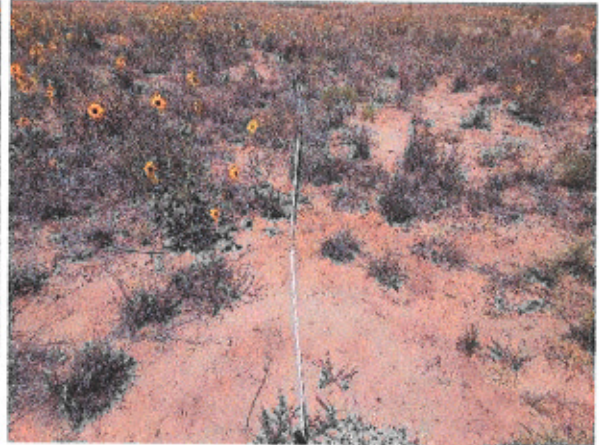
Transect 26



Transect 27



Transect 28



Transect 29



Transect 30



Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 35

Transect 1



Transect 2



Transect 3



Transect 4



Transect 5



Transect 6



Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 35

Transect 7



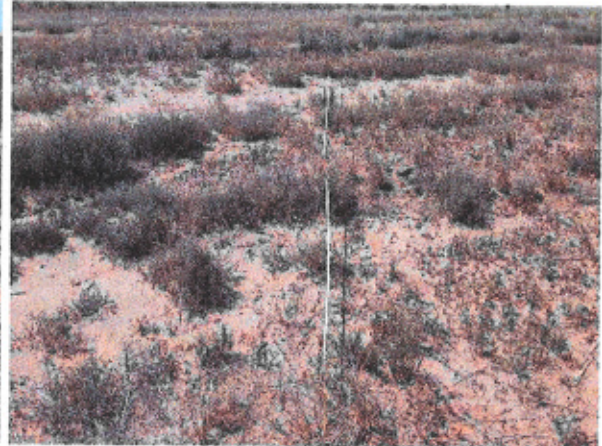
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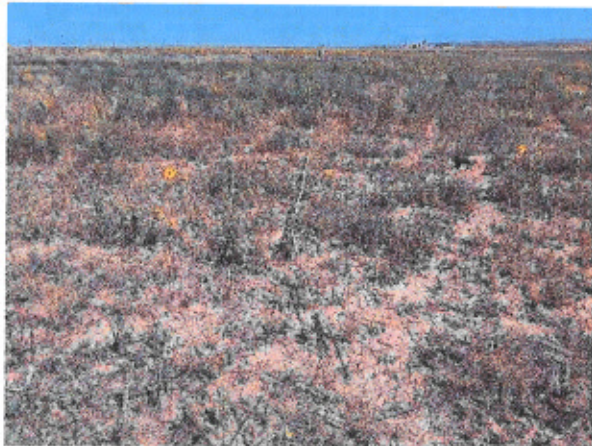
Transect 9



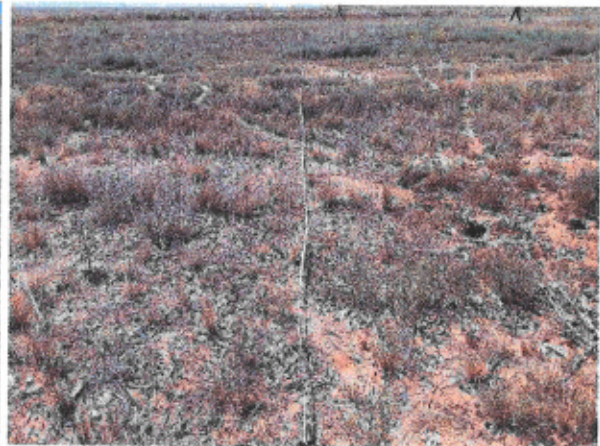
Transect 10



Transect 11



Transect 12



Keenesburg Mine 2022 Vegetation Monitoring Report

Reclamation Area 35

Transect 13



Transect 14



Transect 15



Reclamation Area 43

Transect 1



Transect 2

