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TECHNICAL MEMORANDUM

DATE: April 19, 2004

TO: Mary Beth Marks, On-Scene Coordinator

FROM: Gretchen Meier, Plant Ecologist

RE: 2003 Reclamation Monitoring (*Revised*)
New World Mining District Response and Restoration Project

Maxim Technologies, Inc (Maxim) prepared this Long-Term Revegetation Monitoring Report for the United States Department of Agriculture - Forest Service (USDA-FS). The USDA-FS is undertaking non-time-critical removal actions in the New World Mining District (District) to respond to human health and environmental impacts attributed to historic gold, silver, copper, and lead mining activities.

This report describes results of long-term monitoring preformed in 2003 by Maxim as part of the New World Mining District Response and Restoration Project. Ten mine waste removal areas were reclaimed in 2001 and were monitored for revegetation success. Long-term monitoring of these areas began in 2002 with area-wide monitoring to document erosion problems (Maxim 2002). One additional site that was reclaimed between 1992 and 1994, the McLaren Triangle, was monitored in 1999, 2000, and 2002. The McLaren Triangle was monitored in 2003 as well.

For sites reclaimed in 2001, revegetation treatments involved applying fertilizer, grass seed, and erosion mat at all the dump sites. An additional treatment was applied at the Spalding, Tredennic, and Small Como dumps by adding agricultural limestone at a rate of 42 metric tons per hectare to the excavated soil surface following dump removal and mixing the limestone into the upper 15 centimeters (cm) of the exposed soil surface, importing 15 cm of soil from the Selective Source Repository area, and thoroughly mixing this soil with the limestone treated soil. The seed mixture used at all sites contained tufted hairgrass (1.8 kilograms pure live seed per hectare (pls/ha)), alpine bluegrass (4.5 kilograms pls/ha), alpine timothy (3.5 kilograms pls/ha), and slender wheatgrass (28.6 kilograms pls/ha).

METHODS

Maxim conducted revegetation monitoring according to methods described in the 2003/2004 Work Plan (Maxim 2003), the Long-Term Revegetation Monitoring Plan (Maxim 1999a), and the Site-Wide Sampling and Analysis Plan (Maxim 1999b). The goal of revegetation monitoring is to document the condition of revegetation on reclaimed areas in the District, to document erosion problems, and to note features that adversely affect plant germination and growth (Maxim, 2003). Reclamation monitoring was conducted during the period of August 18 through 20, 2003. Maxim investigated the following reclaimed mine dumps, tailing sites, and reclaimed roads:

- Spalding Middle Dump
- Spalding Access Road
- Spalding Lower Dump
- Small Como Dump
- Upper Tredennic Dump 1

- Upper Tredennic Dump 2
- Middle Tredennic Dump 1
- Lower Tredennic Dump 1
- Rommel Tailings
- Soda Butte Tailings
- McLaren Triangle

Field measurements used the point-quadrate method described in the Long-Term Revegetation Plan (Maxim 1999a). Field data sheets were used to record monitoring data and field conditions and site impressions were recorded in a field book.

Sampling methods follow Chambers and Brown (1983) and are similar to cover monitoring methods followed previously. A baseline was established along one edge or through the center of the sampling area. Baselines were located to most thoroughly cover the area. Transects were placed systematically on the baseline every 10 meters (m) with a random start. Depending on size and shape of sampling areas, transects were placed on alternating sides, on one side, or through the center of the baseline. Quadrates were placed systematically on transects every 3 m with a random start. Baseline and transects were marked with survey stakes and locations recorded with a Global Positioning System (GPS) instrument.

Quadrates were a standard Daubenmire frame with a wire grid of 10 intersections. A pin flag was used to determine 'hits' of vegetation, litter, rock, or bare ground. Vegetation 'hits' were recorded by species. If more than one species was encountered, the tallest was recorded. Litter was defined as dead, dry vegetative material, and included organic portions of erosion mat. The current season's growth, green or not, was recorded as vegetation. Rocks that were larger than 1.25 centimeters (cm) were recorded as rocks, and rocks smaller than 1.25cm were recorded as bare ground. Inorganic material was recorded as bare ground, irregardless of size.

RESULTS

This section presents data obtained during the 2003 revegetation cover monitoring event. Appendix A contains data summary tables of data collected along transects and copies of field data sheets. Table 1 contains summary information of all monitoring areas. Appendix B contains field notes. Appendix C contains site photographs and Appendix D contains scientific names of plant species.

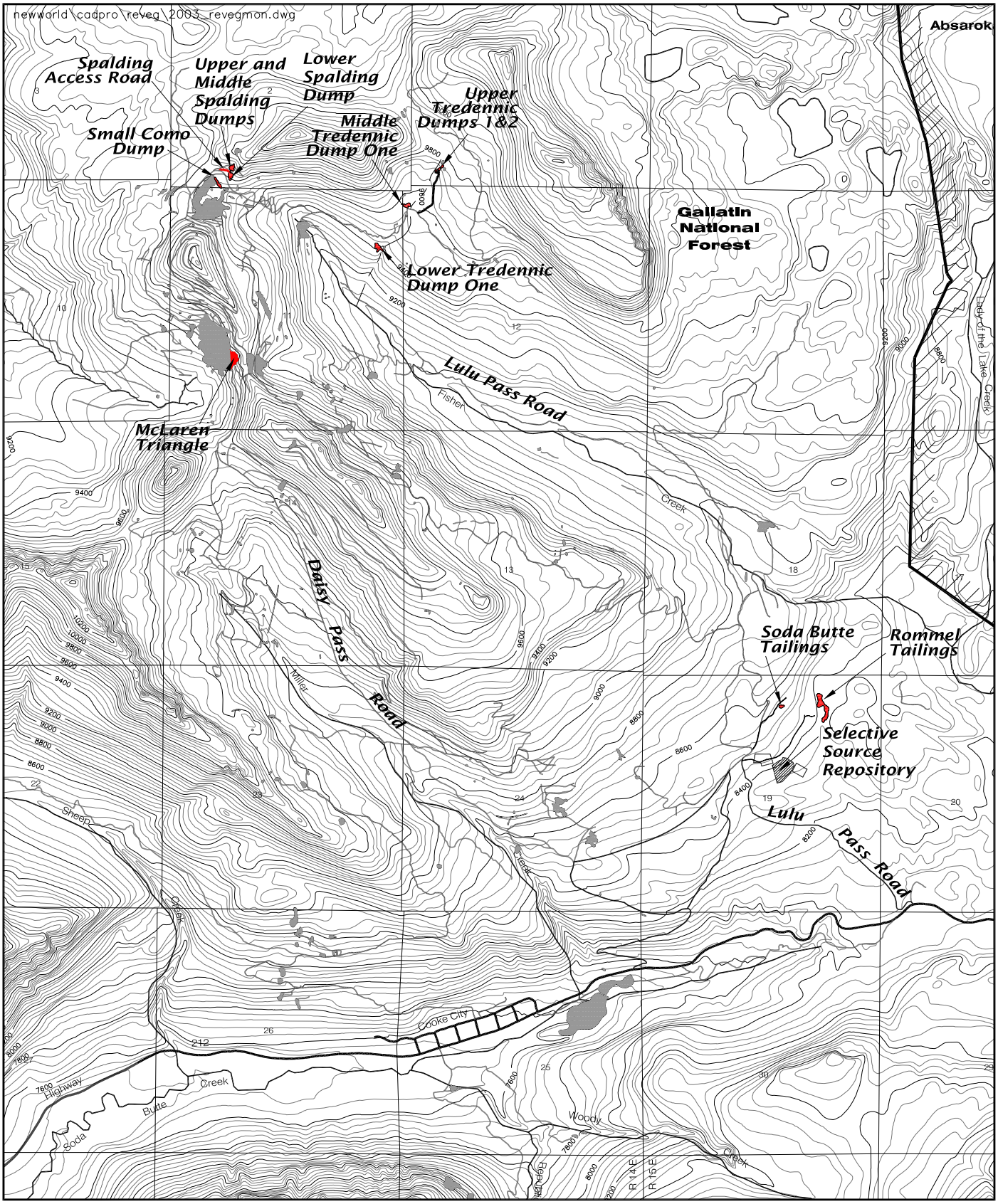
COMO BASIN MONITORING AREA

Maxim monitored four areas in the Como Basin, Middle Spalding Dump, Spalding Access Road, Lower Spalding Dump, and Small Como Dump. Figure 1 illustrates locations of monitoring areas. The monitoring areas were well vegetated. Plants were vigorous and vegetative cover was even throughout. Additional native species including sheep sorrel, Payson's sedge, grouse whortleberry, and rock jasmine, were present especially along edges of monitoring areas. The Lower Spalding Dump contained a large rock-lined channel that was not sampled (Appendix B).

TABLE 1
Cover Monitoring Results
New World Mining District Response and Restoration Project

	MONITORING AREA																					
	Middle Spalding Dump		Spalding Access Road		Lower Spalding Dump		Small Como Dump		Upper Tredennic Dump 1		Upper Tredennic Dump 2		Middle Tredennic Dump 1		Lower Tredennic Dump 1		Rommel Tailings		Soda Butte Tailings		McLaren Triangle	
Species[1]	Hits[2]	Cvr[3]	Hits	Cvr	Hits	Cvr	Hits	Cvr	Hits	Cvr	Hits	Cvr	Hits	Cvr	Hits	Cvr	Hits	Cvr	Hits	Cvr	Hits	Cvr
Alpine bluegrass	27	5.0	7	3.5	36	7.3	6	3.3	-	0.0	6	6.7	17	10.6	24	5.6	6	1.1	6	2.9	16	2.2
Alpine timothy	33	6.1	12	6.0	58	11.8	43	23.9	-	0.0	16	17.8	25	15.6	29	6.7	12	2.2	5	2.4	1	0.1
Slender wheatgrass	51	9.4	-	0.0	6	1.2	13	7.2	-	0.0	1	1.1	10	6.3	90	20.9	40	7.3	24	11.4	-	0.0
Tufted hairgrass	19	3.5	47	23.5	72	14.7	10	5.6	-	0.0	6	6.7	11	6.9	49	11.4	40	7.3	55	26.2	40	5.4
Bluegrass	-	-	-	-	-	-	1	0.6	-	-	-	-	-	-	1	0.2	-	-	-	-	-	-
Clover	-	-	-	-	-	-	1	0.6	-	-	-	-	-	-	1	0.2	-	-	3	1.4	-	-
Pea	-	-	-	-	1	0.2	-	-	-	-	-	-	3	1.9	-	-	1	0.2	2	1.0	-	-
Grouse whortleberry	-	-	-	-	2	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Payson's sedge	-	-	2	1.0	2	0.4	5	2.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sheep sorrel	3	0.6	-	-	1	0.2	-	-	-	-	-	-	1	0.6	-	-	-	-	22	10.5	-	-
Rock jasmine	-	-	-	-	1	0.2	-	-	-	-	-	-	1	0.6	2	0.5	-	-	-	-	-	-
Horsetail	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0.4	-	-	-	-
Moss	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	1.6	-	-	22	3.0
Wild rye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2	-	-	-	-
Fireweed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2	-	-	-	-
Percent Vegetated	24.8		34.0		36.5		43.9		0.0		32.2		42.5		45.8		20.3		55.7		10.7	
Litter	305	56.5	102	51.0	227	46.3	77	42.8	22	24.2	44	48.9	81	50.6	195	45.3	291	52.8	64	30.5	93	12.6
Rock	42	7.8	2	1.0	40	8.2	6	3.3	32	35.2	7	7.8	0	0.0	16	3.7	47	8.5	11	5.2	298	40.3
Bare Ground	59	10.9	28	14.0	44	9.0	18	10.0	37	40.7	10	11.1	11	6.9	23	5.3	101	18.3	18	8.6	270	36.5
Percent Non-Vegetated	75.2		66.0		63.5		56.1		100.0		67.8		57.5		54.2		79.3		44.3		89.3	
Quadrates	54		20		49		18		21		9		16		43		55		21		74	
Transects	5		9		8		4		3		2		3		5		18		3		6	

Notes
1 Appendix C contains scientific names.
2 Hits=Number of hits or the total number of species hits per sampling area.
3 Cvr=Percent Cover or the total number of species hits / the total number of hits per sampling area multiplied by 100.



Monitoring Sites
2003 Revegetation Monitoring
New World Mining District
Response and Restoration Project
Cooke City, Montana
FIGURE 1

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Overall percent vegetative cover ranged from 24.8 (Middle Spalding Dump) to 43.9% (Small Como Dump). Alpine timothy had the highest cover (23.9%) at the Small Como Dump (Table 1). Tufted hairgrass had cover of 23.5% and 14.7% at the Spalding Access Road and Lower Spalding Dump, respectively. Slender wheatgrass had cover of 9.4% at the Middle Spalding Dump, although the occurrence of slender wheatgrass was relatively low at other monitoring sites in the Como basin. Cover of alpine bluegrass was low in each monitoring area (Table 1 and Appendix A).

All monitoring areas within the Como Basin had more non vegetated area than vegetated area. Litter was most frequently encountered; measurements ranged from 42.8% (Small Como Dump) to 56.5% (Middle Spalding Dump). Bare ground had lower cover, ranging from 9% (Lower Spalding Dump) to 14% (Spalding Access Road). Rock was least frequently encountered (Table 1).

TREDENNIC MONITORING AREA

Maxim monitored four areas in the in the Tredennic area, Upper Tredennic Dump 1 and Dump 2, Middle Tredennic Dump 2, and Lower Tredennic Dump 1 (Figure 1). Revegetation at these areas was variable. The Upper Tredennic Dump 1 was very rocky with little plant growth. This area was not treated with a seed mixture or other revegetation prescriptions due to its steep slopes and limited access. A few tufted hairgrass and alpine timothy plants were growing in a central swath in fine-grained soil. Upper Tredennic Dump 2 contained a rock-lined diversion channel that was not monitored. Middle Tredennic Dump 1 was fairly wet and plant cover was even throughout. Lower Tredennic Dump 1 contained even and substantial vegetation cover. Plant height reached upwards of one meter in some areas on this dump (Appendix C).

Vegetative cover ranged from zero (Upper Tredennic Dump 1) to 45.8% (Lower Tredennic Dump 1). Alpine timothy was more frequently the dominant species though slender wheatgrass at the Lower Tredennic Dump 1 had the highest percent cover. Other native species encountered were sheep sorrel, horsetail, rock primrose, pea, bluegrass, and clover (Table 1).

The four Tredennic monitoring areas had more non-vegetated area that vegetated area. Litter was most frequently measured and ranged from 24.2% (Upper Tredennic Dump 2) to 50.6% (Middle Tredennic Dump 1). Bare ground was slight more evident than rock, and ranged in value from 5.3% (Lower Tredennic Dump 1) to 40.7% at the Upper Tredennic Dump 1 (Table 1).

SELECTIVE SOURCE RESPOSITORY MONITORING AREA

Maxim monitored two areas in the vicinity of the Selective Source Repository (Figure 1). Revegetation was variable and patchy. Rommel Tailing had a large rock lined channel along one edge that was not sampled. Garbage was evident throughout the Rommel Tailing monitoring area (plastic sheeting, black plastic tubing, fabric staples, and cardboard boxes) that litter the site. Noxious weeds were present at the site and along the access road. Some surface water flow was evident; it appears that on occasion, water has overflowed the banks of the constructed channel. Soda Butte Tailing was very well vegetated; plants were robust, evenly spaced, and quite tall. No revegetation problems were encountered (Appendix B).

Overall vegetative cover ranged from 20.3% at Rommel Tailings to 50.7% at Soda Butte Tailings. Tufted hairgrass and slender wheatgrass were the most successful species. Additional native species present within quadrates were horsetail, moss, wild rye, fireweed, bluegrass, clover, pea, and rock jasmine.

A large portion (79.3%) of Rommel Tailings monitoring area was non-vegetated. Litter covered 52.8% of the area and rock and bare ground accounted for 8.5% and 18.3%, respectively (Table 1). At Soda Butte Tailings, non-vegetated area accounted for 44.3% of the area. Litter covered 30.5% of the area and rock and bare ground accounted for 5.2% and 8.6%, respectively (Table 1).

MCLAREN TRIANGLE

Maxim monitored revegetation at the McLaren Triangle in 1999, 2000, 2002, and 2003. Data from long-term revegetation monitoring indicate that percent cover is low and has not improved (Table 2). Total percent cover measured at the McLaren Triangle is 10.7%, lower than any other reclaimed monitoring strata measured in 2003.

TABLE 2
McLaren Triangle Cover Monitoring Results
New World Mining District Response and Restoration Project

Year	Overall Percent Vegetative Cover
1999	11.3
2000	16.6
2002	15.0
2003	10.7

Tufted hairgrass had the highest cover (5.4%) followed by alpine bluegrass (2.2%) and alpine timothy (0.1%). Slender wheatgrass was not recorded. Moss was the only other recorded native species. Litter covered 12.6% of the area and rock and bare ground accounted for 40.3% and 36.5%, respectively (Table 1). Large patches of dead moss occurred throughout the site, apparently dislodged by surface water (Appendix B).

DISCUSSION

Revegetation monitoring indicated that vegetation growth was variable. Revegetation at the McLaren Triangle was poor (10.7%) and, based on previous monitoring events, appeared to be declining. Revegetation at the Middle Spalding Dump and Rommel Tailing was fair with overall cover of 24.8% and 20.3%, respectively. Revegetation at Spalding Access Road, Spalding Lower Dump, and Upper Tredennic Dump 2 was good with overall cover of 34%, 36.5, and 32.2%, respectively. Vegetation growth at Small Como Dump, Middle Tredennic Dump 1, Soda Butte Tailings, and Lower Tredennic Dump 1 was excellent with overall cover of 43.9%, 42.5%, 55.7%, and 45.8% (Table 1).

Tufted hairgrass was most frequently encountered as the dominant species, although alpine timothy had the highest percent cover recorded and had consistently high cover throughout the sites. Slender wheatgrass was the only species absent in some areas although it appeared to be most successful in protected areas surrounded by trees, such as the Lower Tredennic Dump 1 and Lower Spalding Dump. Alpine bluegrass was never the most successful species.

No erosion problems were noted at any of the sites. Except for refertilization and reseeding work that is being done at the McLaren Triangle this fall, no maintenance, reseeding, or refertilization is necessary at any of the sites monitored based on 2003 revegetation monitoring results.

REFERENCES

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APPENDIX A
DATA SUMMARY TABLES AND FIELD DATA SHEETS

2003 REVEGETATION MONITORING
New World Mining District Response and Restoration Project

Data Summary - Middle Spalding Dump
2003 Reclamation Monitoring Results

Species	Transect Number					Total hits	Percent Cover
	1	2	3	4	5		
Alpine bluegrass	2	10	8	5	2	27	5.0
Alpine timothy	9	8	9	5	2	33	6.1
Slender wheatgrass	6	16	3	7	19	51	9.4
Tufted hairgrass	4	7	3	3	2	19	3.5
Sheep sorrel	1	1	1	-	-	3	0.6
Pea	-	✓	1	-	-	1	0.2
Total Vegetation Cover							24.8
Litter	66	44	65	72	58	305	56.5
Rock	12	14	4	8	4	42	7.8
Bare Ground	10	10	16	10	13	59	10.9
Totals	110	110	110	110	100	540	100.0

Data Summary - Spalding Access Road
2003 Reclamation Monitoring Results

Species	Transect Number									Total hits	Percent Cover
	1	2	3	4	5	6	7	8	9		
Alpine bluegrass	-	-	-	1	-	-	2	2	2	7	3.5
Alpine timothy	2	2	3	1	-	-	-	3	1	12	6.0
Slender wheatgrass	-	-	-	-	-	-	-	-	-	-	0.0
Tufted hairgrass	3	4	2	13	9	6	9	-	1	47	23.5
Sheep sorrel	-	-	-	-	-	✓	-	-	-	-	0.0
Payson sedge	2	-	-	-	-	-	-	-	-	2	1.0
Rock jasmine	-	-	-	-	-	-	-	-	✓	-	0.0
Bluegrass.	✓	-	-	-	-	-	-	-	-	-	0.0
Total Vegetation Cover											34.0
Litter	9	13	13	9	10	14	10	11	13	102	51.0
Rock	1	-	-	-	-	-	-	-	1	2	1.0
Bare Ground	3	1	2	6	1	-	9	4	2	28	14.0
Totals	20	20	20	30	20	20	30	20	20	200	100.0

Data Summary - Spalding Lower Dump
2003 Reclamation Monitoring Results

Species	Transect Number								Total hits	Percent Cover
	1	2	3	4	5	6	7	8		
Alpine bluegrass	1	8	10	5	5		3	4	36	7.3
Alpine timothy	7	8	13	8	12	5	2	3	58	11.8
Slender wheatgrass	-	-	-	5	1	-	-	-	6	1.2
Tufted hairgrass	2	10	20	9	15	7	4	5	72	14.7
Pea	-	-	1	-	✓	✓	-	-	1	0.2
Grouse whortleberry	-	-	-	-	-	2	-	-	2	0.4
Payson sedge	-	-	-	-	-	2	-	-	2	0.4
Sheep sorrel	-	-	-	-	1	✓	-	-	1	0.2
Rock jasmine	-	-	-	-	✓	-	1	✓	1	0.2
Phacelia	-	-	-	-	✓	✓	-	-	-	0.0
Scrophulariaceae	-	-	-	-	✓	-	-	-	-	0.0
Speedwell	-	-	-	-	✓	-	-	-	-	0.0
Geranium	-	-	-	-		✓	-	-	-	0.0
Aster	-	-	-	-	-	-	-	✓	-	0.0
Total Vegetation Cover										36.5
Litter	32	19	49	49	34	32	7	5	227	46.3
Rock	7	5	7	6	3	9	1	2	40	8.2
Bare Ground	1	10	10	8	9	3	2	1	44	9.0
Totals	50	60	110	90	80	60	20	20	490	100.0

Data Summary - Small Como Dump
2003 Reclamation Monitoring Results

Species	Transect Number				Total hits	Percent Cover
	1	2	3	4		
Alpine bluegrass	2	1	-	3	6	3.3
Alpine timothy	13	19	9	2	43	23.9
Slender wheatgrass	9	2	2	-	13	7.2
Tufted hairgrass	6	2	1	1	10	5.6
Sheep sorrel	✓	✓	-	✓	0	0.0
Payson sedge	-	-	5	-	5	2.8
Bluegrass	-	-	1	-	1	0.6
Mustard	-	-	✓	-	0	0.0
Dandelion	-	-	-	✓	0	0.0
Clover	1	-	-	-	1	0.6
Total Vegetation Cover						43.9
Litter	22	32	10	13	77	42.8
Rock	2	4	-	-	6	3.3
Bare Ground	15	-	2	1	18	10.0
Totals	70	60	30	20	180	100.0

Data Summary - Upper Tredennic Dump 1 2003 Reclamation Monitoring Results					
Species	Transect Number			Total hits	Percent Cover
	1	2	3		
Alpine bluegrass	-	-	-	0	0.0
Alpine timothy	-	-	-	0	0.0
Slender wheatgrass	-	-	-	0	0.0
Tufted hairgrass	-	-	-	0	0.0
Total Vegetation Cover					0.0
Litter	22	-	-	22	24.2
Rock	-	15	17	32	35.2
Bare Ground	8	15	14	37	40.7
Totals	60	70	80	210	100.0

Data Summary - Upper Tredennic Dump 2 2003 Reclamation Monitoring Results				
Species	Transect Number		Total hits	Percent Cover
	1	2		
Alpine bluegrass	5	1	6	6.7
Alpine timothy	7	9	16	17.8
Slender wheatgrass	-	1	1	1.1
Tufted hairgrass	5	1	6	6.7
Sheep sorrel	✓	-	0	0.0
Polemonium	✓	-	0	0.0
Clover	-	✓	0	0.0
Cardamine	✓	-	0	0.0
Speedwell	✓	-	0	0.0
Total Vegetation Cover				32.2
Litter	21	23	22	24.2
Rock	2	5	32	35.2
Bare Ground	10		37	40.7
Totals	50	40	90	100.0

Data Summary - Middle Tredennic Dump 1
2003 Reclamation Monitoring Results

Species	Transect Number				Total hits	Percent Cover
	1	2	3	4		
Alpine bluegrass	2	1	-	3	6	3.3
Alpine timothy	13	19	9	2	43	23.9
Slender wheatgrass	9	2	2	-	13	7.2
Tufted hairgrass	6	2	1	1	10	5.6
Bluegrass	-	-	1	-	1	0.6
Clover	1	-	-	-	1	0.6
Dandelion	-	-	-	✓	0	0.0
Mustard	-	-	✓	-	0	0.0
Payson's sedge	-	-	5	-	5	2.8
Sheep sorrel	✓	✓	-	✓	0	0.0
Total Vegetation Cover						43.9
Litter	22	32	10	13	77	42.8
Rock	2	4	-	-	6	3.3
Bare Ground	15	-	2	1	18	10.0
Totals	70	60	30	20	180	100.0

Data Summary - Rommel Tailings
2003 Reclamation Monitoring Results

Species	Transect Number																		Total hits	Percent Cover
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18		
Alpine bluegrass	-	2	-	-	-	-	-	-	-	-	2	-	-	2	-	-	-	-	6	1.1
Alpine timothy	1	1	1	1	-	-	-	-	-	2	1	-	1	-	-	-	3	1	12	2.2
Slender wheatgrass	1	2	-	1	-	-	3	5	-	3	2	3	2	6	3	1	5	3	40	7.3
Tufted hairgrass	-	-	1	-	2	-	2	1	-	5	1	2	3	1	8	2	3	9	40	7.3
Horsetail	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	0.4
Pea	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2
Moss	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	6	9	1.6
Wild rye	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	0.2
Fireweed	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	0.2
Pussytoes	-	-	-	-	-	-	-	-	-	-	-	-	-	*	-	-	-	*	-	0.0
Aster	-	*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Total Vegetation Cover																				20.3
Litter	5	14	18	34	17	10	20	23	15	23	16	14	14	20	13	9	18	8	291	52.8
Rock	2	4	1	5	1	-	5	1	3	2	3	1	3	3	9	-	1	3	47	8.5
Bare Ground	1	6	9	8	-	-	10	10	2	5	5	10	3	8	7	8	-	9	101	18.3
Totals	10	30	30	50	20	10	40	40	20	40	30	30	30	40	40	20	30	41	551	100.0

Data Summary - Lower Tredennic Dump 1
2003 Reclamation Monitoring Results

Species	Transect Number					Total hits	Percent Cover
	1	2	3	4	5		
Alpine bluegrass	1	3	6	9	5	24	5.6
Alpine timothy	2	5	10	9	3	29	6.7
Slender wheatgrass	10	41	14	12	13	90	20.9
Tufted hairgrass	3	9	12	6	19	49	11.4
Clover	-	✓	-	-	1	1	0.2
Pea	✓	-	✓	✓	1	1	0.2
Mustard	-	-	✓	-	-	-	0.0
Rock jasmine	1	✓	✓	1	-	2	0.5
Sheep sorrel	✓	✓	✓	-	✓	-	0.0
Yarrow	-	-	-	-	✓	-	0.0
Total Vegetation Cover							45.6
Litter	32	28	62	46	27	195	45.3
Rock	-	3	1	7	5	16	3.7
Bare Ground	1	1	5	10	6	23	5.3
Totals	50	90	110	100	80	430	100.0

Data summary - McLaren Triangle
2003 Reclamation Monitoring Results

Species	Transect Number						Total hits	Percent Cover
	1	2	3	4	5	6		
Alpine bluegrass	-	5	-	-	3	8	16	2.2
Alpine timothy	-	-	-	-	1	-	1	0.1
Slender wheatgrass	-	-	-	-	-	-	-	0.0
Tufted hairgrass	-	2	14	5	12	7	40	5.4
Sheep sorrel	-	-	-	-	-	-	-	0.0
moss	-	-	1	-	11	10	22	3.0
Total Vegetation Cover								10.7
Litter	-	5	12	19	17	40	93	12.6
Rock	25	35	45	75	62	56	298	40.3
Bare Ground	25	43	48	61	44	49	270	36.5
Totals	50	90	120	160	150	170	740	100.0

Data Summary - Soda Butte Tailings
2003 Reclamation Monitoring Results

Species	Transect Number			Total hits	Percent Cover
	1	2	3		
Alpine bluegrass	2	2	2	6	2.9
Alpine timothy	2	1	2	5	2.4
Slender wheatgrass	7	9	8	24	11.4
Tufted hairgrass	3	23	29	55	26.2
Sheep sorrel	11	7	4	22	10.5
Pearly everlasting	✓	-	-	-	0.0
Rock jasmine	-	-	✓	-	0.0
Pea	✓	-	2	2	1.0
Clover	✓	-	3	3	1.4
Yarrow	-	-	✓	-	0.0
Bentgrass	-	-	✓	-	0.0
Monkey flower	-	-	✓	-	0.0
Total Vegetation Cover					55.7
Litter	26	19	19	64	30.5
Rock	-	-	11	11	5.2
Bare Ground	9	9	-	18	8.6
Totals	60	70	80	210	100.0

APPENDIX B
FIELD NOTES

2003 REVEGETATION MONITORING
New World Mining District Response and Restoration Project

APPENDIX C
SCIENTIFIC NAMES OF PLANT SPECIES

2003 REVEGETATION MONITORING
New World Mining District Response and Restoration Project

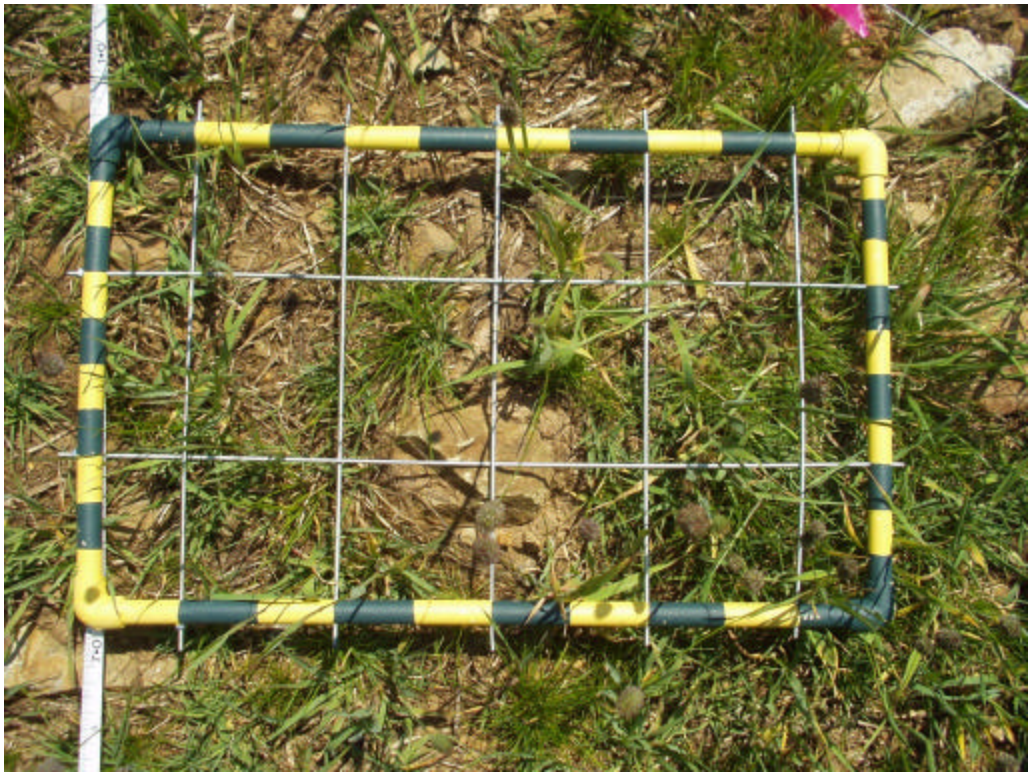
APPENDIX C
SCIENTIFIC AND COMMON NAMES OF PLANT SPECIES
2003 RECLAMATION MONITORING RESULTS
New World Mining District Response and Restoration Project

Common Name	Scientific Name
Alpine bluegrass	*Poa alpina*
Alpine timothy	*Phleum alpina*
Aster	*Asteraceae*
Bentgrass	*Agrostis spp.*
Bluegrass.	*Poa spp.*
Cardamine	*Cardamine spp.*
Clover	*Trifolium*
Collomia	*Collomia spp.*
Dandelion	*Taraxacum*
Figwort	Scrophulariaceae
Fireweed	*Epilobium angustifolium*
Geranium	*Geranium*
Grouse whortleberry	*Vaccinium cespitosum*
Horsetail	*Equisetum spp.*
Monkey flower	*Mimulus spp.*
Moss	moss
Mustard	*Brassicaceae*
Mustard	Brassicaceae
Payson's sedge	*Carex paysonis*
Pea	Fabaceae
Pearly everlasting	*Anaphalis margaritacea*
Phacelia	*Phacelia spp.*
Pussytoes	*Antennaria microphylla*
Rock jasmine	*Androsace spp.*
Sheep sorrel	*Rumex acetosela*
Slender wheatgrass	*Agropyron trachycaulum*
Speedwell	*Veronica spp.*
Tufted hairgrass	*Deschampsia cespitosa*
Wild rye	*Elymus spp.*
Yarrow	*Achillea millefolium*

APPENDIX D
SITE PHOTOGRAPHS

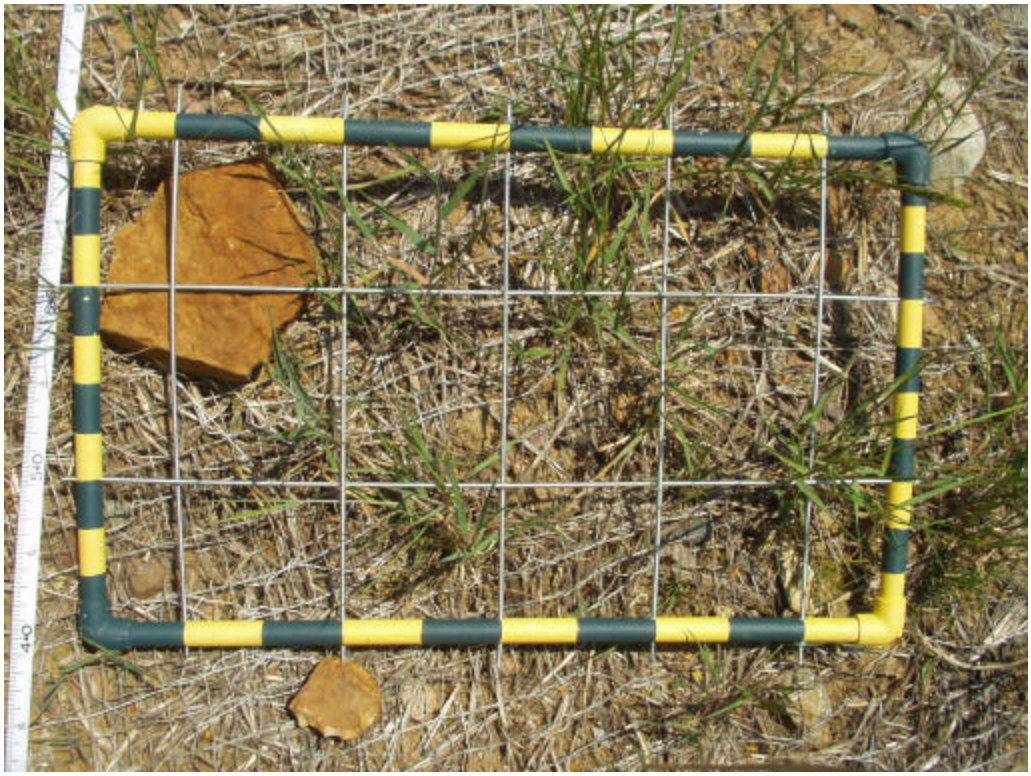
2003 REVEGETATION MONITORING
New World Mining District Response and Restoration Project

Photograph 1. View of Lower Spalding Dump.



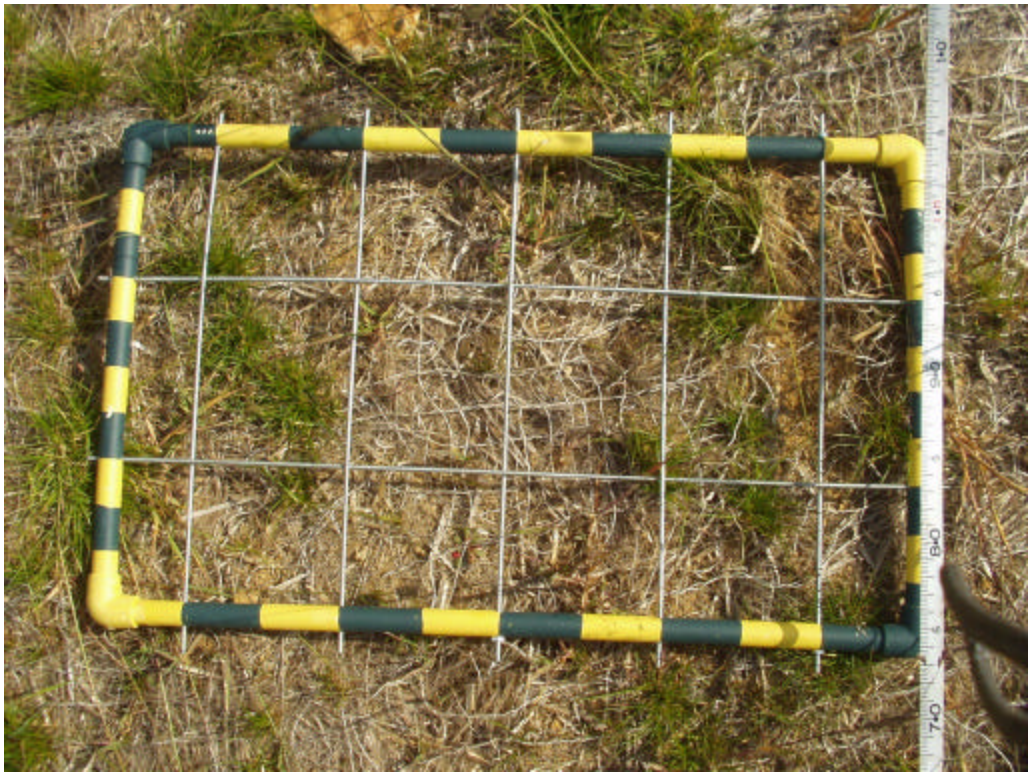
Photograph 2. Lower Spalding Dump, Transect 8 Quadrate 2.

Photograph 3. View of Middle Spalding Dump.



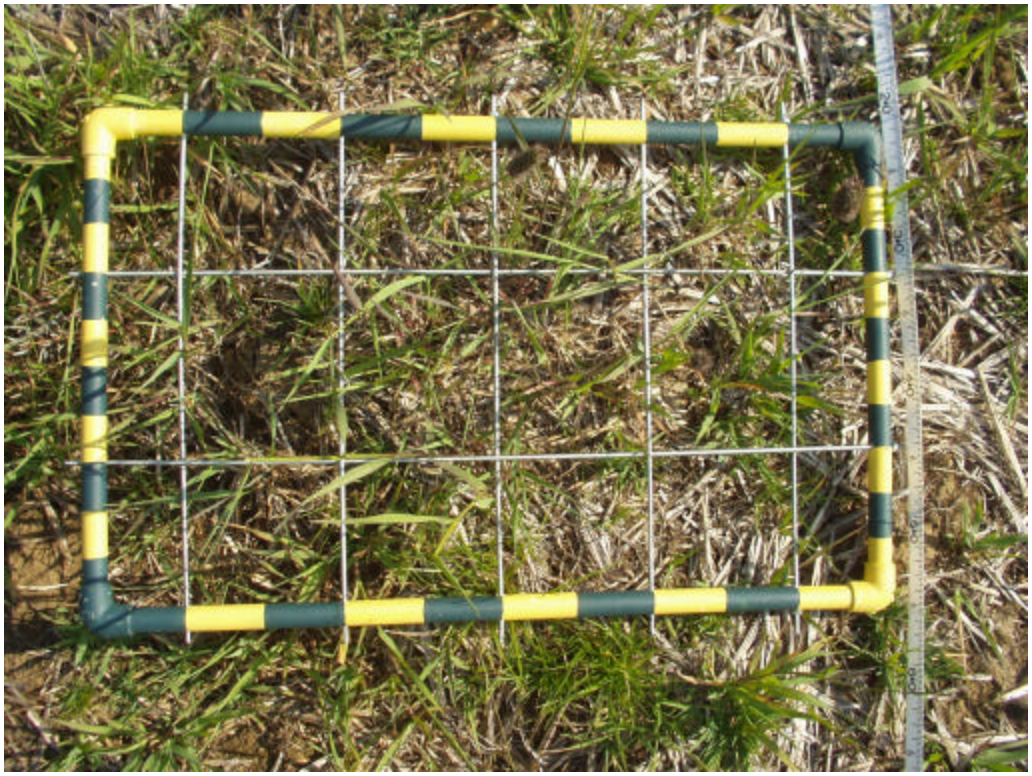
Photograph 4. Middle Spalding Dump, Transect 1 Quadrate 10.

Photograph 5. View of Spalding Access Road.



Photograph 6. Spalding Access Road, Transect 7 Quadrate 2.

Photograph 7. View of Small Como Dump.

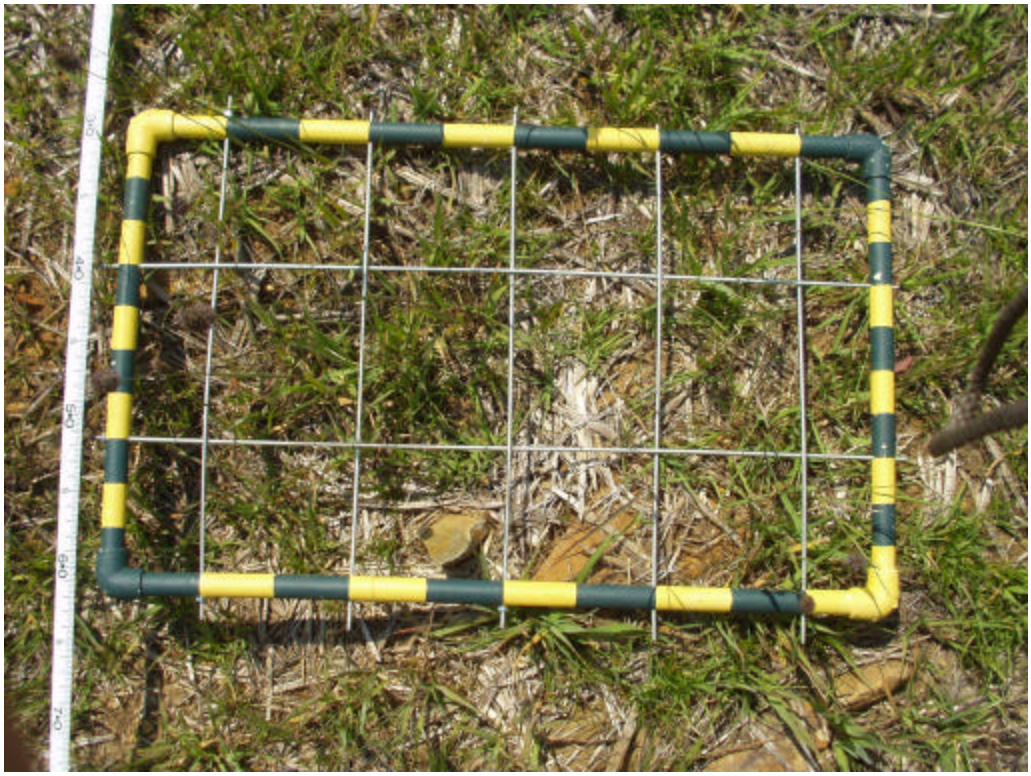


Photograph 8. Small Como Dump, Transect 2 Quadrate 4.

Photograph 9. View of Upper Tredennic Dump 1.

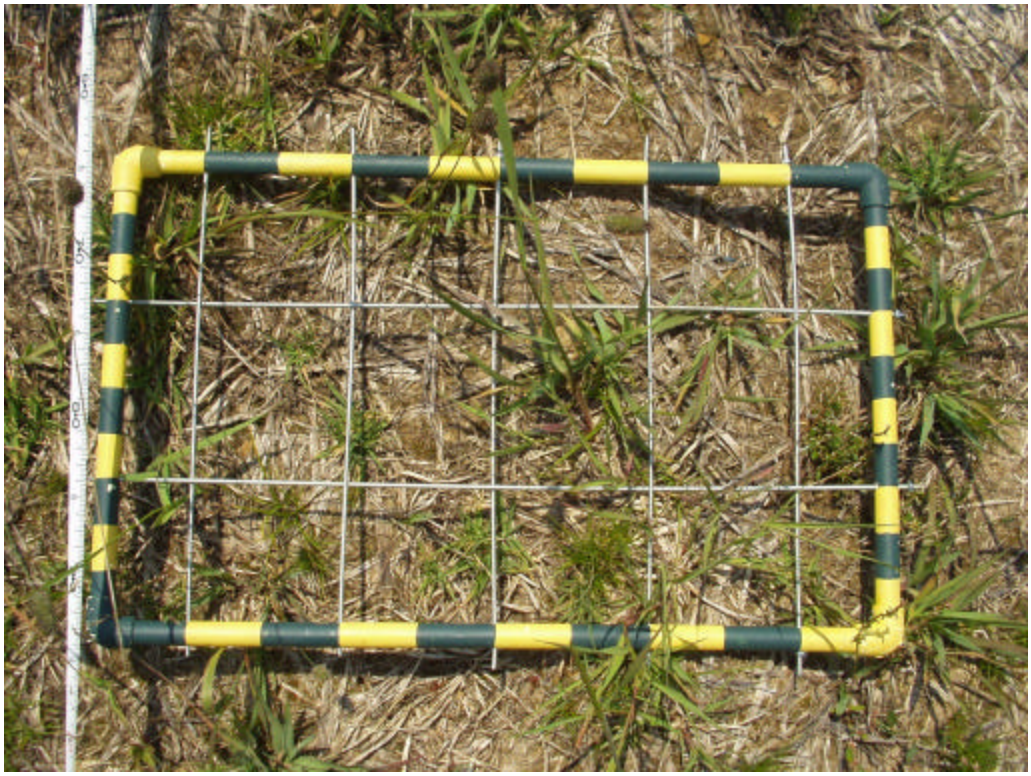
Photograph 10. Upper Tredennic Dump 1, Transect 3 Quadrate 1.

Photograph 11. View of Upper Tredennic Dump 2.



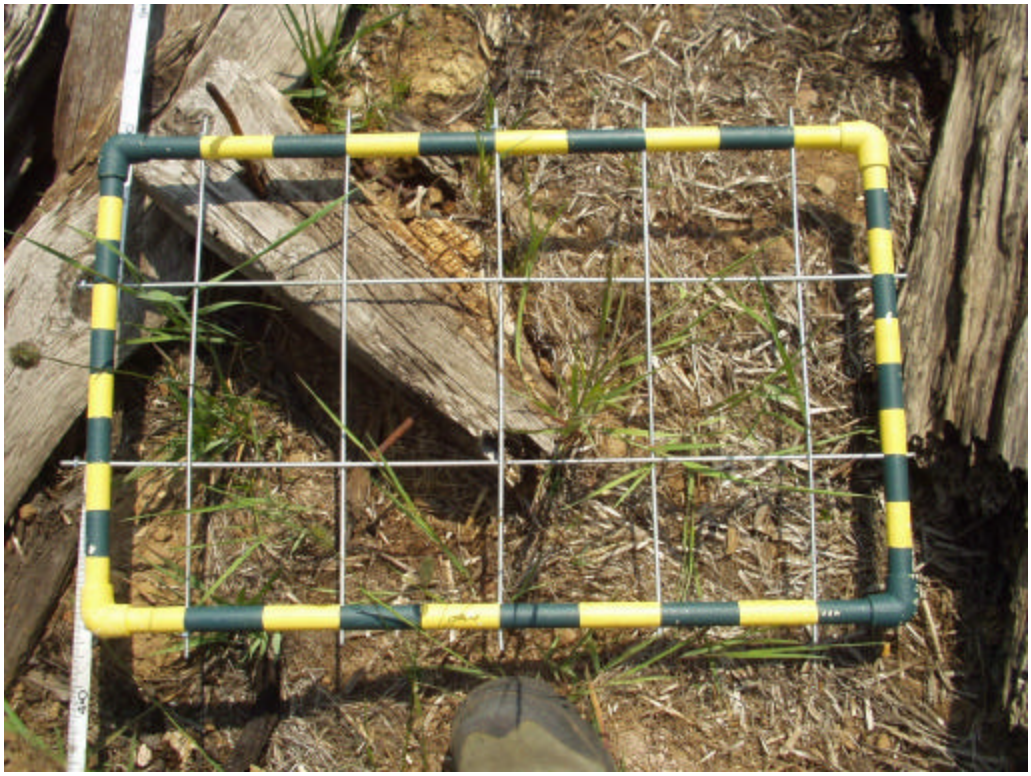
Photograph 12. Upper Tredennic Dump 2, Transect 2 Quadrate 4 .

Photograph 13. View of Middle Tredennic Dump.



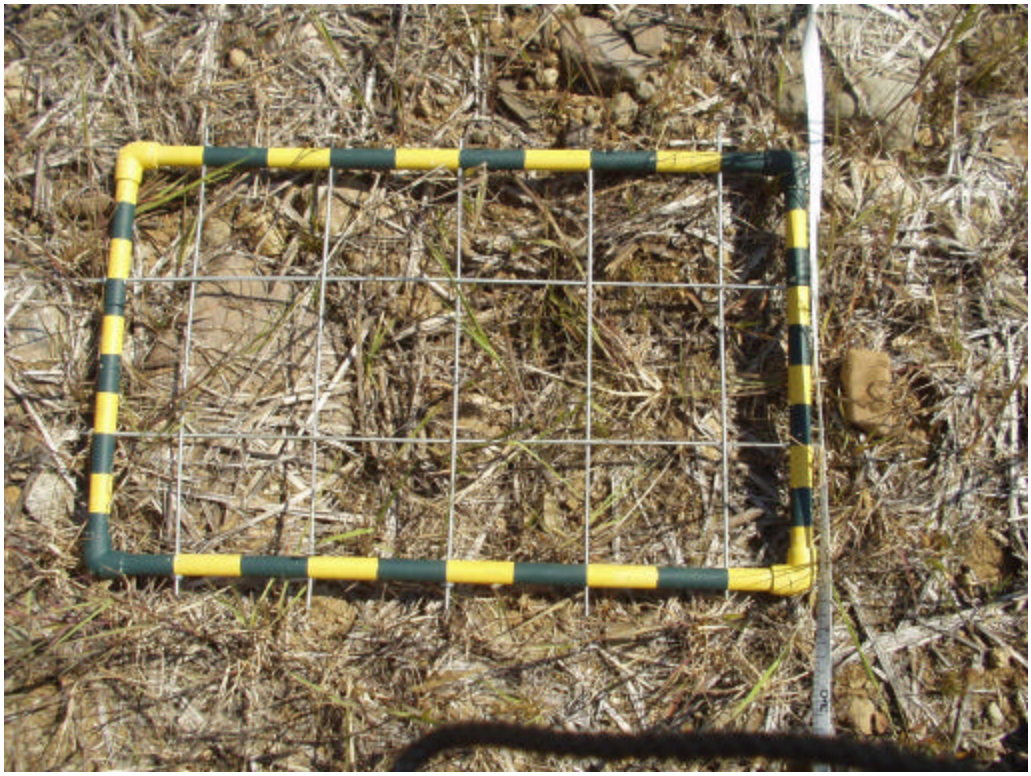
Photograph 14. Middle Tredennic Dump, Transect 3 Quadrate 3.

Photograph 15. View of Lower Tredennic Dump.

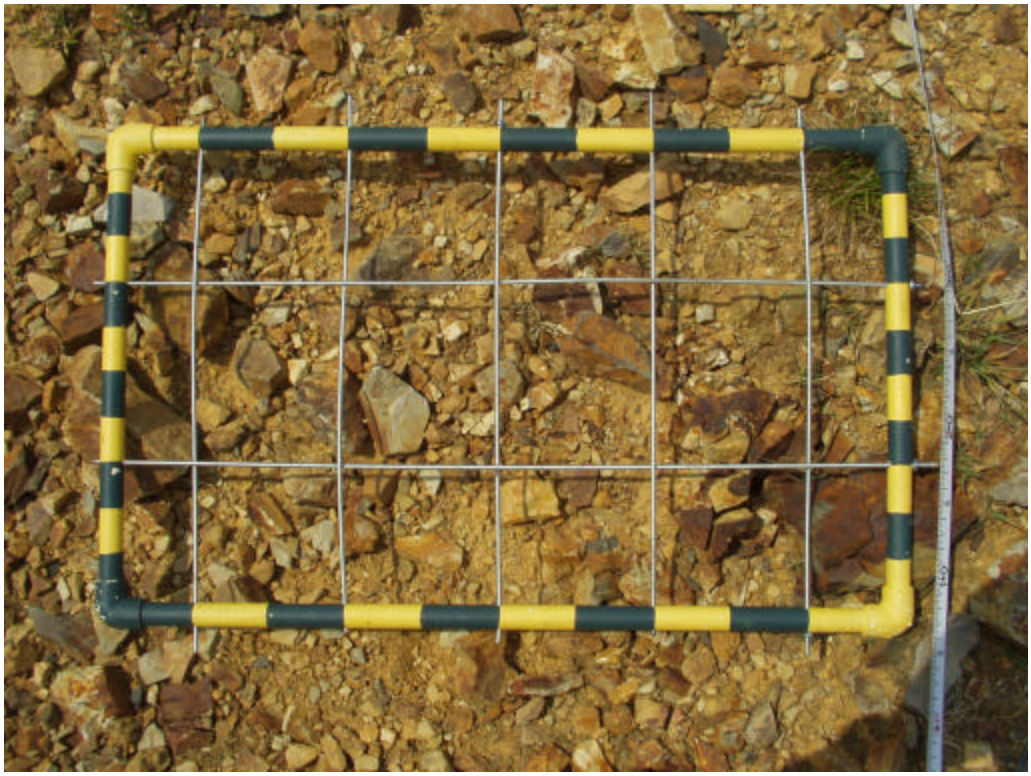


Photograph 16. Lower Tredennic Dump, Transect 3 Quadrate 1.

Photograph 17. View of Rommel Tailings



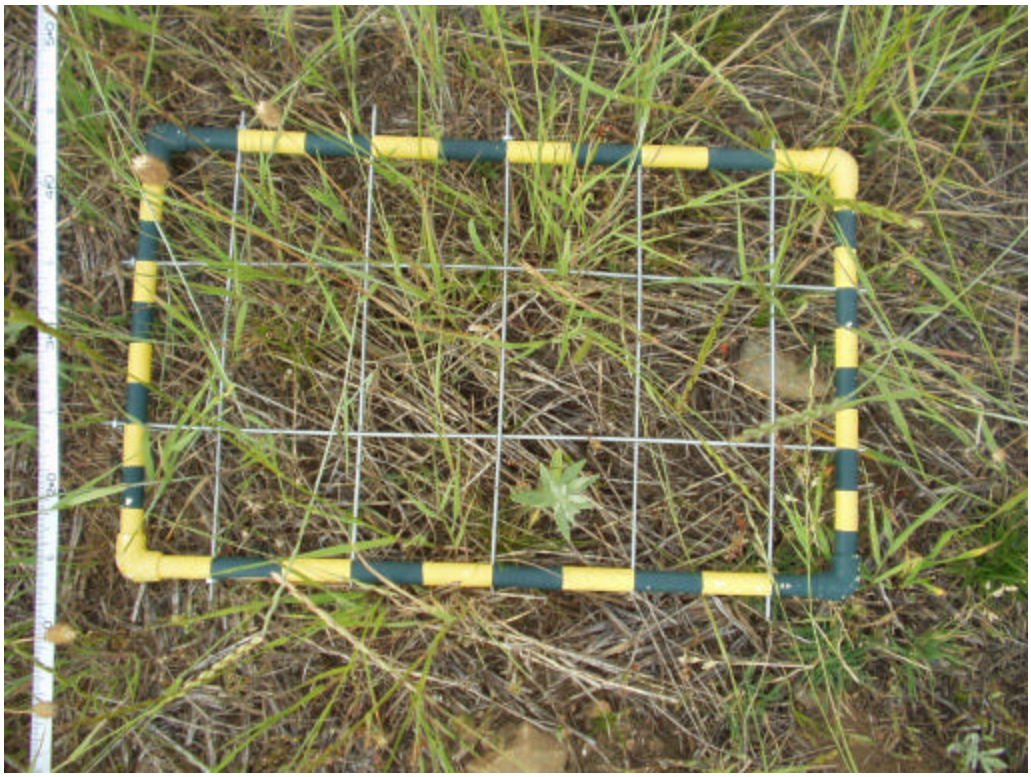
Photograph 18. Rommel Tailings, Transect 15 Quadrate 2.



Photograph 19. McLaren Triangle, Transect 4 Quadrate 2.

Photograph 20. McLaren Triangle, Transect 6 Quadrate 5.

Photograph 21. View of Soda Butte Tailings.



Photograph 22. Soda Butte Tailings, Transect 1 Quadrate 4.