

## *Appendix 3-H*

### *Baseline Vegetation Characterization Study*

AJAX PROJECT

**Environmental Assessment Certificate Application / Environmental Impact Statement  
for a Comprehensive Study**



## **KGHM Ajax Mine Baseline Vegetation Characterization Study**

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**TABLE OF ABBREVIATIONS**

BC	British Columbia
EMRSF	East Mine Rock Storage Facility
GA	General Arrangement
KAM	KGHM Ajax Mine
NRC	National Research Council Canada
SMRSF	South Mine Rock Storage Facility
SMU	Soil map unit
SOT	Start of transect
TEM	Terrestrial ecosystem mapping
TRU	Thompson Rivers University
TSF	Tailings Storage Facility

## 1.0 INTRODUCTION

KGHM Ajax Mining Inc. proposes to develop the Ajax Project (Project), an open pit copper-gold mine at the historic Afton Mining Camp, south of the City of Kamloops, British Columbia (BC). The Project is located in the South-Central Interior of British Columbia, southeast of the junction of the Trans-Canada Highway No. 1 and the Coquihalla Highway (No. 5), within the Thompson Nicola Regional District.

The Project lies in the traditional territory of the Secwepemc Nation. Within the Secwepemc Nation, the Tk'emlúps te Secwepemc and the Skeetchestn Indian Band are the Aboriginal groups in closest proximity to the Project. In a cooperative effort, the Tk'emlúps te Secwepemc and Skeetchestn Indian Bands have formed the Stk'emlupsemc te Secwepemc Nation (SSN), as a division of the greater Secwepemc Nation. The Ashcroft Indian Band and Lower Nicola Indian Band, whose members are part of the Nlaka'pamux Nation also assert their Aboriginal rights to the Project area- an area of common interest with the SSN.

The Ajax property includes two historic pits: the Ajax West Pit, and the Ajax East Pit. Both pits were formerly mined in the 1980s and 1990s. As many as 25 rock types have been recognized in the Project area, some of which are "hybrid" units resulting from the intermixing of multiple rock types.

Key Project facilities include the Tailings Storage Facility (TSF), which is planned as a conventional tailings storage facility; water management ponds; Peterson Creek diversion, and the Tailings Embankments, which will be constructed using mine rock; and four mine rock storage facilities (MRSFs). The four MRSFs include:

- the South Mine Rock Storage Facility (SMRSF),
- East Mine Rock Storage Facility (EMRSF),
- West Mine Rock Storage Facility (WMRSF), and
- the In-Pit Mine Rock Storage Facility (IPMRSF).

Several facilities that will be part of the operation phase but not remain after project closure include the:

- plant facilities and administration buildings,
- reclamation stockpiles,
- explosives facility,
- truck stop and fuel storage,
- power lines, and
- access roads.

The mine plan for the Project predicts an operation based on a mill throughput of 65,000 tonnes of ore per day from the Ajax Pit with up to a 23 year mine life. The construction phase of the Project will be approximately two and a half years, and following the 23 year operation the decommissioning and closure phase is expected to take up to 5 years. Over the mine life the Project will produce approximately 140 million pounds of copper and 130,000 ounces of gold annually with the concentrate shipped by truck to the Port of Vancouver.

## 2.0 SCOPE OF WORK

The vegetation characterization work involved the collection of data to determine pre-disturbance vegetation community characteristics including species composition (grasses, forbs and woody species), biomass production and metals concentrations in order to provide baseline information for comparison to future data collected from reclaimed areas of the mine as per annual mine reclamation reporting requirements.

Assessment and terrestrial ecosystem mapping (TEM) of vegetation resources and wetlands to determine the distribution, abundance and composition of vegetation ecosystems and the distribution and abundance of species at risk and ecological communities at risk in the vicinity of the Project was completed separately by Keystone Wildlife Research.

## 3.0 METHODS

### 3.1 Vegetation Survey Design

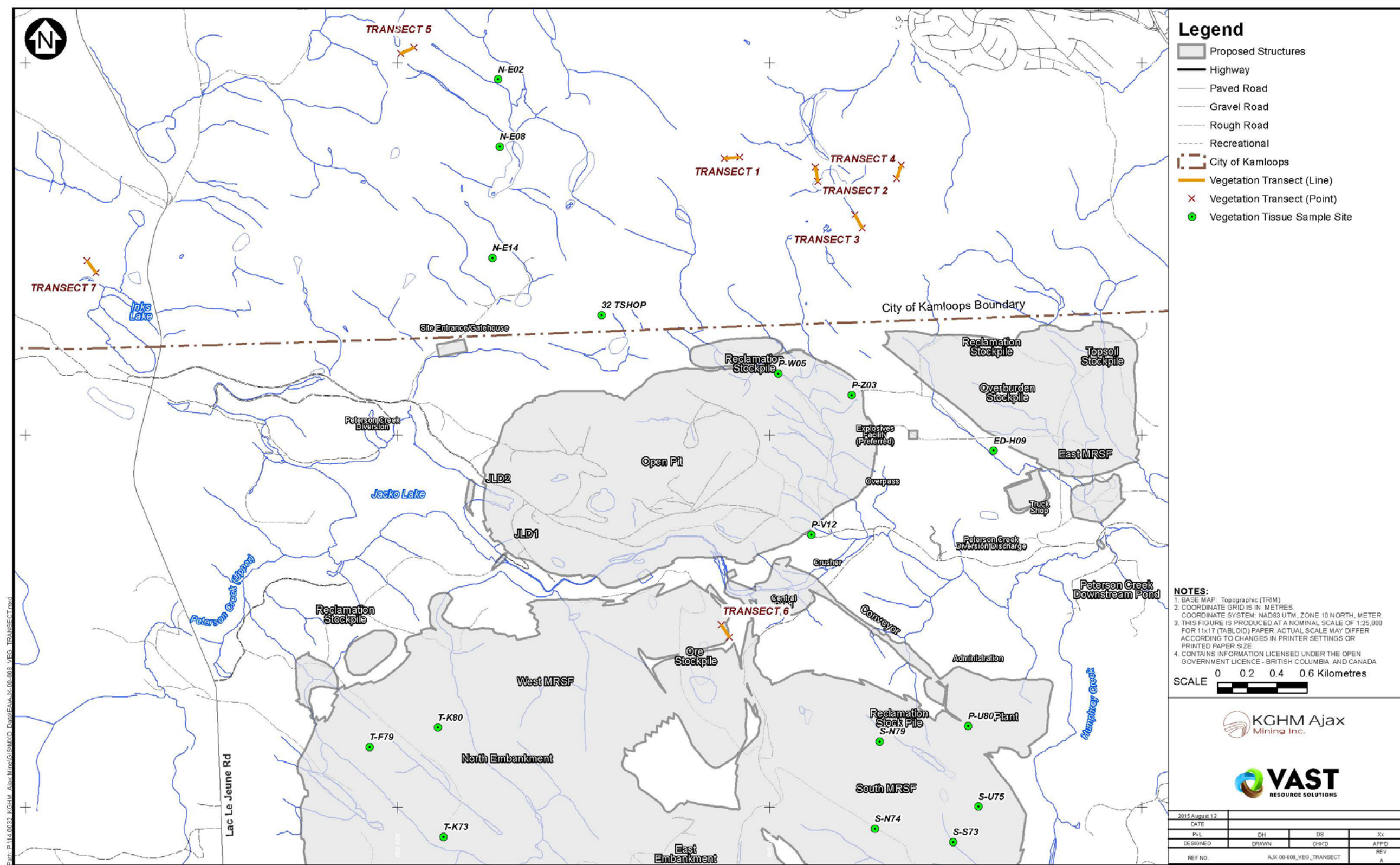
Multiple field visits to the Project site were completed in 2012 in order to characterize soils, landforms and topography, and visually assess vegetation communities. Information collected during those visits were used to design the baseline vegetation surveys completed in 2013. Seven permanent 100 metre long transect lines were established using the following criteria:

- Areas representative of similar vegetation communities in proposed undisturbed areas that matched vegetation communities in areas that were to be disturbed as per the 2013 Ajax North Project general arrangement (GA) plan;
- Areas with similar soil types as in the proposed disturbed areas (based on 2012 field work that classified soil types on the property);
- Areas that were not grazed by livestock in 2013, allowing representative sampling of typical plant biomass production; and
- Areas with representative slopes and aspects similar to the proposed disturbance areas.

Transect locations were delineated with painted iron pins and numbered tags, and geo-referenced for easy identification in the future. Transect locations are shown in Figure 1. The transect number, tag number and corresponding soil map units (SMU) are summarized below:

- Transect 1, Tag # 730 – SMU 2
- Transect 2, Tag # 731 – SMU 99
- Transect 3, Tag # 732 – SMU 1
- Transect 4, Tag # 733 – SMU 4
- Transect 5, Tag # 734 – SMU 3
- Transect 6, Tag # 735 – SMU 6
- Transect 7, Tag # 736 – SMU 5

For detailed information and descriptions of the various soil types identified on the Project site, refer to the SMU discussion in the KGHM Ajax Project Baseline Soil Characterization Study.



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Figure 1. Vegetation transect locations and tissue sampling points

Vegetation assessment occurred July 8 to 12, 2013 using standard sampling techniques developed by Daubenmire (1959). Species composition sampling occurred on the right-hand side of each transect line (with back to start of transect (SOT) pin) and vegetation biomass clip plots occurred on the left hand side. Species composition (percent cover) was estimated ocularly using a 20 x 50 cm (0.1 m<sup>2</sup>) Daubenmire frame. Frames were placed every four metres resulting in a total of 25 ocular assessments along each transect line. Species identification was confirmed with reference materials by Hitchcock and Cronquist (1973), Looman (1982), Aiken and Darbyshire (1983), Parish et al (1996) and Douglas et al. (2001). The six coverage classes by Daubenmire were modified to add trace cover, i.e., less than 1 percent, resulting in seven classes. Midpoints were used in calculations.

Species diversity was calculated using the Shannon-Wiener (S-W) species diversity index, a mathematical measure of species diversity in a community. The S-W index combines two quantifiable measures: species richness (number of species present) and equitability (how even are the numbers of individual species) of species present. Given a large sample size, i.e., more than five species present, the S-W index values (H) can range between 0 to ~4.6 using the natural logarithm (ln) formula outlined below. A value near 0 indicates very low diversity. Values in the midrange are moderately diverse and values in the upper end indicate high diversity. The Shannon-Wiener species diversity index is calculated as follows:

$$H = \sum_{i=1}^S - (P_i * \ln P_i)$$

where: H = the Shannon diversity index

P<sub>i</sub> = fraction of the entire population made up of species i

S = numbers of species encountered

∑ = sum from species 1 to species S

ln = natural logarithm: the power to which the base e (e = 2.718281828.....) must be raised to obtain a number is called the natural logarithm (ln) of the number.

There were five clip plots (20 m apart) along each transect line for biomass productivity data collection. Species were combined into two groups, grass and forb, using 1 m<sup>2</sup> circular plots. Vegetation was clipped to within two centimetres of ground surface, bagged according to species group and dried at 100°C in an industrial despatch oven. Dried samples were weighed using an electronic precision balance scale (accuracy ± 0.1 g). Data was reported in grams/1 m<sup>2</sup>.

In recognition that transects were located in areas subject to seasonal livestock grazing, small portable grazing exclosures were constructed near the SOT pin at each transect to allow for the collection of biomass productivity data in subsequent years. Composite grass/forb biomass samples were collected between July 18 to 20, 2014 from the exclosures located on transects T2, T3, T4, T5 and T6. Exclosures on transects T1 and T7 were damaged by livestock so no sampling was conducted in these locations in 2014.

### 3.2 Metal Uptake by Vegetation

Plant tissue samples were collected from all seven transect lines between July 9 -11, 2013 and sent to ALS Global Laboratories for processing and analysis. Samples were analyzed for concentrations of 38 metals with test methods referenced in the lab report from ALS (Appendix A). The results for the concentrations in plant tissues were compared with National Research Council Canada (NRC) Standards for mineral tolerances of animals. The maximum mineral tolerances for livestock used in the comparisons were from NRC (2005).

## 4.0 RESULTS AND DISCUSSION

### 4.1 Vegetation Cover, Diversity, and Biomass

#### 4.1.1 Vegetation Cover

Vegetation percent cover summary statistic is presented in Table 1, with actual field sheets for each transect provided in Appendix B. Total vegetation cover ranged from 69.9% in Transect 3 to 32.2% in Transect 7. Grasses were the dominant cover species in all transects except T3 and T6, which were dominated by forb species. A listing of all plant species observed is provided in Appendix C.

**Table 1. Summary of vegetation cover data for Ajax Project transects, 2013.**

Percent Cover Statistics	Grass							Forb						
	T1	T2	T3	T4	T5	T6	T7	T1	T2	T3	T4	T5	T6	T7
Mean	23.5	35.1	28.3	30.8	19.5	22	16	13.5	4.3	39.0	20.8	18.7	35	16.5
Standard Deviation	20.2	23.7	24.0	23.2	21.1	25	17	11.5	6.1	25	12.9	19.9	29	7.8
Minimum	2.5	5.0	2.5	3.5	0.5	0	0	0.5	0.5	1.0	0.5	0.0	2.5	1.5
Maximum	85.0	88.0	97.5	97.5	85.0	100	63	42.5	32.5	100	52.5	100	98	33.5
Count	23	25	25	25	25	25	25	25	25	25	25	25	25	25

Percent Cover Statistics	Total Cover							Litter						
	T1	T2	T3	T4	T5	T6	T7	T1	T2	T3	T4	T5	T6	T7
Mean	37.0	39.4	69.9	40.5	50.0	56.7	32.3	27.0	25.2	14.6	21.4	18.3	26.0	15.4
Standard Deviation	24.4	23.9	28.5	17.5	32.1	37.0	15.9	9.7	9.4	8.2	19.7	19.7	18.0	11.5
Minimum	6.0	8.0	24.0	3.0	7.5	5.5	8.5	10.0	10.0	5.0	2.0	2.0	10.0	5.0
Maximum	92.5	90.5	140	70.5	110	148	77.5	55.0	45.0	30.0	95.0	94.0	70.0	60.0
Count	25	25	25	25	25	25	25	25	25	23	25	23	25	25

Percent Cover Statistics	Moss							Wood						
	T1	T2	T3	T4	T5	T6	T7	T1	T2	T3	T4	T5	T6	T7
Mean	21.1	21.4	0.0	20.9	22.6	5.9	15.0	6.0	0.0	0.0	2.6	0.0	0.0	28.6
Standard Deviation	10.3	12.9		25.2	18.9	3.3		6.2			1.7			18.1
Minimum	2.0	5.0	0.0	3.0	5.0	1.0	15.0	2.0	0.0	0.0	1.0	0.0	0.0	2.0
Maximum	45.0	40.0	0.0	85.0	85.0	10.0	15.0	15.0	0.0	0.0	5.0	0.0	0.0	75.0
Count	25	14	0	16	19	14	1	4	0	0	7	0	0	24

Percent Cover Statistics	Rock							Soil						
	T1	T2	T3	T4	T5	T6	T7	T1	T2	T3	T4	T5	T6	T7
Mean	13.0	12.5	5.5	11.5	21.3	23.6	12.5	7.9	21.2	26.5	21.1	12.6	16.4	27.9
Standard Deviation	6.9	3.5	6.4	13.0	22.1	17.9	10.6	4.2	14.9	15.7	13.6	12.5	11.2	13.6
Minimum	2.0	10.0	1.0	1.0	1.0	2.0	5.0	1.0	1.0	1.0	5.0	2.0	2.0	3.0
Maximum	25.0	15.0	10.0	40.0	75.0	60.0	20.0	15.0	55.0	50.0	55.0	40.0	45.0	50.0
Count	25	2	2	10	25	25	2	20	25	14	23	8	25	15

Percent Cover Statistics	Organic						
	T1	T2	T3	T4	T5	T6	T7
Mean	92.4	82.2	92.0	84.8	89.2	71.8	83.0
Standard Deviation	24.8	20.5	20.4	22.4	36.2	36.2	20.2
Minimum	60.0	35.0	55.0	45.0	27.0	20.0	30.0
Maximum	175	120	130	120	145	135	105
Count	25	25	25	25	25	25	25

\* Count refers to the number of plots along each transect that contained grass, forbs, moss, etc.

### 4.1.2 Vegetation Diversity

Vegetation diversity was calculated for each SMU at the time of the sampling (2013) utilizing Shannon-Wiener index values (H). Figure 2 shows the H values as well as the standard deviations for each soil type. Diversity indices varied from 0.58 (SMU 6 and 99) to 1.09 (SMU 4), indicating all sites have relatively low vegetation diversity. There was no significant difference between the vegetation diversity in each SMU. The box plot in Figure 3 shows the range of variation within the raw data as well as the mean for the diversity occurring at each soil type.

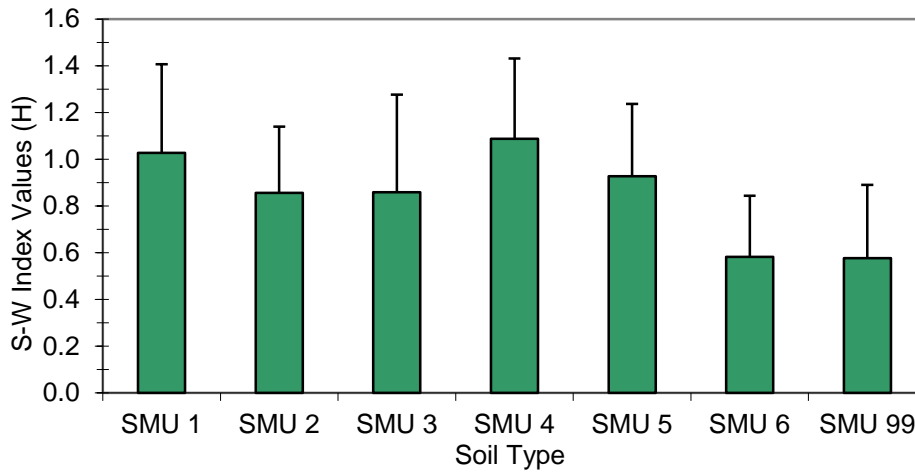


Figure 2. Mean Shannon-Wiener (S-W) index values (H) for each SMU. Standard Deviation indicated by the bars.

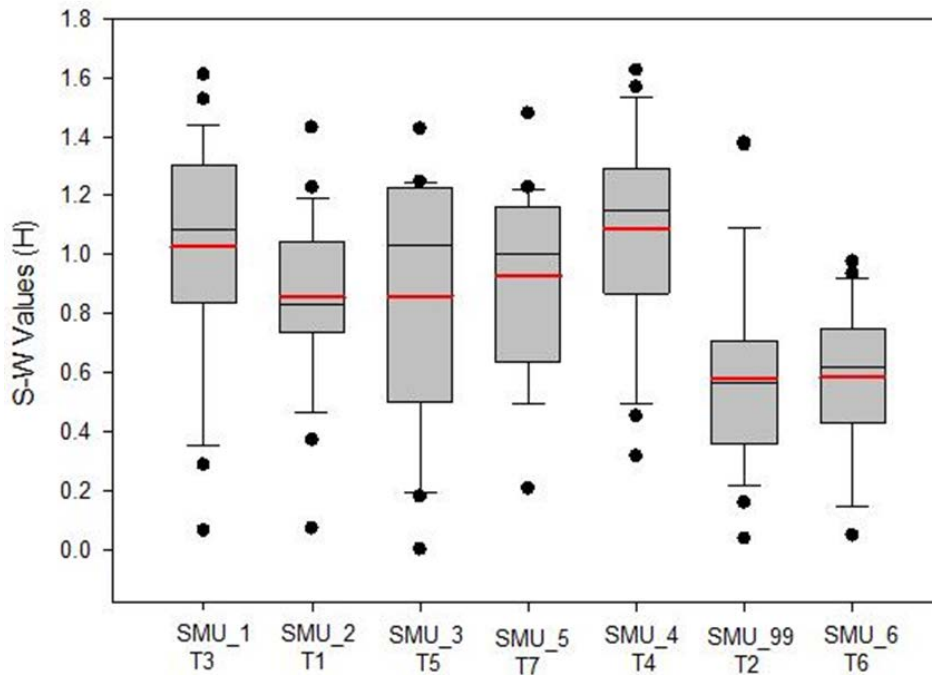
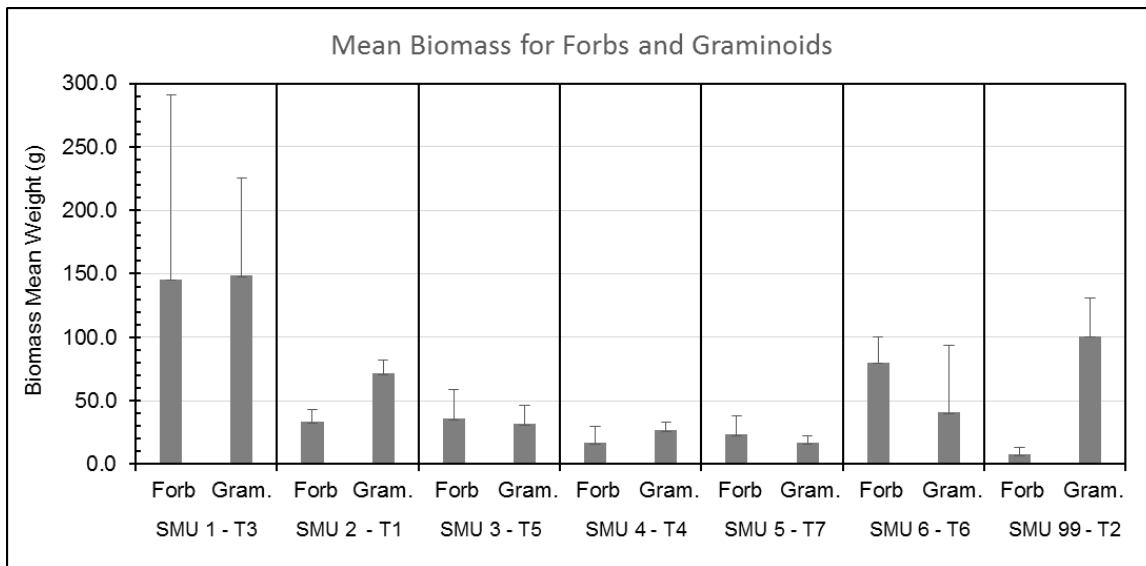


Figure 3. Box plots of raw data for species diversity index values (H) by soil type. The black line is the median and the red line is the mean.

### 4.1.3 Vegetation Biomass (Productivity)

Vegetation biomass summaries are similar to vegetation cover, with variation occurring between soil types and between forbs and graminoids (grasses). Figure 4 shows the mean biomass values for five clip plots per transect line along with the Standard Deviation. Total biomass production ranged from 40.3 g/m<sup>2</sup> on SMU 5 (T7) to 294.6 g/m<sup>2</sup> on SMU 1 (T3). The variation in biomass productivity can be attributed to the combined influences of soil characteristics, slope and aspect on vegetation communities. Forb and graminoid species accounted for proportionately similar biomass production in SMU 1, 3, 4 and 5. Forbs, specifically alfalfa, accounted for approximately two-thirds of the biomass production in SMU 6 (T6). This transect is located on the revegetated waste dump associated with the former Afton mine. Graminoid species accounted for approximately 93% of the total biomass in SMU 99 (T2). This transect was located in a saline meadow where salt-tolerant grasses were the predominant species.



**Figure 4. Mean biomass for each transect line occurring in each soil type (SMU). Bars indicate Standard Deviation occurring within sample along each transect line.**

Table 2 provides a comparison of composite biomass production from transects T2 through T6 for 2013 and 2014. As noted, the grazing exclosures on transects T1 and T7 were damaged by livestock so no sampling was conducted at these locations in 2014. Biomass production in 2014 was lower than 2013 at all sites except T4. The overall relationship in biomass productivity by soil type was consistent between both years, with SMU 1 (T3) producing more than two times the biomass of any other soil type.

**Table 2. Composite biomass comparisons (g/m<sup>2</sup>) for 2013 and 2014**

Transect	SMU	2013			2014
		Forb	Grass	Total*	Total*
T1	2	33.0	71.3	104.3	n/a
T2	99	7.5	100.8	108.3	101.4
T3	1	145.8	148.7	294.5	248.8
T4	4	16.9	26.4	43.3	45.0
T5	3	36.0	31.6	67.6	53.9
T6	6	80.3	40.5	120.8	104.5
T7	5	23.6	16.7	40.3	n/a

\* To convert g/m<sup>2</sup> to kg/ha, multiply g/m<sup>2</sup> values by 10.

For comparative purposes, typical forage production in the grassland phases of the Thompson Very Dry Hot Interior Douglas-fir (IDFxh2) biogeoclimatic unit, as reported by Campbell and Bawtree (1998), range from 560 kg/ha for sites in poor condition to 1120 kg/ha for sites in excellent condition.

## 4.2 Vegetation Tissue Metals Analysis

Table 3 shows the 2013 baseline metal concentrations found in forb and grass tissue collected from each transect, compared to the NRC Standards for maximum mineral tolerances for livestock. Refer to Figure 1 for transect locations. The certificate of analysis from ALS Global Laboratories is in Appendix A. Values in the table that exceed NRC guidelines are highlighted in yellow. Molybdenum (Mo) concentrations in two samples, T1-Grass and T6-Forb, and potassium (K) concentrations in the forb samples for T1, T2, T3, T4 and T7 exceed the guidelines. Additionally, several samples, both grass and forb, had copper:molybdenum (Cu:Mo) ratios lower than the target level (2:1); these are denoted in orange. A copper to molybdenum ratio of 2:1 or less can cause severe interference with copper absorption and result in copper deficiency in domestic livestock, although the condition can be mitigated by supplemental copper. To our knowledge, the current ranch operations have not reported incidences of either molybdenosis (molybdenum toxicity) or hypocuprosis (copper deficiency) in range cattle that graze on the sites where vegetation tissue analysis was conducted. Samples of grass tissue from T2 and T7 reported calcium:phosphorus (Ca:P) ratios lower than the target level for beef cattle (1.5:1); these are denoted in green. Calcium and phosphorus are absorbed by cattle in the proportions that are present in the diet. Rations with ratios less than 1.5:1 have been shown to be detrimental to livestock health and beef production. Ca:P dietary ratios can be managed with supplements and range minerals.

In 2013, tissue samples from predominant grass species utilized by livestock were collected at selected soil test pit locations in the vicinity of the proposed Ajax Pit and East Mine Rock Storage Facility (EMRSF). All samples were collected from undisturbed native range sites not impacted by former mining operations. This data is presented in Table 4. Molybdenum (Mo) concentrations in two rough fescue and three bluebunch wheatgrass samples exceeded NRC guidelines. All samples except one green needlegrass sample collected north of the Ajax Pit have Cu:Mo ratios lower than the target level (2:1). Samples of Kentucky bluegrass and green needlegrass collected north of the proposed Ajax Pit has Ca:P ratios lower than the target level (1.5:1). Refer to Figure 1 for sampling locations.

In 2014, several additional tissue samples were collected at soil test pit locations within the proposed south-option GA footprints of the Tailings Storage Facility (TSF), South Mine Rock Storage Facility (SMRSF) and Ajax Pit footprint. All samples were collected from undisturbed native range sites not impacted by former mining operations. This data is presented in Table 5. One forb sample in the SMRSF and two samples in the TSF had iron (Fe) concentrations that exceed NRC guidelines. Molybdenum (Mo) concentrations exceeded guidelines in five samples from the proposed SMRSF and the sample from the Ajax Pit. Three samples, two from the SMRSF and one from the Ajax Pit had potassium (K) concentrations that exceeded NRC guidelines. A majority of the samples had Cu:Mo ratios lower than the target level (2:1). One grass sample from the SMRSF and three from the TSF had Ca:P ratios below the target level. Refer to Figure 1 for sampling locations.

**Table 3. Results of vegetation tissue analysis, 2013.**

Sample ID	Maximum Mineral Tolerances for Livestock ppm	T1-F	T1-G	T2-F	T2-G	T3	T3-D	T4-F	T4-G	T5-F	T5-G	T6-F	T6-G	T7-F	T7-G
Date Sampled		09-JUL-13	09-JUL-13	09-JUL-13	09-JUL-13	10-JUL-13	10-JUL-13	10-JUL-13	10-JUL-13	11-JUL-13	11-JUL-13	11-JUL-13	11-JUL-13	11-JUL-13	11-JUL-13
Time Sampled		11:00	11:00	14:00	14:00	10:00	10:00	12:00	12:00	09:00	09:00	12:00	12:00	15:00	15:00
ALS Sample ID		L1334433-1	L1334433-2	L1334433-3	L1334433-4	L1334433-5	L1334433-6	L1334433-7	L1334433-8	L1334433-9	L1334433-10	L1334433-11	L1334433-12	L1334433-13	L1334433-14
Matrix		Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
<b>Metals</b>															
Aluminum (Al)	200-1000	56.3	45.9	80.4	29.2	43.2	47.7	67.9	19.8	76.4	33.8	55.0	7.8	76.5	32.8
Antimony (Sb)	70-150	<0.010	<0.010	0.012	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic (As)	30	0.050	0.035	0.099	0.044	0.031	0.054	0.095	0.043	0.044	0.031	0.123	0.039	0.058	0.032
Barium (Ba)	250	61.6	29.6	9.97	5.53	13.9	11.5	116	47.3	143	58.4	27.4	13.1	42.2	24.4
Beryllium (Be)		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Bismuth (Bi)	500	<0.010	<0.010	<0.010	<0.010	<0.010	0.022	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Boron (B)	150	43.4	7.9	33.8	12.7	14.0	12.2	38.2	8.1	37.8	8.7	31.4	3.8	24.1	9.4
Cadmium (Cd)	10	0.034	<0.010	0.053	<0.010	<0.010	<0.010	0.351	<0.010	0.083	<0.010	<0.010	<0.010	0.154	<0.010
Calcium (Ca)	15000-20000	15500	3910	7890	1750	3780	3650	10600	3530	11100	4010	10900	1730	6690	2200
Cesium (Cs)	n	0.0053	<0.0050	0.0078	<0.0050	0.0054	0.0054	0.0067	<0.0050	0.0159	<0.0050	0.0280	<0.0050	0.0063	<0.0050
Chromium (Cr)	100	0.184	0.215	0.224	0.108	0.201	0.155	0.419	0.112	0.135	0.114	0.218	0.094	0.257	0.154
Cobalt (Co)	25	0.071	0.030	0.073	0.026	0.066	0.062	0.099	<0.020	0.072	0.025	0.140	<0.020	0.073	0.027
Copper (Cu)	500	5.51	3.23	10.1	3.41	5.57	5.62	6.61	3.32	5.50	3.76	7.91	2.69	6.15	3.00
Gallium (Ga)	n	<0.020	<0.020	0.024	<0.020	<0.020	<0.020	0.024	<0.020	0.022	<0.020	<0.020	<0.020	0.029	<0.020
Iron (Fe)	500	102	77.9	122	52.2	74.8	82.9	125	46.3	104	56.5	121	22.1	124	68.6
Lead (Pb)	10-100	0.154	0.075	0.219	0.062	0.067	0.061	0.193	0.084	0.131	0.086	0.032	0.038	0.105	0.096
Lithium (Li)	25	<0.10	<0.10	0.37	<0.10	0.59	0.35	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium (Mg)	5000-6000	2390	705	4760	1350	2150	2120	2010	791	2350	1010	4810	795	3050	1400
Manganese (Mn)	400-2000	43.2	53.0	61.9	22.0	41.5	46.3	105	58.2	30.5	36.4	24.7	38.2	54.0	92.7
Mercury (Hg)	1 to 2	0.0084	0.0077	0.0084	0.0054	0.0065	0.0059	0.0127	0.0076	0.0075	0.0091	<0.0050	<0.0050	0.0051	0.0067
Molybdenum (Mo)	5 to 7	1.84	12.9	3.41	3.21	6.15	5.86	1.97	5.08	1.41	4.90	10.4	5.48	1.77	6.13
Nickel (Ni)	50-100	1.12	0.282	0.243	0.231	0.637	0.592	0.762	0.858	0.415	0.310	3.09	0.103	1.20	1.52
Phosphorus (P)	6000-10000	2560	1950	3380	1780	2110	2140	3130	1850	1730	1780	770	400	3050	2740
Potassium (K)	10000-20000	21400	10200	33500	11300	20700	19800	21400	11000	13800	11000	16900	9810	23500	11900
Rhenium (Re)	n	<0.010	<0.010	0.123	0.024	0.010	0.012	<0.010	<0.010	<0.010	<0.010	0.511	0.095	<0.010	<0.010
Rubidium (Rb)	200	2.28	0.379	4.51	1.45	5.39	5.52	1.35	0.918	4.45	1.05	6.12	0.956	2.21	0.678
Selenium (Se)	3.0-5.0	0.22	<0.10	0.21	<0.10	0.25	0.36	<0.10	<0.10	<0.10	<0.10	0.30	0.16	0.21	<0.10
Sodium (Na)	n	<100	<100	210	600	540	520	<100	<100	<100	<100	<100	<100	<100	<100
Strontium (Sr)	1000-2000	78.8	16.3	149	25.3	49.7	43.4	47.6	14.1	46.2	14.4	136	16.7	56.2	14.5
Tellurium (Te)	n	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium (Tl)	n	<0.0020	<0.0020	0.0042	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0053	<0.0020	<0.0020	<0.0020
Thorium (Th)	n	<0.010	<0.010	0.016	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Tin (Sn)	100	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Uranium (U)	100	<0.0020	<0.0020	0.0414	0.0065	0.0035	0.0044	<0.0020	<0.0020	<0.0020	<0.0020	0.0098	<0.0020	<0.0020	<0.0020
Vanadium (V)	10.0-50.0	0.24	0.19	0.30	0.11	0.15	0.16	0.25	<0.10	0.26	0.13	0.29	<0.10	0.31	0.15
Yttrium (Y)	n	0.035	0.021	0.038	0.014	0.019	0.019	0.041	0.013	0.043	0.019	0.024	<0.010	0.037	0.015
Zinc (Zn)	300-500	12.8	22.4	19.2	7.98	18.3	18.4	37.9	24.6	16.4	23.9	10.8	8.27	20.4	12.7
Zirconium (Zr)	n	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Ca:P (target 1.5:1 or higher)		6.05	2.01	2.33	0.98	1.79	1.71	3.39	1.91	6.42	2.25	14.16	4.33	2.19	0.80
Cu:Mo (target 2:1 or higher)		2.99	0.25	2.96	1.06	0.91	0.96	3.36	0.65	3.90	0.77	0.76	0.49	3.47	0.49

**Table 4. Vegetation tissue analysis for selected grass species, 2013.**

Sampling Location:		EMRSF				Rangeland north of Ajax Pit						Ajax Pit			
Sample ID	Maximum Mineral Tolerances for Livestock ppm	ED-H09 BLUEBUNCH WHEATGRASS	ED-H09 NEEDLE & THREAD GRASS	32 TSHOP ROUGH FESCUE	32 TSHOP GREEN NEEDLEGRASS	N-E02 ROUGH FESCUE	N-E02 BLUEBUNCH WHEATGRASS	N-E08 KENTUCKY BLUEGRASS	N-E08 GREEN NEEDLEGRASS	N-E14 KENTUCKY BLUEGRASS	N-E14 FESCUE	P-V12 BLUEBUNCH WHEATGRASS	P-W05 BLUEBUNCH WHEATGRASS	P-W05 ROUGH FESCUE	P-Z03 BLUEBUNCH WHEATGRASS
Date Sampled		07-AUG-13	07-AUG-13	07-AUG-13	07-AUG-13	06-AUG-13	06-AUG-13	06-AUG-13	06-AUG-13	06-AUG-13	06-AUG-13	07-AUG-13	07-AUG-13	07-AUG-13	07-AUG-13
ALS Sample ID		L1344043-13	L1344043-14	L1344043-5	L1344043-6	L1344043-23	L1344043-24	L1344043-25	L1344043-26	L1344043-28	L1344043-29	L1344043-4	L1344043-2	L1344043-3	L1344043-1
Matrix		Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
<b>Metals</b>															
Aluminum (Al)-Total	200-1000	36.0	37.7	54.5	54.7	20.3	22.5	12.2	27.9	120	19.1	77.2	18.2	31.2	118
Antimony (Sb)-Total	70-150	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic (As)-Total	30	0.035	0.035	0.039	0.026	<0.020	0.033	<0.020	0.021	0.057	<0.020	0.040	<0.020	0.033	0.058
Barium (Ba)-Total	250	34.2	36.4	33.2	34.2	10.4	7.08	33.0	20.9	33.6	41.4	36.1	27.1	15.5	27.4
Beryllium (Be)-Total		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Bismuth (Bi)-Total	500	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Boron (B)-Total	150	8.6	7.7	16.3	9.4	21.8	11.2	5.1	4.8	8.8	9.7	6.6	6.7	8.6	11.1
Cadmium (Cd)-Total	10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Calcium (Ca)-Total	15000-20000	4490	3990	4570	3150	2760	1890	1200	1720	3540	3610	4340	2870	3730	3740
Cesium (Cs)-Total	n	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0069	<0.0050	<0.0050	<0.0050	<0.0050	0.0060
Chromium (Cr)-Total	100	0.119	0.185	0.146	0.144	0.103	0.078	<0.050	0.066	0.297	<0.050	0.327	0.119	0.080	0.321
Cobalt (Co)-Total	25	0.021	0.029	0.041	0.049	0.022	0.022	<0.020	0.044	0.089	<0.020	0.068	<0.020	<0.020	0.074
Copper (Cu)-Total	500	2.82	3.19	2.88	3.12	2.70	2.48	2.37	3.87	4.88	2.54	3.75	2.30	2.12	3.29
Gallium (Ga)-Total	n	<0.020	<0.020	0.021	<0.020	<0.020	<0.020	<0.020	<0.020	0.037	<0.020	0.023	<0.020	<0.020	0.047
Iron (Fe)-Total	500	59.9	64.7	87.1	94.1	49.4	42.4	28.3	57.3	215	41.2	119	37.8	57.0	168
Lead (Pb)-Total	10-100	0.042	0.046	0.053	0.061	0.037	0.057	0.022	0.055	0.043	0.026	0.074	0.045	0.076	0.073
Lithium (Li)-Total	25	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Magnesium (Mg)-Total	5000-6000	1120	862	1510	1130	1980	653	751	689	2050	1530	787	907	1200	2060
Manganese (Mn)-Total	400-2000	67.8	47.5	42.4	27.7	27.0	42.1	18.7	20.7	30.0	25.5	65.6	37.1	26.2	68.5
Mercury (Hg)-Total	1 to 2	0.0097	0.0103	0.0106	0.0097	0.0096	0.0069	<0.0050	<0.0050	0.0104	0.0097	0.0083	0.0106	0.0143	0.0112
Molybdenum (Mo)-Total	5 to 7	5.98	3.11	10.3	7.08	14.1	12.3	5.16	1.19	2.62	6.87	9.55	5.93	5.00	10.4
Nickel (Ni)-Total	50-100	0.144	0.293	0.606	0.937	0.250	0.151	0.546	1.92	0.792	0.330	0.238	0.138	0.178	0.278
Phosphorus (P)-Total	6000-10000	1500	1410	1860	1540	1120	1030	1120	1290	1850	2110	1330	1210	1400	1390
Potassium (K)-Total	10000-20000	10400	9660	9160	10700	11900	8610	8090	11600	13900	10700	9590	8190	9080	8050
Rhenium (Re)-Total	n	0.018	<0.010	0.016	0.013	0.061	0.021	<0.010	<0.010	0.024	<0.010	0.152	<0.010	<0.010	0.059
Rubidium (Rb)-Total	200	0.509	0.522	0.413	0.538	0.664	0.672	0.325	0.733	0.722	0.470	0.810	0.550	0.557	0.470
Selenium (Se)-Total	3.0-5.0	0.20	<0.10	0.14	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.28	<0.10	<0.10	<0.10	0.11
Sodium (Na)-Total	n	<100	<100	<100	<100	160	<100	<100	<100	<100	<100	<100	<100	<100	<100
Strontium (Sr)-Total	1000-2000	25.6	24.9	28.6	23.0	49.6	44.4	10.7	14.2	32.5	31.9	19.8	19.8	21.8	33.0
Tellurium (Te)-Total	n	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Thallium (Tl)-Total	n	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Thorium (Th)-Total	n	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.012	<0.010	<0.010	<0.010	<0.010	0.012
Tin (Sn)-Total	100	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Uranium (U)-Total	100	<0.0020	<0.0020	<0.0020	<0.0020	0.0048	0.0027	<0.0020	<0.0020	0.0046	<0.0020	0.0022	<0.0020	<0.0020	0.0033
Vanadium (V)-Total	10.0-50.0	0.16	0.16	0.24	0.24	0.11	<0.10	<0.10	0.12	0.64	<0.10	0.33	<0.10	0.13	0.50
Yttrium (Y)-Total	n	0.018	0.017	0.026	0.026	0.012	0.012	<0.010	0.015	0.062	<0.010	0.034	<0.010	0.015	0.049
Zinc (Zn)-Total	300-500	11.0	8.59	12.8	8.68	7.43	6.61	15.0	25.0	11.2	10.6	16.3	14.4	9.60	15.4
Zirconium (Zr)-Total	n	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Ca:P (target 1.5:1 or higher)		2.99	2.83	2.46	2.05	2.46	1.83	1.07	1.33	1.91	1.71	3.26	2.37	2.66	2.69
Cu:Mo (target 2:1 or higher)		0.47	1.03	0.28	0.44	0.19	0.20	0.46	3.25	1.86	0.37	0.39	0.39	0.42	0.32

Table 5. Results of vegetation tissue analysis, 2014.

Sampling Location:		SMRSF								TSF					Ajax Pit		
Sample ID	Maximum Mineral Tolerances for Livestock ppm	S-S73 GRASS	S-S73 FORB	S-N79 GRASS	S-N79 FORB	S-U75 GRASS	S-U75 FORB	S-N74 GRASS	S-N74 FORB	T-F79 GRASS	T-F79 FORB	T-K80 GRASS	T-K80 FORB	T-K73 GRASS	P-U80 GRASS	P-U80 FORB	
Date Sampled		26-AUG-14	26-AUG-14	25-AUG-14	25-AUG-14	25-AUG-14	25-AUG-14	25-AUG-14	25-AUG-14	26-AUG-14	26-AUG-14	26-AUG-14	26-AUG-14	25-AUG-14	25-AUG-14	25-AUG-14	
Time Sampled		00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00
ALS Sample ID		L1508757-1	L1508757-2	L1508757-7	L1508757-8	L1508757-11	L1508757-12	L1508757-14	L1508757-15	L1508757-3	L1508757-4	L1508757-5	L1508757-6	L1508757-13	L1508757-9	L1508757-10	
Matrix		Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue	
<b>Metals</b>																	
Aluminum (Al)-Total	200-1000	398	612	50.3	198	23.0	34.0	60.4	92.4	106	355	278	750	182	18.9	77.3	
Antimony (Sb)-Total	70-150	<0.010	0.018	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.011	<0.010	0.021	<0.010	<0.010	<0.010	
Arsenic (As)-Total	30	0.107	0.171	<0.020	0.069	<0.020	0.029	0.033	0.048	0.036	0.104	0.097	0.238	0.073	<0.020	0.040	
Barium (Ba)-Total	250	31.1	39.9	36.9	52.2	14.3	28.9	44.0	28.0	20.7	38.3	29.7	28.0	24.9	23.2	25.9	
Beryllium (Be)-Total		<0.010	0.012	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.014	<0.010	<0.010	<0.010	
Bismuth (Bi)-Total	500	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
Boron (B)-Total	150	7.3	36.5	8.3	37.3	12.3	42.0	6.0	36.4	17.5	35.0	12.8	27.3	9.2	5.5	45.7	
Cadmium (Cd)-Total	10	0.0115	0.0625	0.0113	0.103	0.0125	0.316	0.0084	0.142	0.0097	0.246	0.0114	0.234	0.0216	<0.0050	0.153	
Calcium (Ca)-Total	15000-20000	4000	14800	3190	14100	3420	6080	4340	8350	3550	9000	4080	5770	2370	3280	10700	
Cesium (Cs)-Total	n	0.0247	0.0371	<0.0050	0.0126	<0.0050	<0.0050	<0.0050	0.0072	0.0074	0.0236	0.0190	0.0456	0.0151	<0.0050	0.0076	
Chromium (Cr)-Total	100	1.18	1.81	0.236	0.834	0.090	0.110	0.333	0.309	0.400	1.34	1.24	3.20	0.617	0.077	0.262	
Cobalt (Co)-Total	25	0.288	0.506	0.040	0.256	<0.020	0.062	0.040	0.103	0.061	0.328	0.169	0.559	0.117	<0.020	0.122	
Copper (Cu)-Total	500	9.24	11.6	3.09	10.3	1.94	13.1	3.47	11.0	3.23	17.2	3.89	19.4	4.24	2.93	9.30	
Iron (Fe)-Total	500	571	864	80.0	279	43.4	63.2	89.3	142	169	523	471	1280	293	37.8	138	
Lead (Pb)-Total	10-100	0.190	0.256	0.080	0.062	0.132	0.046	0.067	0.041	0.097	0.115	0.110	0.173	0.075	0.028	0.054	
Lithium (Li)-Total	25	<0.50	<0.50	<0.50	3.13	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
Magnesium (Mg)-Total	5000-6000	2060	4170	1550	3430	1800	3640	755	2930	1710	2910	2290	2610	1520	1160	4980	
Manganese (Mn)-Total	400-2000	52.4	71.6	42.1	57.9	59.9	45.9	76.7	43.3	53.5	107	80.4	80.7	40.6	43.3	71.4	
Mercury (Hg)-Total	1 to 2	0.0087	0.0091	0.0089	0.0085	0.0105	0.0076	0.0097	0.0072	0.0114	0.0087	0.0130	0.0087	0.0097	0.0089	0.0104	
Molybdenum (Mo)-Total	5 to 7	9.17	10.7	16.9	8.05	5.16	1.86	18.1	4.41	3.03	2.11	2.79	1.33	6.91	14.5	10.5	
Nickel (Ni)-Total	50-100	2.12	2.25	0.69	1.18	0.46	1.30	0.33	1.95	1.56	2.81	2.01	3.80	1.06	<0.20	0.86	
Phosphorus (P)-Total	6000-10000	2940	3580	2040	3840	1550	2880	1760	3020	2410	3340	2730	3180	1960	1710	2230	
Potassium (K)-Total	10000-20000	21800	37400	10700	18900	8470	15000	6320	16000	10100	17800	7810	14200	8320	7430	21900	
Rubidium (Rb)-Total	200	1.48	2.77	0.497	1.24	0.342	0.842	0.448	1.61	0.539	1.38	0.625	1.07	0.608	0.267	2.84	
Selenium (Se)-Total	3.0-5.0	0.404	1.14	0.127	0.236	0.214	0.412	0.063	0.091	0.056	0.063	0.337	0.483	0.136	0.138	0.260	
Sodium (Na)-Total	n	23	46	<20	<20	<20	<20	<20	<20	<20	<20	<20	23	<20	<20	267	
Strontium (Sr)-Total	1000-2000	25.9	91.7	19.4	80.2	18.8	55.4	21.7	54.3	20.6	56.8	25.5	44.9	25.5	27.8	151	
Tellurium (Te)-Total	n	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	
Thallium (Tl)-Total	n	0.0022	0.0036	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0036	0.0022	0.0034	<0.0020	<0.0020	<0.0020	
Tin (Sn)-Total	100	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	
Uranium (U)-Total	100	0.0107	0.0159	<0.0020	0.0050	<0.0020	<0.0020	<0.0020	0.0020	0.0022	0.0078	0.0074	0.0201	0.0049	<0.0020	0.0029	
Vanadium (V)-Total	10.0-50.0	1.79	2.81	0.24	0.97	<0.10	0.13	0.26	0.41	0.50	1.80	1.69	5.05	1.00	<0.10	0.40	
Zinc (Zn)-Total	300-500	19.3	22.8	12.0	19.8	8.36	21.7	17.7	21.1	16.3	26.8	19.4	32.3	13.1	14.2	22.2	
Zirconium (Zr)-Total	n	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	
Ca:P (target 1.5:1 or higher)		1.36	4.13	1.56	3.67	2.21	2.11	2.47	2.76	1.47	2.69	1.49	1.81	1.21	1.92	4.80	
Cu:Mo (target 2:1 or higher)		1.01	1.08	0.18	1.28	0.38	7.04	0.19	2.49	1.07	8.15	1.39	14.59	0.61	0.20	0.89	

## 5.0 RECOMMENDATIONS

Reclamation research conducted over the years prior to closure of the Ajax Mine will provide invaluable opportunities to test, refine and optimize proposed reclamation techniques prior to their implementation. The proximity of the Project to Thompson Rivers University (TRU) provides unique and expanded post-secondary learning options and potential opportunities for collaboration between KAM, TRU and other academic institutions, as well as local First Nations.

As part of KAM's ongoing commitment to assess vegetation productivity, range capability and metals concentrations in vegetation throughout the mine life and following closure, it is recommended that permanent, large (i.e., a minimum of 10m x 10m) fenced grazing exclosures be established on a minimum of five reference sites (off-mine) that will not be subject to mining disturbance to allow for long-term vegetation assessments (productivity, species composition, metals content) in areas that have not been unduly influenced by domestic livestock and/or wild ungulate use. Sites should be representative of the soils, topography and vegetation communities found on the mine site. As reclamation and revegetation treatments progress on the mine property, permanent sample plots should be established on reclaimed sites to allow long-term comparisons with the reference sites.

Further research and sampling is recommended in order to effectively understand and manage the potential for copper molybdenosis (molybdenum toxicity) or hypocuprosis (copper deficiency) in reclaimed sites.

## 6.0 STATEMENT OF LIMITATIONS

KGHM International Ltd. (the client) and all readers are hereby advised of the following conditions and limitations regarding the technical input provided by VAST Resource Solutions:

- The work performed in this report was carried out in accordance with the terms and conditions specified in VAST's contractual agreement with the client. The conclusions presented herein are based solely upon the scope of services and time and budgetary limitations approved by the client and described in the agreement. Since site conditions may change over time, the report is intended for immediate use only.
- Services provided by VAST Resource Solutions Inc. for this report have been conducted in a manner consistent with the level of skill, care and competence ordinarily exercised by members of the profession currently practicing under similar conditions and like circumstances in the same jurisdiction in which the services were provided. Professional judgment has been applied in developing any conclusions and/or recommendations in this report. No warranties, expressed or implied, are made as to the professional services provided under the terms of the agreement and included in this report.
- The report is based on and limited by circumstances and conditions referred to throughout the report and on information available at the time of the site investigation. The conclusions of this report are based in part on information provided by others. VAST Resource Solutions Inc. believes this information is accurate but cannot guarantee or warrant its accuracy or completeness.
- The information presented in this report was acquired, compiled and interpreted exclusively for the client for the purposes described in this report. VAST Resource Solutions Inc. does not accept any responsibility for the use of this report, in whole or in part, for any purpose other than intended or to any third party for use whatsoever.
- The conclusions and/or recommendations provided in this report do not relieve the client or their agents or representatives of the responsibility to comply with applicable Acts, regulations, bylaws and/or decisions of any authorities that have jurisdiction under an enactment.

The author reserves the right to amend this report if additional information becomes available.

Digital copies of this assessment report are available upon request. If discrepancies exist between the original signed paper copy and the digital report, the paper copy report will prevail.

## 7.0 CLOSURE

VAST Resource Solutions trusts that this report satisfies your present requirements. Should you have any comments, please contact us at your convenience.

Authored By:

**VAST Resource Solutions Inc.**

Per:



The seal is circular with a double-line border. The outer ring contains the text "BRITISH COLUMBIA" at the top and "INSTITUTE OF AGRICULTURE" at the bottom. The inner circle contains "B.C.I.A." in the center, "1684" below it, and "1984" at the bottom.

David Struthers, B.Sc. PAg  
Senior Agrologist/Reclamation Specialist

*I certify that I am a qualified registered professional and that I personally supervised and carried out the scope of work described in this report.*

## 8.0 REFERENCES

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**Appendix A – ALS Global Certificate Of Analysis**



Vast Resource Solutions Inc.  
ATTN: DAVID STRUTHERS  
4500 Mennie Road  
P.O. BOX 538  
CRANBROOK BC V1C 4J1

Date Received: 18-JUL-13  
Report Date: 10-SEP-13 10:47 (MT)  
Version: FINAL

Client Phone: 877-426-8865

## Certificate of Analysis

**Lab Work Order #:** L1334433  
**Project P.O. #:** NOT SUBMITTED  
**Job Reference:** 12.0026.00-KGHM AJAX MINE  
**C of C Numbers:**  
**Legal Site Desc:**

Can Dang  
Senior Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700  
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

## ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1334433-1	L1334433-2	L1334433-3	L1334433-4	L1334433-5
		Description	Tissue	Tissue	Tissue	Tissue	Tissue
		Sampled Date	09-JUL-13	09-JUL-13	09-JUL-13	09-JUL-13	10-JUL-13
		Sampled Time	11:00	11:00	14:00	14:00	10:00
		Client ID	T1-F	T1-G	T2-F	T2-G	T3
Grouping	Analyte						
TISSUE							
<b>Metals</b>	Aluminum (Al)-Total (mg/kg)	56.3	45.9	80.4	29.2	43.2	
	Antimony (Sb)-Total (mg/kg)	<0.010	<0.010	0.012	<0.010	<0.010	
	Arsenic (As)-Total (mg/kg)	0.050	0.035	0.099	0.044	0.031	
	Barium (Ba)-Total (mg/kg)	61.6	29.6	9.97	5.53	13.9	
	Beryllium (Be)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010	
	Bismuth (Bi)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010	
	Boron (B)-Total (mg/kg)	43.4	7.9	33.8	12.7	14.0	
	Cadmium (Cd)-Total (mg/kg)	0.034	<0.010	0.053	<0.010	<0.010	
	Calcium (Ca)-Total (mg/kg)	15500	3910	7890	1750	3780	
	Cesium (Cs)-Total (mg/kg)	0.0053	<0.0050	0.0078	<0.0050	0.0054	
	Chromium (Cr)-Total (mg/kg)	0.184	0.215	0.224	0.108	0.201	
	Cobalt (Co)-Total (mg/kg)	0.071	0.030	0.073	0.026	0.066	
	Copper (Cu)-Total (mg/kg)	5.51	3.23	10.1	3.41	5.57	
	Gallium (Ga)-Total (mg/kg)	<0.020	<0.020	0.024	<0.020	<0.020	
	Iron (Fe)-Total (mg/kg)	102	77.9	122	52.2	74.8	
	Lead (Pb)-Total (mg/kg)	0.154	0.075	0.219	0.062	0.067	
	Lithium (Li)-Total (mg/kg)	<0.10	<0.10	0.37	<0.10	0.59	
	Magnesium (Mg)-Total (mg/kg)	2390	705	4760	1350	2150	
	Manganese (Mn)-Total (mg/kg)	43.2	53.0	61.9	22.0	41.5	
	Mercury (Hg)-Total (mg/kg)	0.0084	0.0077	0.0084	0.0054	0.0065	
	Molybdenum (Mo)-Total (mg/kg)	1.84	12.9	3.41	3.21	6.15	
	Nickel (Ni)-Total (mg/kg)	1.12	0.282	0.243	0.231	0.637	
	Phosphorus (P)-Total (mg/kg)	2560	1950	3380	1780	2110	
	Potassium (K)-Total (mg/kg)	21400	10200	33500	11300	20700	
	Rhenium (Re)-Total (mg/kg)	<0.010	<0.010	0.123	0.024	0.010	
	Rubidium (Rb)-Total (mg/kg)	2.28	0.379	4.51	1.45	5.39	
	Selenium (Se)-Total (mg/kg)	0.22	<0.10	0.21	<0.10	0.25	
	Sodium (Na)-Total (mg/kg)	<100	<100	210	600	540	
	Strontium (Sr)-Total (mg/kg)	78.8	16.3	149	25.3	49.7	
	Tellurium (Te)-Total (mg/kg)	<0.020	<0.020	<0.020	<0.020	<0.020	
	Thallium (Tl)-Total (mg/kg)	<0.0020	<0.0020	0.0042	<0.0020	<0.0020	
	Thorium (Th)-Total (mg/kg)	<0.010	<0.010	0.016	<0.010	<0.010	
	Tin (Sn)-Total (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10	
	Uranium (U)-Total (mg/kg)	<0.0020	<0.0020	0.0414	0.0065	0.0035	
	Vanadium (V)-Total (mg/kg)	0.24	0.19	0.30	0.11	0.15	
	Yttrium (Y)-Total (mg/kg)	0.035	0.021	0.038	0.014	0.019	
	Zinc (Zn)-Total (mg/kg)	12.8	22.4	19.2	7.98	18.3	

\* Please refer to the Reference Information section for an explanation of any qualifiers detected.

## ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1334433-6 Tissue 10-JUL-13 10:00 T3-D	L1334433-7 Tissue 10-JUL-13 12:00 T4-F	L1334433-8 Tissue 10-JUL-13 12:00 T4-G	L1334433-9 Tissue 11-JUL-13 09:00 T5-F	L1334433-10 Tissue 11-JUL-13 09:00 T5-G
Grouping	Analyte						
<b>TISSUE</b>							
<b>Metals</b>	Aluminum (Al)-Total (mg/kg)	47.7	67.9	19.8	76.4	33.8	
	Antimony (Sb)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010	
	Arsenic (As)-Total (mg/kg)	0.054	0.095	0.043	0.044	0.031	
	Barium (Ba)-Total (mg/kg)	11.5	116	47.3	143	58.4	
	Beryllium (Be)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010	
	Bismuth (Bi)-Total (mg/kg)	0.022	<0.010	<0.010	<0.010	<0.010	
	Boron (B)-Total (mg/kg)	12.2	38.2	8.1	37.8	8.7	
	Cadmium (Cd)-Total (mg/kg)	<0.010	0.351	<0.010	0.083	<0.010	
	Calcium (Ca)-Total (mg/kg)	3650	10600	3530	11100	4010	
	Cesium (Cs)-Total (mg/kg)	0.0054	0.0067	<0.0050	0.0159	<0.0050	
	Chromium (Cr)-Total (mg/kg)	0.155	0.419	0.112	0.135	0.114	
	Cobalt (Co)-Total (mg/kg)	0.062	0.099	<0.020	0.072	0.025	
	Copper (Cu)-Total (mg/kg)	5.62	6.61	3.32	5.50	3.76	
	Gallium (Ga)-Total (mg/kg)	<0.020	0.024	<0.020	0.022	<0.020	
	Iron (Fe)-Total (mg/kg)	82.9	125	46.3	104	56.5	
	Lead (Pb)-Total (mg/kg)	0.061	0.193	0.084	0.131	0.086	
	Lithium (Li)-Total (mg/kg)	0.35	<0.10	<0.10	<0.10	<0.10	
	Magnesium (Mg)-Total (mg/kg)	2120	2010	791	2350	1010	
	Manganese (Mn)-Total (mg/kg)	46.3	105	58.2	30.5	36.4	
	Mercury (Hg)-Total (mg/kg)	0.0059	0.0127	0.0076	0.0075	0.0091	
	Molybdenum (Mo)-Total (mg/kg)	5.86	1.97	5.08	1.41	4.90	
	Nickel (Ni)-Total (mg/kg)	0.592	0.762	0.858	0.415	0.310	
	Phosphorus (P)-Total (mg/kg)	2140	3130	1850	1730	1780	
	Potassium (K)-Total (mg/kg)	19800	21400	11000	13800	11000	
	Rhenium (Re)-Total (mg/kg)	0.012	<0.010	<0.010	<0.010	<0.010	
	Rubidium (Rb)-Total (mg/kg)	5.52	1.35	0.918	4.45	1.05	
	Selenium (Se)-Total (mg/kg)	0.36	<0.10	<0.10	<0.10	<0.10	
	Sodium (Na)-Total (mg/kg)	520	<100	<100	<100	<100	
	Strontium (Sr)-Total (mg/kg)	43.4	47.6	14.1	46.2	14.4	
	Tellurium (Te)-Total (mg/kg)	<0.020	<0.020	<0.020	<0.020	<0.020	
	Thallium (Tl)-Total (mg/kg)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	
	Thorium (Th)-Total (mg/kg)	<0.010	<0.010	<0.010	<0.010	<0.010	
	Tin (Sn)-Total (mg/kg)	<0.10	<0.10	<0.10	<0.10	<0.10	
	Uranium (U)-Total (mg/kg)	0.0044	<0.0020	<0.0020	<0.0020	<0.0020	
	Vanadium (V)-Total (mg/kg)	0.16	0.25	<0.10	0.26	0.13	
	Yttrium (Y)-Total (mg/kg)	0.019	0.041	0.013	0.043	0.019	
	Zinc (Zn)-Total (mg/kg)	18.4	37.9	24.6	16.4	23.9	

\* Please refer to the Reference Information section for an explanation of any qualifiers detected.

## ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1334433-11	L1334433-12	L1334433-13	L1334433-14
		Description	Tissue	Tissue	Tissue	Tissue
		Sampled Date	11-JUL-13	11-JUL-13	11-JUL-13	11-JUL-13
		Sampled Time	12:00	12:00	15:00	15:00
		Client ID	T6-F	T6-G	T7-F	T7-G
Grouping	Analyte					
<b>TISSUE</b>						
<b>Metals</b>	Aluminum (Al)-Total (mg/kg)		55.0	7.8	76.5	32.8
	Antimony (Sb)-Total (mg/kg)		<0.010	<0.010	<0.010	<0.010
	Arsenic (As)-Total (mg/kg)		0.123	0.039	0.058	0.032
	Barium (Ba)-Total (mg/kg)		27.4	13.1	42.2	24.4
	Beryllium (Be)-Total (mg/kg)		<0.010	<0.010	<0.010	<0.010
	Bismuth (Bi)-Total (mg/kg)		<0.010	<0.010	<0.010	<0.010
	Boron (B)-Total (mg/kg)		31.4	3.8	24.1	9.4
	Cadmium (Cd)-Total (mg/kg)		<0.010	<0.010	0.154	<0.010
	Calcium (Ca)-Total (mg/kg)		10900	1730	6690	2200
	Cesium (Cs)-Total (mg/kg)		0.0280	<0.0050	0.0063	<0.0050
	Chromium (Cr)-Total (mg/kg)		0.218	0.094	0.257	0.154
	Cobalt (Co)-Total (mg/kg)		0.140	<0.020	0.073	0.027
	Copper (Cu)-Total (mg/kg)		7.91	2.69	6.15	3.00
	Gallium (Ga)-Total (mg/kg)		<0.020	<0.020	0.029	<0.020
	Iron (Fe)-Total (mg/kg)		121	22.1	124	68.6
	Lead (Pb)-Total (mg/kg)		0.032	0.038	0.105	0.096
	Lithium (Li)-Total (mg/kg)		<0.10	<0.10	<0.10	<0.10
	Magnesium (Mg)-Total (mg/kg)		4810	795	3050	1400
	Manganese (Mn)-Total (mg/kg)		24.7	38.2	54.0	92.7
	Mercury (Hg)-Total (mg/kg)		<0.0050	<0.0050	0.0051	0.0067
	Molybdenum (Mo)-Total (mg/kg)		10.4	5.48	1.77	6.13
	Nickel (Ni)-Total (mg/kg)		3.09	0.103	1.20	1.52
	Phosphorus (P)-Total (mg/kg)		770	400	3050	2740
	Potassium (K)-Total (mg/kg)		16900	9810	23500	11900
	Rhenium (Re)-Total (mg/kg)		0.511	0.095	<0.010	<0.010
	Rubidium (Rb)-Total (mg/kg)		6.12	0.956	2.21	0.678
	Selenium (Se)-Total (mg/kg)		0.30	0.16	0.21	<0.10
	Sodium (Na)-Total (mg/kg)		<100	<100	<100	<100
	Strontium (Sr)-Total (mg/kg)		136	16.7	56.2	14.5
	Tellurium (Te)-Total (mg/kg)		<0.020	<0.020	<0.020	<0.020
	Thallium (Tl)-Total (mg/kg)		0.0053	<0.0020	<0.0020	<0.0020
	Thorium (Th)-Total (mg/kg)		<0.010	<0.010	<0.010	<0.010
	Tin (Sn)-Total (mg/kg)		<0.10	<0.10	<0.10	<0.10
	Uranium (U)-Total (mg/kg)		0.0098	<0.0020	<0.0020	<0.0020
	Vanadium (V)-Total (mg/kg)		0.29	<0.10	0.31	0.15
	Yttrium (Y)-Total (mg/kg)		0.024	<0.010	0.037	0.015
	Zinc (Zn)-Total (mg/kg)		10.8	8.27	20.4	12.7

\* Please refer to the Reference Information section for an explanation of any qualifiers detected.

# ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1334433-1	L1334433-2	L1334433-3	L1334433-4	L1334433-5
		Description	Tissue	Tissue	Tissue	Tissue	Tissue
		Sampled Date	09-JUL-13	09-JUL-13	09-JUL-13	09-JUL-13	10-JUL-13
		Sampled Time	11:00	11:00	14:00	14:00	10:00
		Client ID	T1-F	T1-G	T2-F	T2-G	T3
Grouping	Analyte						
TISSUE							
Metals	Zirconium (Zr)-Total (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

\* Please refer to the Reference Information section for an explanation of any qualifiers detected.

# ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1334433-6	L1334433-7	L1334433-8	L1334433-9	L1334433-10
Description	Tissue	Tissue	Tissue	Tissue	Tissue	Tissue
Sampled Date	10-JUL-13	10-JUL-13	10-JUL-13	10-JUL-13	11-JUL-13	11-JUL-13
Sampled Time	10:00	12:00	12:00	12:00	09:00	09:00
Client ID	T3-D	T4-F	T4-G	T4-G	T5-F	T5-G
Grouping	Analyte					
TISSUE						
Metals	Zirconium (Zr)-Total (mg/kg)	<0.20	<0.20	<0.20	<0.20	<0.20

\* Please refer to the Reference Information section for an explanation of any qualifiers detected.

# ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1334433-11	L1334433-12	L1334433-13	L1334433-14	
Description	Tissue	Tissue	Tissue	Tissue	
Sampled Date	11-JUL-13	11-JUL-13	11-JUL-13	11-JUL-13	
Sampled Time	12:00	12:00	15:00	15:00	
Client ID	T6-F	T6-G	T7-F	T7-G	
Grouping	Analyte				
TISSUE					
Metals	Zirconium (Zr)-Total (mg/kg)				
	<0.20	<0.20	<0.20	<0.20	

\* Please refer to the Reference Information section for an explanation of any qualifiers detected.

## Reference Information

### QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Uranium (U)-Total	DUP-H	L1334433-3
Method Blank	Copper (Cu)-Total	MB-LOR	L1334433-1, -10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Method Blank	Copper (Cu)-Total	MB-LOR	L1334433-1, -10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8, -9
Method Blank	Barium (Ba)-Total	MB-LOR	L1334433-3
Method Blank	Strontium (Sr)-Total	MB-LOR	L1334433-3
Method Blank	Barium (Ba)-Total	MB-LOR	L1334433-3
Method Blank	Strontium (Sr)-Total	MB-LOR	L1334433-3

### Qualifiers for Individual Parameters Listed:

Qualifier	Description
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.

### Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
<b>HG-DRY-CVAFS-VA</b>	Tissue	Mercury in Tissue by CVAFS (DRY)	EPA 200.3, EPA 245.7
<p>This method is adapted from US EPA Method 200.3 "Sample Procedures for Spectrochemical Determination of Total Recoverable Elements in Biological Tissues" (1996). Tissue samples are homogenized and sub-sampled prior to hotblock digestion with nitric and hydrochloric acids, in combination with repeated additions of hydrogen peroxide. Analysis is by atomic fluorescence spectrophotometry or atomic absorption spectrophotometry, adapted from US EPA Method 245.7. This digestion procedure was implemented on October 5, 2009.</p>			
<b>MET-DRY-HRMS-VA</b>	Tissue	Metals in Tissue by HR-ICPMS (DRY)	EPA 200.3/200.8
<p>Trace metals in tissue are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) modified from US EPA Method 200.8, (Revision 5.5). The sample preparation procedure is modified from US EPA 200.3. Analytical results are reported on dry weight basis.</p>			
<b>MET-DRY-ICP-VA</b>	Tissue	Metals in Tissue by ICPOES (DRY)	EPA 200.3, EPA 6010B
<p>This method is adapted from US EPA Method 200.3 "Sample Procedures for Spectrochemical Determination of Total Recoverable Elements in Biological Tissues" (1996). Tissue samples are homogenized and sub-sampled prior to hotblock digestion with nitric and hydrochloric acids, in combination with repeated additions of hydrogen peroxide. Analysis is by Inductively Coupled Plasma - Optical Emission Spectrophotometry, adapted from US EPA Method 6010B. This digestion procedure was implemented on October 5, 2009.</p>			

\*\* ALS test methods may incorporate modifications from specified reference methods to improve performance.

*The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:*

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

### Chain of Custody Numbers:

#### GLOSSARY OF REPORT TERMS

*Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.*

*mg/kg - milligrams per kilogram based on dry weight of sample.*

*mg/kg wwt - milligrams per kilogram based on wet weight of sample.*

*mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.*

*mg/L - milligrams per litre.*

*< - Less than.*

*D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).*

*N/A - Result not available. Refer to qualifier code and definition for explanation.*

*Test results reported relate only to the samples as received by the laboratory.*

**UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.**

*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*

<b>Report To</b>			<b>Report Format / Distribution</b>			<b>Service Requested</b> (Rush for routine analysis subject to availability)								
Company: VAST Resource Solutions Inc.			<input checked="" type="checkbox"/> Standard <input type="checkbox"/> Other			<input checked="" type="radio"/> Regular (Standard Turnaround Times - Business Days)								
Contact: David Struthers			<input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> Excel <input type="checkbox"/> Digital <input type="checkbox"/> Fax			<input type="radio"/> Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT								
Address: PO Box 538, 4500 Mennie Rd Cranbrook, BC V1C 4J1			Email 1: dave.struthers@vastresource.com			<input type="radio"/> Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT								
Phone: 250-426-5300 Fax: 250-426-5311			Email 2: aden.stewart@vastresource.com			<input type="radio"/> Same Day or Weekend Emergency - Contact ALS to Confirm TAT								
Invoice To Same as Report? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			<b>Client / Project Information</b>			Please indicate below Filtered, Preserved or both (F, P, F/P)								
Hardcopy of Invoice with Report? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			Job #: 12.0026.00 - KGHM Ajax Mine											
Company:			PO / AFE:			MET-DRY-ICP+HRMS-VA	HG-DRY-CVAFS-VA							Number of Containers
Contact:			LSD:											
Address:			Quote #:											
Phone: Fax:			ALS Contact: Can Dang											
Lab Work Order # (lab use only) <b>L1334433</b>														
Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type										
	T1-F	09-Jul-13	11:00	Tissue	X	X								
	T1-G	09-Jul-13	11:00	Tissue	X	X								
	T2-F	09-Jul-13	14:00	Tissue	X	X								
	T2-G	09-Jul-13	14:00	Tissue	X	X								
	T3	10-Jul-13	10:00	Tissue	X	X								
	T3-D	10-Jul-13	10:00	Tissue	X	X								
	T4-F	10-Jul-13	12:00	Tissue	X	X								
	T4-G	10-Jul-13	12:00	Tissue	X	X								
	T5-F	11-Jul-13	9:00	Tissue	X	X								
	T5-G	11-Jul-13	9:00	Tissue	X	X								
	T6-F	11-Jul-13	12:00	Tissue	X	X								
	T6-G	11-Jul-13	12:00	Tissue	X	X								
	T7-F	11-Jul-13	15:00	Tissue	X	X								
	T7-G	11-Jul-13	15:00	Tissue	X	X								
Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details														
Failure to complete all portions of this form may delay analysis. Please fill in this section.														
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation instructions.														
SHIPMENT RELEASE (client use)						SHIPMENT RECEPTION (lab use only)								
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF				
David Struthers	16-Jul-13	14:00	Britt	July 18	9:50	20.1 °C								

Short Holding Time  
Rush Processing



L1334433-COFC

**Appendix B – Field Data Sheets**

Transect 1	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	
Plot spacing	4 m	8 m	12 m	16 m	20 m	24 m	28 m	32 m	36 m	40 m	44 m	48 m	52 m	56 m	60 m	64 m	68 m	72 m	76 m	80 m	84 m	88 m	92 m	96 m	100 m	Mean	
<i>Agro spi</i>	15	2.5		37.5	85	37.5	2.5		15	0.5	15	2.5		15			62.5	15	37.5	2.5	15		15	37.5	15	22.5	
<i>Stip vir</i>	15	2.5		0.5		2.5						2.5														4.6	
<i>Stip com</i>			15					37.5																		26.3	
<i>Koel mac</i>							2.5	0.5																		1.5	
<i>Fest ida</i>									15	2.5		2.5			15											8.8	
<b>TOT GRASS</b>	<b>30</b>	<b>5</b>	<b>15</b>	<b>38</b>	<b>85</b>	<b>40</b>	<b>5</b>	<b>37.5</b>	<b>15.5</b>	<b>15.5</b>	<b>17.5</b>	<b>5</b>	<b>2.5</b>	<b>15</b>	<b>0</b>	<b>15</b>	<b>62.5</b>	<b>15</b>	<b>37.5</b>	<b>2.5</b>	<b>15</b>	<b>0</b>	<b>15</b>	<b>37.5</b>	<b>15</b>	<b>21.7</b>	
<i>Oxyt cam</i>	2.5	2.5	2.5	15	2.5		2.5	2.5	0.5	2.5		2.5			15		15	2.5		2.5		2.5				4.9	
<i>Erig com</i>	0.5	15	2.5		2.5			2.5		15		15			2.5	2.5		2.5				0.5				5.5	
<i>Lith rud</i>		0.5													0.5										2.5	1.2	
<i>Arte fri</i>			0.5			15	15						2.5	2.5					2.5							6.3	
<i>Tara off</i>					2.5			2.5	2.5						0.5							0.5				1.7	
<i>Astr agr</i>						0.5							2.5	2.5						0.5	0.5	0.5				1.2	
<i>Trag dub</i>							2.5				2.5															2.5	
<i>Achi mil</i>							15		2.5							0.5						0.5	2.5		0.5	3.6	
<i>Astr bec wei</i>								2.5																		2.5	
<i>Ante umb</i>																0.5			0.5				0.5	2.5		1.0	
<i>Erig fla</i>															0.5		2.5									1.5	
<i>Ante pul</i>																			0.5							0.5	
<i>Astr mis</i>																					15	15	37.5	37.5	2.5	21.5	
<i>Crep atr</i>																						0.5				0.5	
<i>Loma tri</i>																								2.5		2.5	
<b>TOT FORB</b>	<b>3</b>	<b>18</b>	<b>5.5</b>	<b>15</b>	<b>7.5</b>	<b>15.5</b>	<b>35</b>	<b>10</b>	<b>5.5</b>	<b>17.5</b>	<b>2.5</b>	<b>17.5</b>	<b>5</b>	<b>5</b>	<b>18.5</b>	<b>3.5</b>	<b>15.5</b>	<b>10</b>	<b>0.5</b>	<b>3.5</b>	<b>15.5</b>	<b>20</b>	<b>40.5</b>	<b>42.5</b>	<b>5.5</b>	<b>13.5</b>	
<i>Chry nau</i>	2.5						37.5	2.5																		14.2	
<i>Rosa nut</i>				2.5																						2.5	
<b>TOT Woody</b>	<b>2.5</b>	<b>0</b>	<b>0</b>	<b>2.5</b>	<b>0</b>	<b>0</b>	<b>37.5</b>	<b>2.5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1.8</b>	
<b>TOT COVER</b>	<b>35.5</b>	<b>23</b>	<b>20.5</b>	<b>55.5</b>	<b>92.5</b>	<b>55.5</b>	<b>77.5</b>	<b>50</b>	<b>21</b>	<b>33</b>	<b>20</b>	<b>22.5</b>	<b>7.5</b>	<b>20</b>	<b>18.5</b>	<b>18.5</b>	<b>78</b>	<b>25</b>	<b>38</b>	<b>6</b>	<b>30.5</b>	<b>20</b>	<b>55.5</b>	<b>80</b>	<b>20.5</b>	<b>37.0</b>	
Animal Dung		3						5	5																	4.3	
Litter	30	25	15	20	55	20	30	40	25	10	30	30	30	40	15	20	30	20	30	30	40	25	20	25	20	27.0	
Moss	10	15	25	15	30	5	2	10	15	35	25	15	20	20	35	45	15	30	30	20	15	35	20	15	25	21.1	
Wood		2					2		5		15															6.0	
Rock	5	10	15	10	5	3	4	6	20	15	10	15	25	15	25	10	2	25	10	15	15	20	20	10	15	13.0	
Soil	15	10	10			1	1	4	10	10	5	10	15	10	10	10		10	5	5		1	5		10	7.9	
Organic	80	70	70	100	175	95	80	100	75	85	95	85	60	85	75	85	125	75	100	135	85	85	100	120	70	92.4	

Transect 2	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	Mean
<b>Plot spacing</b>	<b>0 m</b>	<b>4 m</b>	<b>8 m</b>	<b>12 m</b>	<b>16 m</b>	<b>20 m</b>	<b>24 m</b>	<b>28 m</b>	<b>32 m</b>	<b>36 m</b>	<b>40 m</b>	<b>44 m</b>	<b>48 m</b>	<b>52 m</b>	<b>56 m</b>	<b>60 m</b>	<b>64 m</b>	<b>68 m</b>	<b>72 m</b>	<b>76 m</b>	<b>80 m</b>	<b>84 m</b>	<b>88 m</b>	<b>92 m</b>	<b>96 m</b>	<b>Mean</b>
<i>Pucc nut</i>	85.0	15.0	85.0	62.5	15.0	85.0	37.5	15.0	37.5	2.5	15.0	2.5	15.0	2.5					37.5	15.0	2.5	2.5	15.0	15.0	15.0	27.5
<i>Elym tra</i>		2.5	2.5	2.5	0.5	0.5	0.5																			1.5
<i>Poa com</i>					2.5									2.5												2.5
<i>Hord jub</i>									2.5				2.5		2.5			2.5				2.5				2.5
<i>Brom jap</i>							0.5						0.5										2.5		15.0	4.6
<i>Poa can</i>												15.0			2.5	0.5		15.0								8.3
<i>Brom tec</i>												2.5		0.5						15.0	2.5					5.1
<i>Spor cry</i>																0.5	15.0									7.8
<i>June bal</i>		2.5	0.5																							1.5
<i>Dist str</i>							2.5	15.0	15.0	2.5	2.5	2.5	15.0	2.5	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	2.5	2.5	10.1
<b>TOT GRASS</b>	<b>85.0</b>	<b>20.0</b>	<b>88.0</b>	<b>65.0</b>	<b>18.0</b>	<b>85.5</b>	<b>41.0</b>	<b>30.0</b>	<b>55.0</b>	<b>5.0</b>	<b>17.5</b>	<b>22.5</b>	<b>33.0</b>	<b>8.0</b>	<b>20.0</b>	<b>16.0</b>	<b>30.0</b>	<b>32.5</b>	<b>52.5</b>	<b>30.0</b>	<b>22.5</b>	<b>20.0</b>	<b>30.0</b>	<b>32.5</b>	<b>17.5</b>	<b>35.1</b>
<i>Tar off</i>	0.5	0.5	2.5	2.5	15.0	2.5	2.5	2.5	0.5	2.5	2.5	0.5	2.5	2.5	2.5	0.5	2.5	2.5	2.5	2.5	2.5	0.5	2.5	2.5	0.5	2.4
<i>Desc sop</i>				2.5								2.5														2.5
<i>Chry vil</i>				2.5							0.5															1.5
<i>Ante umb</i>					2.5																					2.5
<i>Medi lup</i>					15.0																					15.0
<i>Astr agr</i>						2.5																				2.5
<i>Came mic</i>							0.5	0.5		0.5	0.5	0.5	0.5	0.5				0.5			0.5					0.5
<i>Grin squ</i>											2.5								2.5							2.5
<i>Arte fri</i>													2.5	2.5												2.5
<i>Poly dou</i>																						2.5				2.5
<i>Achi mil</i>																							0.5			0.5
<i>Lepi den</i>																							0.5	0.5		0.5
Puffball mushroom (not a forb)																			0.5							0.5
<b>TOT FORB</b>	<b>0.5</b>	<b>0.5</b>	<b>2.5</b>	<b>7.5</b>	<b>32.5</b>	<b>5</b>	<b>3</b>	<b>3</b>	<b>3.5</b>	<b>3</b>	<b>5</b>	<b>1</b>	<b>5.5</b>	<b>5.5</b>	<b>2.5</b>	<b>0.5</b>	<b>3</b>	<b>5</b>	<b>3</b>	<b>3</b>	<b>2.5</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>4.3</b>
<b>TOT Woody</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>
<b>TOT COVER</b>	<b>85.5</b>	<b>20.5</b>	<b>90.5</b>	<b>72.5</b>	<b>50.5</b>	<b>90.5</b>	<b>44</b>	<b>33</b>	<b>58.5</b>	<b>8</b>	<b>22.5</b>	<b>23.5</b>	<b>38.5</b>	<b>13.5</b>	<b>22.5</b>	<b>16.5</b>	<b>33</b>	<b>37.5</b>	<b>55.5</b>	<b>33</b>	<b>25</b>	<b>23</b>	<b>33</b>	<b>35.5</b>	<b>18.5</b>	<b>39.4</b>
Animal Dung									4			2	5					1		6						3.6
Litter	25	20	10	10	30	15	35	25	20	25	40	45	30	40	20	30	20	40	20	30	25	15	20	20	20	25.2
Moss					10	5					20	30		25	40	15	5		30	10	20	40	10	40		21.4
Wood																										
Rock																		10							15	12.5
Soil	2	55	2	5	10	15	15	35	15	45	30	5	20	10	15	35	25	20	1	30	25	20	30	15	50	21.2
Organic	115	45	106	95	90	110	80	65	90	60	70	100	80	90	90	65	65	85	120	75	75	80	75	95	35	82.2

Transect 3	PLOT 1	PLOT 2	PLOT 3	PLOT 4	PLOT 5	PLOT 6	PLOT 7	PLOT 8	PLOT 9	PLOT 10	PLOT 11	PLOT 12	PLOT 13	PLOT 14	PLOT 15	PLOT 16	PLOT 17	PLOT 18	PLOT 19	PLOT 20	PLOT 21	PLOT 22	PLOT 23	PLOT 24	PLOT 25		
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	Mean
<b>Plot spacing</b>	4 m	8 m	12 m	16 m	20 m	24 m	28 m	32 m	36 m	40 m	44 m	48 m	52 m	56 m	60 m	64 m	68 m	72 m	76 m	80 m	84 m	88 m	92 m	96 m	100 m	Mean	
<i>Pucc nut</i>	62.5	37.5	62.5	15	2.5	37.5	2.5	15.0	2.5					15.0	15.0	15.0	15.0	2.5	2.5	37.5	0.5	0.5	15.0	15.0			18.6
<i>Poa com</i>	2.5	0.5	0.5	2.5		0.5											2.5	15.0	15.0	0.5	15.0	2.5			97.5	12.9	
<i>Agro gig</i>							0.5	15.0	2.5	62.5	15.0	2.5	15.0	15.0		15.0											15.9
<i>Elym tra</i>														0.5										0.5			0.5
<i>Fest cam</i>																						0.5	37.5				19.0
<i>Junc bal</i>			0.5	0.5	2.5	2.5	0.5	2.5	0.5	0.5	15.0	37.5			0.5				0.5								5.3
<b>TOT GRASS</b>	<b>65.0</b>	<b>38.0</b>	<b>63.5</b>	<b>18.0</b>	<b>5.0</b>	<b>40.5</b>	<b>3.5</b>	<b>32.5</b>	<b>5.5</b>	<b>63.0</b>	<b>30.0</b>	<b>40.0</b>	<b>15.0</b>	<b>30.5</b>	<b>15.5</b>	<b>30.0</b>	<b>17.5</b>	<b>17.5</b>	<b>18.0</b>	<b>38.0</b>	<b>15.5</b>	<b>3.5</b>	<b>53.0</b>	<b>15.0</b>	<b>97.5</b>	<b>30.8</b>	
<i>Pote rec</i>	2.5																										2.5
<i>Tara off</i>	15	15	15	15		15	2.5	2.5			15.0	2.5	15.0	15.0	15.0	2.5	2.5	2.5	15.0	15.0	15.0	15.0		2.5	0.5		10.1
<i>Medi lup</i>	2.5	0.5	0.5		0.5			0.5	2.5		15.0			37.5			15.0	15.0	15.0	15.0	2.5		15	15.0			9.8
<i>Trif rep</i>		37.5	2.5	37.5	85	85	62.5	62.5	15.0	2.5	15.0	62.5	0.5		2.5	0.5	2.5	2.5	37.5	15.0	15.0	37.5	2.5				27.8
<i>Pote ans</i>										0.5	15.0					2.5											6.0
<i>Chry vil</i>										0.5	2.5																1.5
<i>Erig fil</i>											0.5									0.5							0.5
<i>Astr agr</i>											0.5																0.5
<i>Astr bec wei</i>																0.5											0.5
<i>Achi mil</i>																2.5				2.5			2.5	2.5	0.5		2.1
<i>Hack mic</i>																		0.5						0.5			0.5
<i>Trag dub</i>																			2.5				2.5				2.5
<b>TOT FORB</b>	<b>20.0</b>	<b>53.0</b>	<b>18.0</b>	<b>52.5</b>	<b>85.5</b>	<b>100.0</b>	<b>65.0</b>	<b>65.5</b>	<b>18.5</b>	<b>21.0</b>	<b>45.0</b>	<b>65.0</b>	<b>15.5</b>	<b>52.5</b>	<b>17.5</b>	<b>8.5</b>	<b>20.0</b>	<b>20.5</b>	<b>55.0</b>	<b>48.0</b>	<b>32.5</b>	<b>52.5</b>	<b>20.0</b>	<b>23.0</b>	<b>1.0</b>	<b>39.0</b>	
<i>Rosa nut</i>																											2.5
<b>TOT Woody</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>2.5</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.1</b>
<b>TOTAL COVER</b>	<b>85.0</b>	<b>91.0</b>	<b>81.5</b>	<b>70.5</b>	<b>90.5</b>	<b>140.5</b>	<b>68.5</b>	<b>98.0</b>	<b>24.0</b>	<b>84.0</b>	<b>75.0</b>	<b>105.0</b>	<b>30.5</b>	<b>83.0</b>	<b>33.0</b>	<b>38.5</b>	<b>37.5</b>	<b>38.0</b>	<b>73.0</b>	<b>86.0</b>	<b>48.0</b>	<b>56.0</b>	<b>73.0</b>	<b>38.0</b>	<b>98.5</b>	<b>69.9</b>	
Animal dung	1			7										1	2												
Litter	10	30	20	10			10	10	15	10	5	5	30	10	20	20	25	10	30	15	10	5	20	5	10		14.6
Moss																											
Wood																											
Rock															1			10									5.5
Soil	5		1						45		10		35		30	20	35	35		5	30	40	30	50			26.5
Organic	95	100	105	100	100	130	100	105	55	100	100	110	70	110	70	80	70	60	115	110	75	75	100	55	110		92.0

Transect 4	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	
Plot spacing	4 m	8 m	12 m	16 m	20 m	24 m	28 m	32 m	36 m	40 m	44 m	48 m	52 m	56 m	60 m	64 m	68 m	72 m	76 m	80 m	84 m	88 m	92 m	96 m	100 m	Mean
<i>Fest cam</i>	15.0	15.0	37.5	15.0	15.0	15.0	15.0	15.0	15.0	2.5	0.5	2.5		15.0	2.5	2.5	2.5	0.5	62.5	15.0	15.0	15.0	37.5	2.5		14.5
<i>Stip vir</i>		2.5	0.5	0.5									2.5	2.5	0.5			15.0		15.0		2.5				4.6
<i>Koel mac</i>							2.5		2.5	2.5			37.5	2.5	15.0	2.5	2.5	15.0		15.0		0.5				8.9
<i>Agro spi</i>												15.0												2.5	2.5	6.7
<b>TOT GRASS</b>	<b>15.0</b>	<b>17.5</b>	<b>38.0</b>	<b>15.5</b>	<b>15.0</b>	<b>15.0</b>	<b>17.5</b>	<b>15.0</b>	<b>17.5</b>	<b>5.0</b>	<b>0.5</b>	<b>17.5</b>	<b>40.0</b>	<b>20.0</b>	<b>18.0</b>	<b>5.0</b>	<b>5.0</b>	<b>30.5</b>	<b>62.5</b>	<b>45.0</b>	<b>15.0</b>	<b>18.0</b>	<b>37.5</b>	<b>5.0</b>	<b>2.5</b>	<b>19.7</b>
<i>Orth lut</i>	2.5																									2.5
<i>Ante umb</i>	15.0	15.0			15.0	15.0	15.0	2.5		15.0	15.0	2.5		15.0		15.0	37.5	15.0	2.5		2.5	15.0		0.5		12.5
<i>Erig cor</i>	0.5									15.0										15.0		15.0				11.4
<i>Arch mil</i>	2.5	2.5	15.0			15.0			2.5					15.0	15.0		15.0		2.5		2.5	15.0				9.3
<i>Tara off</i>		2.5	15.0	2.5			0.5	2.5	2.5	2.5			0.5	2.5				0.5		0.5						2.9
<i>Erig fil</i>			2.5		15.0																					8.8
<i>Heuc cyl</i>						2.5														2.5						2.5
<i>Arte fri</i>							2.5																			2.5
<i>Oxyt cam</i>								2.5	15.0		2.5		15.0			2.5		15.0							2.5	7.9
<i>Astr agr</i>									2.5	0.5																1.5
<i>Erig com</i>									15.0		2.5	15.0			0.5			2.5					0.5	2.5	0.5	4.9
<i>Gail ari</i>															0.5											0.5
<i>Frag vir</i>																					2.5					2.5
<b>TOT FORB</b>	<b>20.5</b>	<b>20.0</b>	<b>32.5</b>	<b>2.5</b>	<b>30.0</b>	<b>32.5</b>	<b>18.0</b>	<b>7.5</b>	<b>37.5</b>	<b>33.0</b>	<b>20.0</b>	<b>17.5</b>	<b>15.5</b>	<b>32.5</b>	<b>15.5</b>	<b>18.0</b>	<b>52.5</b>	<b>33.0</b>	<b>5.0</b>	<b>3.0</b>	<b>22.5</b>	<b>30.0</b>	<b>15.5</b>	<b>5.5</b>	<b>0.5</b>	<b>20.8</b>
<b>TOT COVER</b>	<b>35.5</b>	<b>37.5</b>	<b>70.5</b>	<b>18.0</b>	<b>45.0</b>	<b>47.5</b>	<b>35.5</b>	<b>22.5</b>	<b>55.0</b>	<b>38.0</b>	<b>20.5</b>	<b>35.0</b>	<b>55.5</b>	<b>52.5</b>	<b>33.5</b>	<b>23.0</b>	<b>57.5</b>	<b>63.5</b>	<b>67.5</b>	<b>48.0</b>	<b>37.5</b>	<b>48.0</b>	<b>53.0</b>	<b>10.5</b>	<b>3.0</b>	<b>40.5</b>
Deer dung								1						2												1.5
Litter	30	35	40	20	10	15	25	20	20	10	2	15	25	15	25	5	5	20	30	50	10	10	2	2	95	21.44
Moss	20	25	10							5	25		4	5	8	20	10	10		3	4	20	80	85		20.88
Wood				5		5		2							2				2	1	1					2.571
Rock							10		5	10	40	30	2								10		1	3	4	11.5
Soil	10	10	5	55	20	20	25	50	20	30	15	15	18	10	25	40	18	20	10		15	40	5	10		21.13
Organic	95	110	120	45	80	85	70	50	90	65	50	55	95	90	80	65	85	115	105	110	80	65	120	95	100	84.8

Transect 5	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	Mean	
<b>Plot spacing</b>	<b>0 m</b>	<b>4 m</b>	<b>8 m</b>	<b>12 m</b>	<b>16 m</b>	<b>20 m</b>	<b>24 m</b>	<b>28 m</b>	<b>32 m</b>	<b>36 m</b>	<b>40 m</b>	<b>44 m</b>	<b>48 m</b>	<b>52 m</b>	<b>56 m</b>	<b>60 m</b>	<b>64 m</b>	<b>68 m</b>	<b>72 m</b>	<b>76 m</b>	<b>80 m</b>	<b>84 m</b>	<b>88 m</b>	<b>92 m</b>	<b>96 m</b>	<b>Mean</b>	
<i>Agro spi</i>	62.5				85.0	15.0	15.0	2.5	15.0	15.0	2.5	37.5	37.5	15.0	15.0	37.5	15.0		2.5	2.5		0.5		0.5		22.0	
<i>Stip vir</i>		15.0																2.5				2.5			0.5	5.1	
<i>Stip com</i>			37.5	15.0																						26.3	
<i>Koel mac</i>									15.0							2.5										6.0	
<i>Poa san</i>									2.5					2.5												2.5	
<i>Brom tec</i>																							0.5	15.0		7.8	
<i>Brom jap</i>																							0.5			0.5	
<b>TOT GRASS</b>	<b>62.5</b>	<b>15.0</b>	<b>37.5</b>	<b>15.0</b>	<b>85.0</b>	<b>15.0</b>	<b>15.0</b>	<b>2.5</b>	<b>32.5</b>	<b>15.0</b>	<b>2.5</b>	<b>37.5</b>	<b>37.5</b>	<b>17.5</b>	<b>15.0</b>	<b>40.0</b>	<b>15.0</b>	<b>2.5</b>	<b>2.5</b>	<b>2.5</b>	<b>0.5</b>	<b>2.5</b>	<b>1.0</b>	<b>15.5</b>	<b>1.0</b>	<b>19.5</b>	
<i>Arte fri</i>																										2.5	2.5
<i>Trif rep</i>																										0.5	0.5
<i>Loma tri</i>	0.5															0.5											0.5
<i>Tara off</i>	2.5		2.5	2.5		2.5						2.5	0.5				0.5										1.8
<i>Cast tho</i>		15.0	0.5						2.5																		6.0
<i>Ante umb</i>		2.5									2.5		15.0		15.0	2.5										2.5	6.7
<i>Oxyt cam</i>		15.0	15.0	15.0	0.5	15.0		15.0	15.0	15.0							15.0	15.0		2.5	15.0	15.0					12.9
<i>Arch mil</i>			2.5										2.5	0.5									2.5				2.0
<i>Erig cor</i>				15.0						0.5							2.5	15.0	15.0		0.5						8.1
<i>Erig com</i>						15.0		2.5		0.5	2.5		2.5	0.5						2.5							3.7
<i>Alli cer</i>								2.5				2.5	2.5	2.5	2.5	0.5											2.2
<i>Came mic</i>														0.5	0.5												0.5
<i>Linu per</i>															2.5					15.0				0.5			6.0
<i>Erio her</i>																	2.5										2.5
<i>Pote pen</i>																				0.5							0.5
<i>Cent mac</i>																					2.5		97.5	2.5			34.2
<i>Verb tha</i>																						2.5					2.5
<i>Trag dub</i>																						0.5			0.5		0.5
<b>TOT FORB</b>	<b>3.0</b>	<b>33.0</b>	<b>20.5</b>	<b>32.5</b>	<b>0.5</b>	<b>32.5</b>	<b>0.0</b>	<b>20.0</b>	<b>18.0</b>	<b>15.5</b>	<b>5.0</b>	<b>2.5</b>	<b>22.5</b>	<b>6.5</b>	<b>20.5</b>	<b>4.0</b>	<b>20.5</b>	<b>30.0</b>	<b>15.5</b>	<b>20.0</b>	<b>18.0</b>	<b>18.0</b>	<b>100.0</b>	<b>3.0</b>	<b>6.0</b>	<b>18.7</b>	
<i>Arte tri</i>		62.5	37.5	62.5	15.0					37.5												15.0		0.5			32.9
<i>Chry nau</i>																				2.5						62.5	32.5
<b>TOT Woody</b>	<b>0.0</b>	<b>62.5</b>	<b>37.5</b>	<b>62.5</b>	<b>15.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>37.5</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>2.5</b>	<b>0.0</b>	<b>15.0</b>	<b>0.0</b>	<b>0.5</b>	<b>62.5</b>	<b>11.8</b>
<b>TOTAL COVER</b>	<b>65.5</b>	<b>110.5</b>	<b>95.5</b>	<b>110.0</b>	<b>100.5</b>	<b>47.5</b>	<b>15.0</b>	<b>22.5</b>	<b>50.5</b>	<b>68.0</b>	<b>7.5</b>	<b>40.0</b>	<b>60.0</b>	<b>24.0</b>	<b>35.5</b>	<b>44.0</b>	<b>35.5</b>	<b>32.5</b>	<b>18.0</b>	<b>25.0</b>	<b>18.5</b>	<b>35.5</b>	<b>101.0</b>	<b>19.0</b>	<b>69.5</b>	<b>50.0</b>	
Elk Dung																											
Litter	20	30	10	5	40	10	94	2	30	8		25	20	15	20	35	15		5	5	5	5	8	10	5	18.3	
Moss	50	15				10		85	30	35	15	20	20	20	15	20	5	25	30	5	15	10			5	22.6	
Wood																											
Rock	6	5	4	2	2	20	5	8	1	25	75	15	5	35	10	5	5	35	45	60	60	40	5	50	10	21.3	
Soil			2	4	3										10		40			10				20	12	12.6	
Organic	140	145	120	115	145	80	105	115	130	120	27	90	105	65	80	105	65	65	55	35	40	60	108	30	85	89.2	

Transect 6	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	Mean	
<b>Plot spacing</b>	<b>0 m</b>	<b>4 m</b>	<b>8 m</b>	<b>12 m</b>	<b>16 m</b>	<b>20 m</b>	<b>24 m</b>	<b>28 m</b>	<b>32 m</b>	<b>36 m</b>	<b>40 m</b>	<b>44 m</b>	<b>48 m</b>	<b>52 m</b>	<b>56 m</b>	<b>60 m</b>	<b>64 m</b>	<b>68 m</b>	<b>72 m</b>	<b>76 m</b>	<b>80 m</b>	<b>84 m</b>	<b>88 m</b>	<b>92 m</b>	<b>96 m</b>	<b>Mean</b>	
<i>Agro spi</i>	62.5				85.0	15.0	15.0	2.5	15.0	15.0	2.5	37.5	37.5	15.0	15.0	37.5	15.0		2.5	2.5		0.5			0.5		22.0
<i>Stip vir</i>		15.0																2.5				2.5			0.5	5.1	
<i>Stip com</i>			37.5	15.0																						26.3	
<i>Elym tra</i>	37.5			15.0	0.5		2.5	0.5	0.5	0.5				2.5	2.5	2.5									2.5	6.1	
<i>Agro cri</i>							0.5	0.5	0.5	2.5	0.5	0.5		0.5			2.5	15.0					2.5		0.5	2.6	
<i>Agro gig</i>																									0.5	0.5	
<b>TOT GRASS</b>	<b>100.0</b>	<b>15.0</b>	<b>37.5</b>	<b>30.0</b>	<b>85.5</b>	<b>15.0</b>	<b>18.0</b>	<b>3.0</b>	<b>16.0</b>	<b>18.0</b>	<b>3.0</b>	<b>38.0</b>	<b>37.5</b>	<b>18.0</b>	<b>17.5</b>	<b>40.0</b>	<b>17.5</b>	<b>17.5</b>	<b>2.5</b>	<b>0.0</b>	<b>0.5</b>	<b>2.5</b>	<b>2.5</b>	<b>0.5</b>	<b>4.0</b>	<b>21.6</b>	
<i>Medi sat</i>	2.5	37.5	15.0	2.5	62.5	37.5	2.5	2.5	37.5	2.5	62.5	62.5	97.5	62.5	62.5	2.5	15.0	2.5	37.5	15.0	62.5	15.0	15.0	62.5	85.0	34.5	
<i>Desc sop</i>																	0.5									0.5	
<i>Meli off</i>																				15.0						15.0	
<i>Trag dub</i>																						0.5				0.5	
<b>TOT FORB</b>	<b>2.5</b>	<b>37.5</b>	<b>15.0</b>	<b>2.5</b>	<b>62.5</b>	<b>37.5</b>	<b>2.5</b>	<b>2.5</b>	<b>37.5</b>	<b>2.5</b>	<b>62.5</b>	<b>62.5</b>	<b>97.5</b>	<b>62.5</b>	<b>62.5</b>	<b>2.5</b>	<b>15.5</b>	<b>2.5</b>	<b>37.5</b>	<b>30.0</b>	<b>62.5</b>	<b>15.5</b>	<b>15.0</b>	<b>62.5</b>	<b>85.0</b>	<b>35.1</b>	
<b>TOTAL COVER</b>	<b>102.5</b>	<b>52.5</b>	<b>52.5</b>	<b>32.5</b>	<b>148.0</b>	<b>52.5</b>	<b>20.5</b>	<b>5.5</b>	<b>53.5</b>	<b>20.5</b>	<b>65.5</b>	<b>100.5</b>	<b>135.0</b>	<b>80.5</b>	<b>80.0</b>	<b>42.5</b>	<b>33.0</b>	<b>20.0</b>	<b>40.0</b>	<b>30.0</b>	<b>63.0</b>	<b>18.0</b>	<b>17.5</b>	<b>63.0</b>	<b>89.0</b>	<b>56.7</b>	
Elk Dung																											
Litter	60	35	15	15	40	25	10	15	10	10	15	10	30	30	50	10	60	20	30	10	30	70	10	10	30	26.0	
Moss						5	10	2		2	8	7	5	2	10	10	1		5			10	5			5.9	
Wood																											
Rock	3	25	30	40	20	25	45	60	30	50	10	5	2	10	5	60	10	45	10	35	20	5	20	15	10	23.6	
Soil	3	30	35	30	10	5	30	20	10	30	5	10	5	10	20	15	10	15	15	20	10	2	45	10	15	16.4	
Organic	100	80	35	30	110	70	25	20	60	20	90	85	135	105	125	25	80	40	75	45	100	100	35	80	125	71.8	

Transect 7	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	Mean
<b>Plot spacing</b>	<b>0 m</b>	<b>4 m</b>	<b>8 m</b>	<b>12 m</b>	<b>16 m</b>	<b>20 m</b>	<b>24 m</b>	<b>28 m</b>	<b>32 m</b>	<b>36 m</b>	<b>40 m</b>	<b>44 m</b>	<b>48 m</b>	<b>52 m</b>	<b>56 m</b>	<b>60 m</b>	<b>64 m</b>	<b>68 m</b>	<b>72 m</b>	<b>76 m</b>	<b>80 m</b>	<b>84 m</b>	<b>88 m</b>	<b>92 m</b>	<b>96 m</b>	<b>Mean</b>
<i>Fest cam</i>	15.0	2.5		2.5		2.5	2.5	2.5	0.5		15.0		15.0	37.5			2.5	15.0		15.0	15.0	62.5		15.0	2.5	13.1
<i>Poa ann</i>					2.5				2.5	2.5											2.5				0.5	2.1
<i>Poa com</i>							15.0	15.0	2.5		2.5						15.0	0.5	15.0							9.4
<i>Hord jub</i>										15.0		15.0														15.0
<i>Brom tec</i>												0.5				62.5										31.5
<i>Brom jap</i>																			2.5							2.5
<b>TOT GRASS</b>	<b>15.0</b>	<b>2.5</b>	<b>0.0</b>	<b>2.5</b>	<b>2.5</b>	<b>2.5</b>	<b>17.5</b>	<b>17.5</b>	<b>5.5</b>	<b>17.5</b>	<b>17.5</b>	<b>15.5</b>	<b>15.0</b>	<b>37.5</b>	<b>0.0</b>	<b>62.5</b>	<b>17.5</b>	<b>15.5</b>	<b>17.5</b>	<b>15.0</b>	<b>17.5</b>	<b>62.5</b>	<b>0.0</b>	<b>15.0</b>	<b>3.0</b>	<b>15.8</b>
<i>Arch mil</i>	2.5	2.5	0.5	2.5		2.5		2.5	15.0			2.5		0.5	15.0		2.5		15.0		0.5		0.5	2.5		4.5
<i>Erig fla</i>	0.5		15.0																							7.8
<i>Cent mac</i>		2.5					2.5																	0.5	15.0	5.1
<i>Erig cor</i>		0.5																								0.5
<i>Came mic</i>		0.5											0.5													0.5
<i>Trag dub</i>			2.5	15.0	15.0		0.5						0.5						2.5	0.5	2.5			0.5		4.4
<i>Tara off</i>				2.5	2.5	2.5		2.5	0.5	15.0		15.0	2.5	0.5	0.5	15.0	15.0	15.0	2.5	2.5	0.5	15.0		15.0	0.5	6.6
<i>Frag vir</i>					2.5																					2.5
<i>Ante umb</i>						15.0	15.0						15.0						2.5		15.0					12.5
<i>Verb tha</i>						2.5									2.5								15.0			6.7
<i>Cirs arv</i>									2.5	2.5	0.5															1.8
<i>Soli can</i>										0.5								2.5								1.5
<i>Astr agr</i>										0.5	15.0							2.5	0.5	0.5						3.8
<i>Alli cer</i>															15.0											15.0
<i>Lepi den</i>															0.5											0.5
<i>Trif rep</i>																							15.0			15.0
<b>TOT FORB</b>	<b>3.0</b>	<b>6.0</b>	<b>18.0</b>	<b>20.0</b>	<b>20.0</b>	<b>22.5</b>	<b>18.0</b>	<b>5.0</b>	<b>18.0</b>	<b>18.5</b>	<b>15.5</b>	<b>17.5</b>	<b>18.0</b>	<b>1.5</b>	<b>33.5</b>	<b>15.0</b>	<b>17.5</b>	<b>20.0</b>	<b>23.0</b>	<b>3.5</b>	<b>18.5</b>	<b>15.0</b>	<b>30.5</b>	<b>18.5</b>	<b>15.5</b>	<b>16.5</b>
<i>Pseu men</i>		15.0																								15.0
<b>TOT Woody</b>	<b>0.0</b>	<b>15</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.6</b>
<b>TOTAL COVER</b>	<b>18.0</b>	<b>8.5</b>	<b>18.0</b>	<b>22.5</b>	<b>22.5</b>	<b>25.0</b>	<b>35.5</b>	<b>22.5</b>	<b>23.5</b>	<b>36.0</b>	<b>33.0</b>	<b>33.0</b>	<b>33.0</b>	<b>39.0</b>	<b>33.5</b>	<b>77.5</b>	<b>35.0</b>	<b>35.5</b>	<b>40.5</b>	<b>18.5</b>	<b>36.0</b>	<b>77.5</b>	<b>30.5</b>	<b>33.5</b>	<b>18.5</b>	<b>32.3</b>
Elk Dung								8	4																	
Litter	10	60	10	5	5	10	15	15	15	15	25	15	10	25	5	5	25	15	20	5	20	5	10	25	15	15.4
Moss						15																				15.0
Wood	2	25	65	50	40	15	40	20	15	50	35	45	20	10		15	30	20	15	75	20	10	20	30	20	28.6
Rock	20														5											12.5
Soil	50	3		20	30	25		30	45				25	20	50			20	15		15		30		40	27.9
Organic	30	105	100	85	70	75	100	70	55	100	100	100	75	80	45	100	100	80	85	100	85	105	70	100	60	83.0

## **Appendix C – Species List**

Scientific Name	Common Name
<b>Graminoids (all grass except one rush)</b>	
<i>Agropyron cristatum</i>	Crested wheatgrass
<i>Agropyron spicatum</i>	Bluebunch wheatgrass
<i>Agrostis gigantea</i>	Redtop
<i>Bromus japonicus</i>	Japanese brome
<i>Bromus tectorum</i>	Downy brome
<i>Distichlis stricta</i>	Alkali saltgrass
<i>Elymus trachycaulus</i>	Slender wheatgrass
<i>Festuca campestris</i>	Rough fescue
<i>Festuca idahoensis</i>	Idaho fescue
<i>Hordeum jubatum</i>	Foxtail barley
<i>Juncus balticus</i>	Baltic rush
<i>Koeleria macrantha</i>	Junegrass
<i>Poa annua</i>	Annual bluegrass
<i>Poa canbyi</i>	Canby bluegrass
<i>Poa compressa</i>	Canada bluegrass
<i>Poa sandbergii</i>	Sandberg bluegrass
<i>Puccinellia nuttalliana</i>	Nuttall's alkaligrass
<i>Sporobolus cryptandrus</i>	Sand dropseed
<i>Stipa comata</i>	needle-and-thread grass
<i>Stipa viridula</i>	Green needle grass
<b>Forbs</b>	
<i>Allium cernuum</i>	nodding onion
<i>Achillea millefolium</i>	yarrow
<i>Antennaria pulcherrima</i> var. <i>pulcherrima</i>	showy pussytoes
<i>Antennaria umbrinella</i>	umber pussytoes
<i>Artemisia frigida</i>	pasture sage
<i>Astragalus agrestis</i>	field or purple milkvetch
<i>Astragalus beckwithii</i> var. <i>weiserensis</i>	Weiser milkvetch
<i>Astragalus miser</i>	timber milkvetch
<i>Camelina microcarpa</i>	little-podded falseflax
<i>Castilleja thompsonii</i>	Thompson's paintbrush/yellow
<i>Centaurea maculosa</i>	spotted knapweed
<i>Chrysopsis villosa</i>	golden aster
<i>Cirsium arvense</i>	Canada thistle
<i>Crepis atrabarba</i>	slender hawksbeard
<i>Descurainia Sophia</i>	flixweed
<i>Erigeron compositus</i> var. <i>glabratus</i>	cut-leaved daisy
<i>Erigeron corymbosus</i>	long-leaved daisy
<i>Erigeron filifolius</i> var. <i>filifolius</i>	thread-leaved daisy
<i>Erigeron flagellaris</i> var. <i>flagellaris</i>	trailing daisy
<i>Eriogonum heracleoides</i>	parsnip-flowered buckwheat
<i>Fragaria virginiana</i>	wild strawberry

**Scientific Name****Common Name****Forbs, cont'd**

<i>Gaillardia aristata</i>	brown-eyed susan
<i>Grindelia squarrosa</i>	curly cup gumweed
<i>Hackelia micrantha</i> ,	blue stickseed
<i>Heuchera cylindrica</i>	round-leaved alumroot
<i>Lepidium densiflorum</i>	prairie pepper-grass
<i>Linum perenne</i> spp. <i>Lewisii</i>	wild blueflax
<i>Lithospermum ruderales</i>	lemonweed
<i>Lomatium triternatum</i>	narrow-leaved desert parsley
<i>Medicago lupulina</i>	black medick
<i>Medicago sativa</i>	alfalfa
<i>Melilotus officinalis</i>	yellow sweet-clover
<i>Orthocarpus luteus</i>	yellow owl-clover
<i>Oxytropis campestris</i>	field locoweed
<i>Polygonum douglasii</i>	Douglas's knotweed
<i>Potentilla anserina</i>	silverweed
<i>Potentilla pensylvanica</i>	prairie cinquefoil
<i>Potentilla recta</i>	sulphur cinquefoil
<i>Sedum lanceolatum</i>	lance-leaved stonecrop
<i>Silene noctiflora</i>	night-flowering catchfly
<i>Solidago canadensis</i>	Canadian goldenrod
<i>Taraxacum officinale</i>	common dandelion
<i>Tragopogon dubius</i>	yellow salsify
<i>Trifolium repens</i>	white clover
<i>Verbacum thapsus</i>	great mullein

**Woody**

<i>Artemisia tridentata</i>	Big sagebrush
<i>Chrysothamnus nauseosus</i>	Common rabbit-brush
<i>Pseudotsuga menziesii</i>	Interior Douglas-fir
<i>Rosa nutkana</i>	Nootka rose

**Fungi**

<i>Lycoperdon</i> species	small puffball mushroom
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