Michael Anthony Pond
2016.07.14 10:27:32 -
08'00'
Mount Milligan Mine

Ministry of Energy, Mines & Petroleum Resources
Mining & Minerals Division
BC Geological Survey

Assessment Report
Title Page and Summary

TYPE OF REPORT [type of survey(s)]: Reclamation Assessment Program **TOTAL COST:** CAD$107,671.00

AUTHOR(S): Michael Pond, M. Laidlaw, J. Anderson, T. Baker, J. Straker, B. Riordan **SIGNATURE(S):**

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA M.A. POND GEOSCIENTIST

NOTICE OF WORK PERMIT NUMBER(S)/DATE(S): #M-4 2012 **YEAR OF WORK:** 2015

STATEMENT OF WORK - CASH PAYMENTS EVENT NUMBER(S)/DATE(S): statement of work - event # 5590861 February 15, 2016 amended July 14, 2016

PROPERTY NAME: Endako Minesite - Mine #0200478

CLAIM NAME(S) (on which the work was done): 507245, 1017547, 1017549, 1017551, 10177562

COMMODITIES SOUGHT: molybdenum

MINERAL INVENTORY MINFILE NUMBER(S), IF KNOWN: 093K/006

MINING DIVISION: Omineca **NTS/BCGS:** Trim 093K 005 UTM Zone 10

LATITUDE: 54 ° 03 ' 37 " **LONGITUDE:** 125 ° 09 ' 27 " **(at centre of work)**

OWNER(S):

1) Thompson Creek Mining Ltd.
2) Sojitz Canada Corp.

MAILING ADDRESS:

177 Victoria Street, Suite 100
Prince George, BC V2L 5R8

Suite 2624, 1055 Dunsmuir St.
Vancouver, BC V7X1L3

OPERATOR(S) [who paid for the work]:

1) Thompson Creek Mining Ltd.
2)

MAILING ADDRESS:

177 Victoria Street, Suite 100
Prince George, BC V2L 5R8

PROPERTY GEOLOGY KEYWORDS (lithology, age, stratigraphy, structure, alteration, mineralization, size and attitude):

Commodities: Molybdenum Significant Minerals: Molybdenite, Pyrite, Magnetite, Chalcopyrite, Sphalerite, Bornite, Scheelite
Alteration: Sericite, Kaolinite, K-Feldspar, Specularite, Pyrite Alteration Type: Argillic, Potassic, Oxidation
Classification: Stockwork, Vein, Porphyry, Hydrothermal, Epigenetic Type: L05: Porphyry Mo (Low F- type)
Shape: Irregular Modifier: Faulted Dimension: 3353x370x365 metres Strike/Dip: 110/60S

REFERENCES TO PREVIOUS ASSESSMENT WORK AND ASSESSMENT REPORT NUMBERS:

Next Page

TYPE OF WORK IN THIS REPORT	EXTENT OF WORK (IN METRIC UNITS)	ON WHICH CLAIMS	PROJECT COSTS APPORTIONED (incl. support)
GEOLOGICAL (scale, area)			
Ground, mapping			
Photo interpretation			
GEOPHYSICAL (line-kilometres)			
Ground			
Magnetic			
Electromagnetic			
Induced Polarization			
Radiometric			
Seismic			
Other			
Airborne			
GEOCHEMICAL (number of samples analysed for...)			
Soil			
Silt			
Rock			
Other			
DRILLING (total metres; number of holes, size)			
Core			
Non-core			
RELATED TECHNICAL			
Sampling/assaying	other - Reclamation		CAD$107,671.00
Petrographic			
Mineralographic			
Metallurgic			
PROSPECTING (scale, area)			
PREPARATORY / PHYSICAL			
Line/grid (kilometres)			
Topographic/Photogrammetric (scale, area)			
Legal surveys (scale, area)			
Road, local access (kilometres)/trail			
Trench (metres)			
Underground dev. (metres)			
Other			
		TOTAL COST:	CAD$107,671.00

BC Geological Survey
Assessment Report
36057

Assessment Report

Endako Mine
2015 Reclamation

Omineca Mining Division

N.T.S. 93K/3E
Latitude 54^0 02' N
Longitude 125^0 07' W

Owner/Operator:

Thompson Creek Mining Ltd.
Endako Mines
177 Victoria Street, Suite 100
Prince George, B.C. V2L 5R8

Prepared for

Ministry of Energy, Mines, & Petroleum Resources
Mining & Minerals Division

By

Michael Pond, P. Geo.
Thompson Creek Metals Company

M. Laidlaw, J. Anderson, T. Baker, & J. Straker
Integral Ecology Group Ltd.

B. Riordan
FM Environmental Services

April 12, 2016 , Revised July 13, 2016

Table of Contents

List of Figures

Appendices

1.0 Summary

The Endako porphyry molybdenite deposit is located 160 kilometres west of Prince George in central British Columbia. At the time of the event filing, the property consisted of 33 claims and 26 mineral leases covering approximately 12,797.2 hectares. Thompson Creek Mining Ltd. owns 75% of the operation and Sojitz Moly Resources Inc. owns 25%. The Endako Mine consists of three different open pits: the Endako, Denak East, and Denak West, with a total proven and probable reserve of 33.4 million tonnes grading 0.049% molybdenum as of December 31, 2014.

On January 01, 2015 the mine went in a 'Temporary Suspension of Operation' and then into full 'Care and Maintenance' on June 01, 2015. At the time of production suspension the mine was operating at a rate of approximately 55,000 tonnes per day.

In 2015 Endako engaged the services of Integral Ecology group (IEG), to continue the design and implementation of a pilot reclamation-assessment program that began in 2013. The intent of the program is to test a revised approach to reclamation assessment at Endako, and to provide information to support finalization of program design for the Ministry of Energy, Mines, and Natural Gas.

In addition to the IEG program, Endako also engaged Rick Leffers Contracting (RLC) to conduct hydroseeding on the upper benches of tailings pond 1. The approved program was 66% completed during the September 2015 field season. Additional hydroseeding will be completed in 2016.

Field work was completed from June 30th to July 24th (IEG), and from September 21st to 30th (RLC). The final IEG report was submitted to Endako on March 31st, 2016. This report comprises the framework to submit the reclamation program for mineral assessment purposes, and wholly includes the IEG report as its main appendix.

2.0 Introduction

2.1 Terms of Reference

In 2013, at the request of Endako and with the support of the B.C. Ministry of Energy and Mines, the Integral Ecology Group (IEG) implemented a program to develop more appropriate "ecosystem-based" criteria for reclamation assessment. The purpose of this program was to provide updated information on reclamation conditions at Endako, and to use this information to support potential revision of reclamation-success criteria and corresponding permit conditions for the mine. A key element of this program is the use of permanent sample plots (PSPs) on both reclaimed and adjacent reference areas, to provide information on local non-mined (reference) conditions and on the convergence of reclaimed ecosystems with these conditions over time.

In 2015, 27 reclaimed plots and 3 reference plots were installed on 8 reclamation sites and 3 references sites. This brought the total number of plots installed between 2013 – 2015 to 78 (62 reclamation and 16 reference plots). In addition, 6 reclaimed plots on 2 reclamation sites were re-sampled in accordance with the re-sampling schedule. The IEG report (Appendix 1), presents a combined analysis of results from the three study years, and evaluates reclamation success at the reclaimed-site level and at the mine level based on the Criteria and Indicators (C&I) framework proposed in the 2014 IEG report.

(IGE 2015, p.i).

2.2 Property Description and Location

The Endako porphyry molybdenite deposit is located 160 kilometres west of Prince George in central British Columbia. The centre of the property sits at 54^0 02'N and 125^0 07'W, or 5990212mN and 362020mE, UTM Zone 10, NAD 83 (Figure 1).

The property consists of 33 legacy and converted legacy claims and 26 mineral leases covering an area of approximately 12,797.2 hectares (Figure 2). Appendix 3 contains information on each individual claim and lease. The expiry dates, (event 5590861) for the claims shown in Figure 2 and Appendix 3, are pending acceptance of this report. The property is 75% owned by Thompson Creek Mining Ltd and 25% by Sojitz Moly Resources Inc. Figure 3 shows the tenure detail of the claims worked on by the reclamation surveys and included in the assessment event.

The Endako Mine consists of three open pits: the Endako, Denak East, and Denak West, with a total proven and probable reserve of 33.4 million tonnes grading 0.049% molybdenum (%Mo) (December 31, 2014).

On January 01, 2015 the mine went in a 'Temporary Suspension of Operation' and then into full 'Care and Maintenance' on June 01, 2015. At the time of production suspension the mine was operating at a rate of approximately 55,000 tonnes per day.

2.3 Accessibility, Climate, Local Resources, Infrastructure and Physiography

The Endako Mine Property lies within the Interior Plateau, characterized by broad valleys, flat-topped hills, and generally gently rolling terrain. Glaciation moved across the area from the west leaving a distinct east-west grain. Elevations range from 670 metres at Endako village to 1,090 metres at the crest of the Endako Pit. Vegetation consists of relatively open pine forests.

Access to the mine is via 10 kilometres of paved road from the Village of Endako located on Highway 16 northeast of the mine. A network of mine roads provides excellent access to most parts of the property. Prince George, the largest service centre in northern British Columbia, is 160 kilometres east along Highway 16. Fraser Lake, 20 kilometres to the northeast, is the nearest significant community to the mine.

2.4 Property History

The Endako deposit was discovered in 1927 by local prospectors and explored with a short shaft and tunnel. The leached nature of the mineralization, extensive overburden, low grades, and lack of precious metals led to the claims being dropped in 1958. In 1962, R and P Metals Corporation acquired the property and after encouraging diamond drilling results incorporated Endako Mines Ltd. Further diamond drilling and bulk sampling led to a positive production decision in 1964 and official mine opening on June 8, 1965. Production was expanded from 9,070 tonnes per day to 24,500 tpd in 1967, 27,000 tpd by 1980, and 30,000 tpd in 1993.

Exploration has been ongoing from the mid-sixties to the present, including geochemical sampling, diamond and percussion drilling. In 1997, Endako was sold to Thompson Creek Mining Ltd. (75%) and Nissho Iwai Moly Resources Inc. (25%).

Recent diamond drill programs occurred in 2010 and 2011. The 2010 program comprised 13,778 metres in 91 holes. The program added significant reserves northwest of the existing Denak West Pit. The 2011 program comprised 21,743 metres in 89 holes. The program again completed additional resource definition northwest of the Denak West Pit, as well as step out reserve definition in the main Endako Pit.

In 2008 Hatch Limited completed a feasibility study for the design and construction of a new mill to increase production from 28,000 tonnes per day (tpd), to 50,000 tpd. On June 1st 2012 the new mill was commissioned. At the time the Mine went to care and maintenance (June, 2015), production and recoveries continued to improve. In 2014 the mine shipped 11.847 million pounds of Mo.

Figure 1 Property Location Map

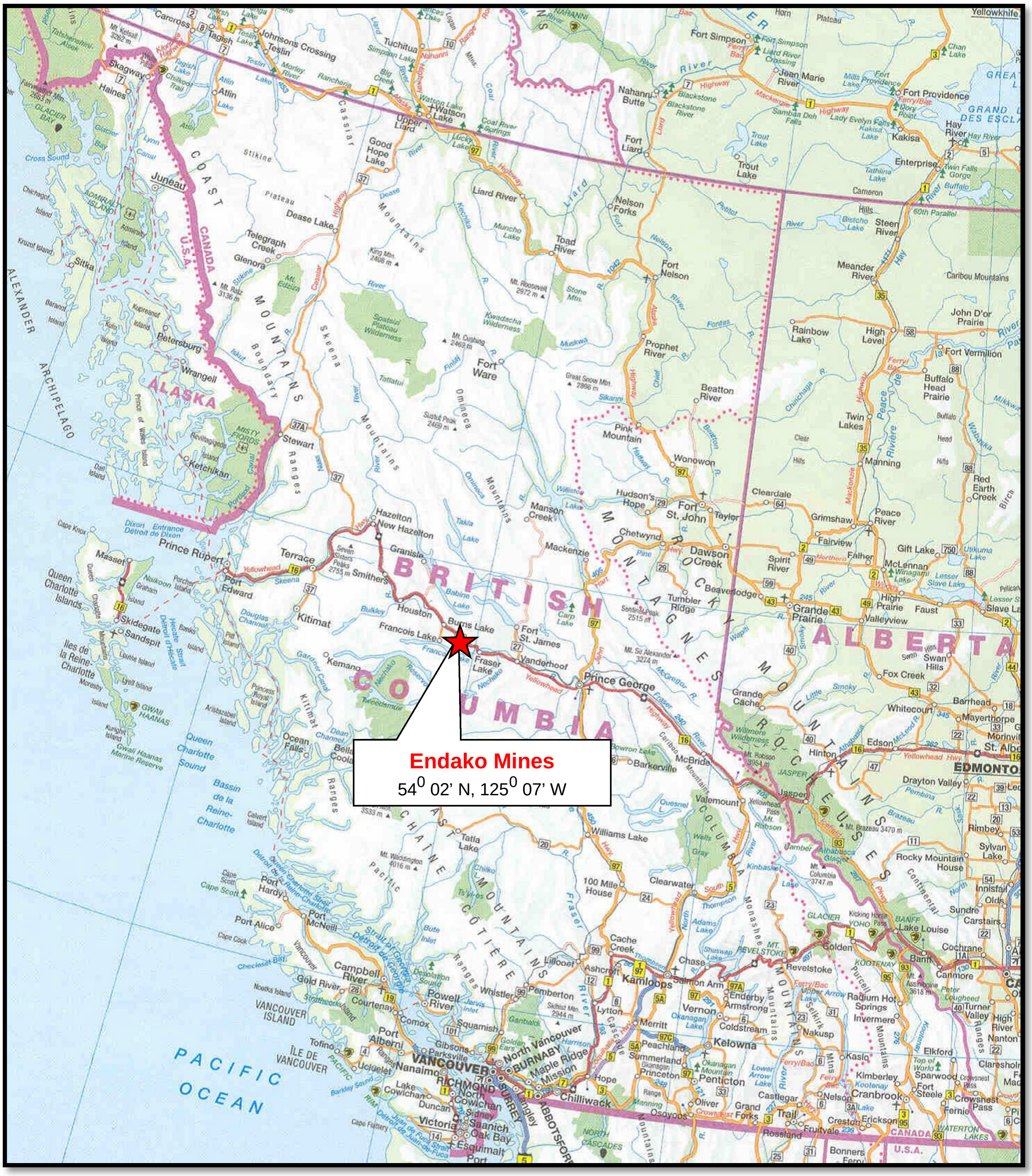


Figure 2 Endako Mine – Land Tenure

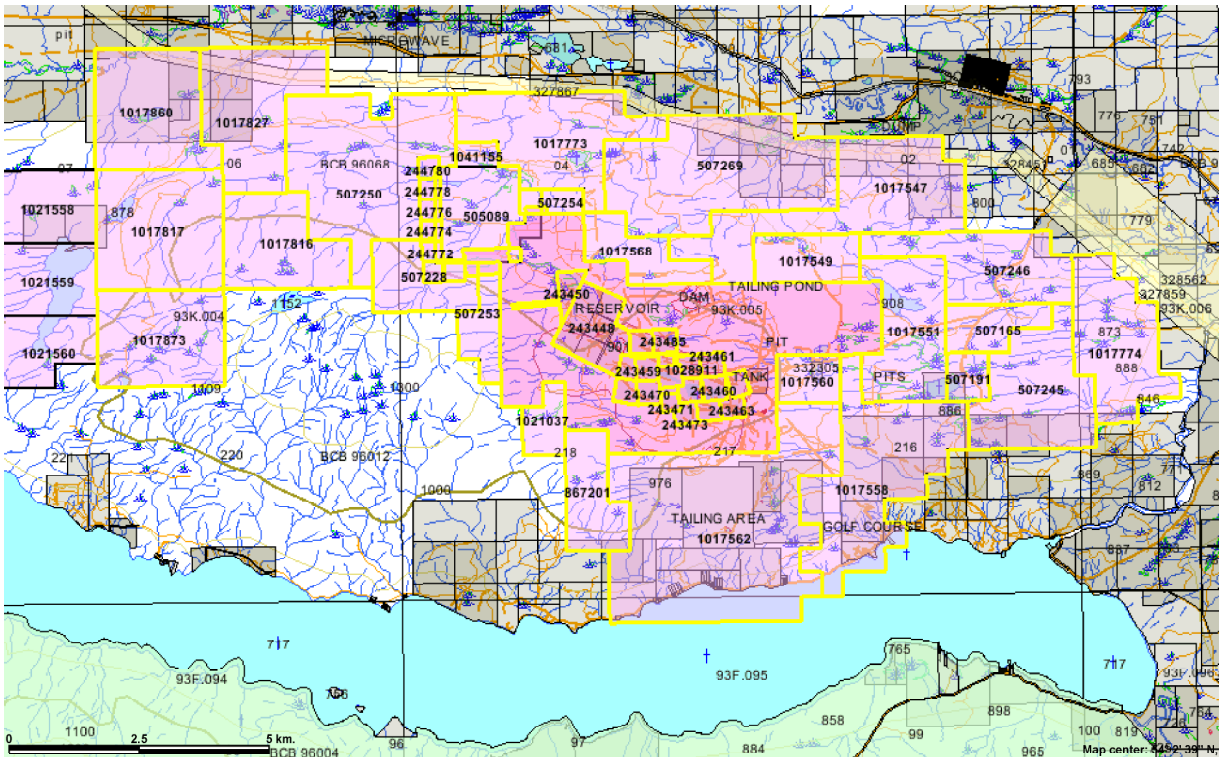
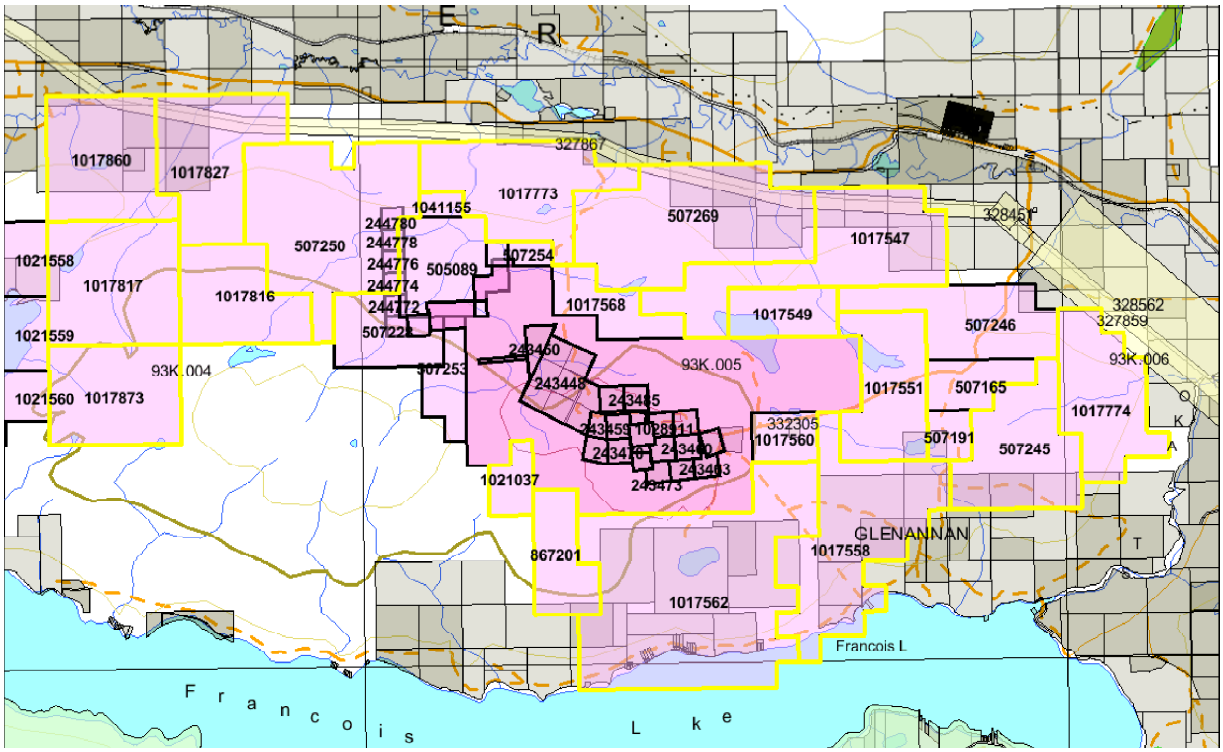


Figure 3 Selected Assessment Tenures



3.0 Field Programs

3.1 Reclamation Assessment

The IEG 2015 Endako field program was conducted June 30th to July 24th. A total of 30 PSPs were installed on reclaimed sites on the Endako mine, and 3 PSPs in adjacent non-mined forests of the SBSdw3 biogeoclimatic subzone. A further 6 PSPs were re-sampled at Endako following the established re-sampling protocol. Figures 4, 5, and 6 show the locations of the 2015 IEG assessment program.

Figure 4 Integral Ecology Group – Sites Visited

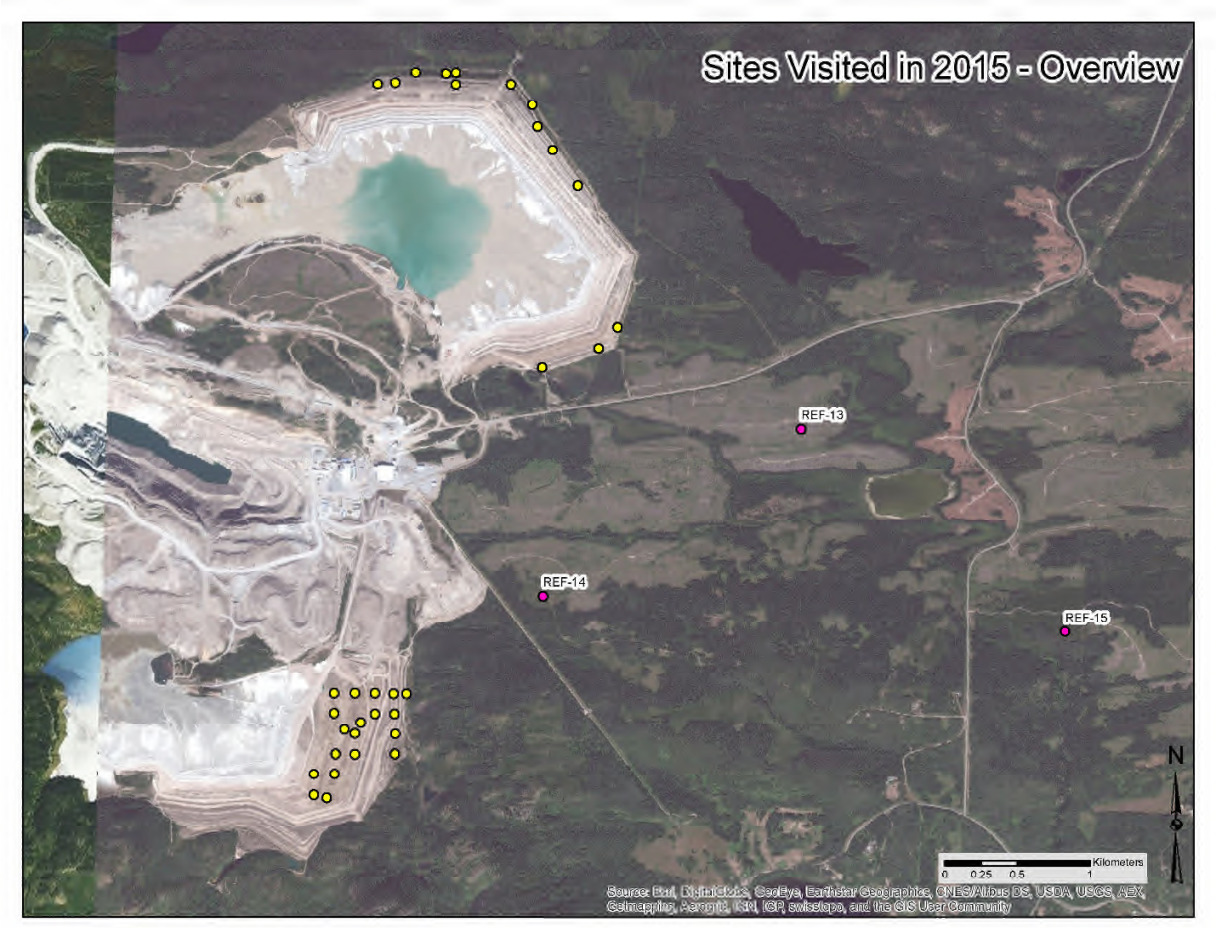
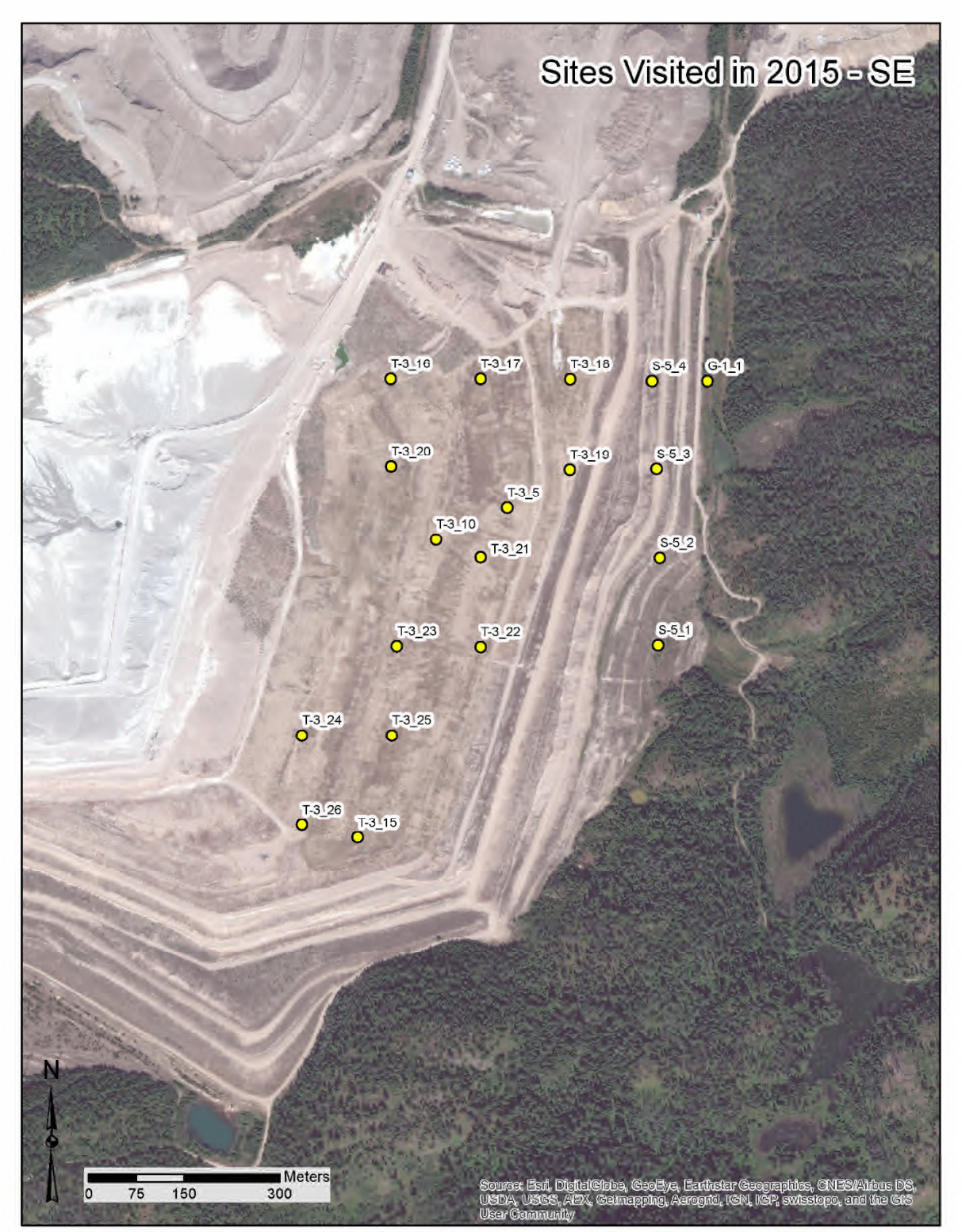


Figure 5 Tailings Pond 1 Detail

Figure 6 Tailings Pond 2 Detail

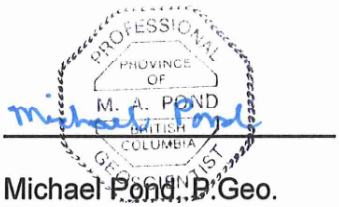


3.2 Hydroseeding

The revegetation of tailings storage facilities (TSF), continued at the Endako site in 2015. From September 21st to 30th, Rick Leffers Contracting conducted hydroseeding of the upper benches of tailings pond 1. Approximately 38 hectares were seeded (Figure 7). Hydroseeding is applied at a rate of 80kg/ha using a custom blended seed mix developed for the Endako Mine site. The composition of the mix is 70% grasses and 30% legumes. Fall rye is applied at a rate of 25kg/ha in addition to the seed mix on the TSF to protect germinating seeds from wind erosion of the sand.

Figure 7 Tailings Pond 1 Hydroseeding Area

Respectfully submitted,



Michael Pond, P.Geo.
Regional Exploration Geologist
Thompson Creek Metals Company Inc.
April 12, 2016

Appendix 1

2015 Reclamation Program (ENDRAS-15 IEG Consulting Group Ltd.)

Endako Mine - 2015 reclamation assessment

PREPARED FOR

Thompson Creek Metals Company Inc. – Endako Mine

PREPARED BY

M. Laidlaw, J. Anderson, T. Baker, & J. Straker, Integral Ecology Group

B. Riordan, FM Environmental Services

March 30, 2016

Project No. ENDRAS-15

Distribution

Endako Mine – e-copy

Integral Ecology Group – e-copy

IEG Integral Ecology Group

1% FOR THE PLANET

March 30, 2016
File: ENDRAS-15

Thompson Creek Metals Company Inc. – Endako Mine
Fraser Lake, B.C.

ATTENTION: KOSTA SAINIS

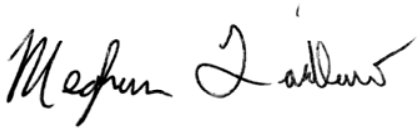
REFERENCE: 2015 RECLAMATION ASSESSMENT AND CRITERIA & INDICATORS FRAMEWORK

Dear Kosta:

Please find following Integral Ecology Group's report on the reclamation assessment in 2015, and a site- and mine-level evaluation of reclamation success based on the criteria & indicators framework proposed in the 2014 report.

We trust this information meets your requirements at this time, and thank you for Integral Ecology Group's continuing involvement in Endako Mines' reclamation program. Should you have any questions or comments on this document, please do not hesitate to contact us at the e-mail or phone number listed below.

Yours sincerely,



Meghan Laidlaw, M.Sc.
Integral Ecology Group Ltd.
Terrestrial Ecologist

mlaidlaw@iegconsulting.com
1 604 992 1652

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EXECUTIVE SUMMARY

Thompson Creek Metals Company Inc.'s Endako Mine (Endako) is a surface molybdenum mine located near the Village of Fraser Lake in central British Columbia. In operation since 1965, Endako moved into Care and Maintenance in July 2015 as a result of weakness in molybdenum prices. In 2013, at the request of Endako and with the support of the B.C. Ministry of Energy and Mines, the Integral Ecology Group (IEG) implemented a program to develop more appropriate "ecosystem-based" criteria for reclamation assessment. The purpose of this program was to provide updated information on reclamation conditions at Endako, and to use this information to support potential revision of reclamation-success criteria and corresponding permit conditions for the mine. A key element of this program is the use of permanent sample plots (PSPs) on both reclaimed and adjacent reference areas, to provide information on local non-mined (reference) conditions and on the convergence of reclaimed ecosystems with these conditions over time.

In 2015, 27 reclaimed plots and 3 reference plots were installed on 8 reclamation sites and 3 references sites. This brought the total number of plots installed between 2013 – 2015 to 78 (62 reclamation and 16 reference plots). In addition, 6 reclaimed plots on 2 reclamation sites were re-sampled in accordance with the re-sampling schedule. This report presents a combined analysis of results from the three study years, and evaluates reclamation success at the reclaimed-site level and at the mine level based on the Criteria and Indicators (C&I) framework proposed in the 2014 report.

Evaluation of the key indicators of reclamation success identified in the C&I framework suggest that 11 of the 18 reclaimed sites (representing 62% of the current reclaimed mine area) meet the requirements for successful reclamation. Of the 7 sites not yet meeting the requirements for reclamation success, 3 sites are classified as non-successful, and 4 sites do not currently meet requirements but are too young for final assessment. Of the 11 successfully reclaimed sites (according to the C&I framework), 6 are 20 years or older. This means that their status would be considered a final evaluation and they do not need to be tested against the C&I framework again.

Reclaimed sites at Endako have a similar range of soil moisture regimes to reference sites, although they tend generally to occupy the drier end of the soil moisture regime spectrum. Native-species richness and cover, and plant diversity is typically lower at reclaimed sites than at reference sites, except in some sites more than 20 years old and younger sites where a surface-soil cover has been used. Most reclaimed sites had total vegetation covers within the natural range of variation. The establishment of closed forest canopy and the development of surface organic-matter layers is currently restricted to a few older reclaimed sites, but these

ecosystem characteristics are expected to develop gradually as sites mature. Three of the four indicators for wildlife utilization have been met, suggesting that reclaimed areas are functioning as wildlife habitat. Medium to high utilization by ungulates on >30 % of the reclaimed mine site area has yet to be achieved. It is expected that this criterion will be met as reclaimed areas develop over time, as is the case with several indicators of mature forest conditions. Wildlife data also show that predators are present, suggesting reclaimed areas support predator-prey relationships.

Based on data collected to date, and the resultant assessment framework, recommendations are presented in this report on best practices for future reclamation at Endako, on remediation options for current under-performing sites, and on improving the assessment process in general. Future reclamation treatments should include where possible the use of surface-soil covers, site preparation (surface micro-topography and use of woody debris), hydroseeding and/or fertilizing when soil covers are not available, planting higher tree densities, and planting dwarf woody species as well as trees at non-covered sites.

The last reclaimed site to have PSPs installed, S-7, is scheduled to be sampled in 2017. The intent of the field program in 2016 is to re-sample PSPs installed on three reclamation areas. We also propose that 9 reference PSPs be added in 2016 to increase the total sampled reference area to 2500 m^2 (25 plots), and further improve our understanding of natural variation across reference site ages and biogeoclimatic subzones.

In 2017, once the full complement of reclaimed PSPs has been installed and the total sampled reference area has been increased to 3000 m^2 (30 PSPs), we recommend a re-evaluation of the C&I framework to ensure that indicators and thresholds reflect the full findings to date from this assessment program.

TABLE OF CONTENTS

. . .

LIST OF FIGURES

LIST OF TABLES

. . .

LIST OF APPENDICES

1. INTRODUCTION

Thompson Creek Metals Company Inc.'s Endako Mine (Endako) is a surface molybdenum mine located in central British Columbia that began operation in 1965. Reclamation of disturbed areas continues at Endako through establishment of ecosystems designed to provide wildlife habitat after mine closure. Results from assessments prior to 2013 indicated that a high proportion of assessed areas did not meet the reclamation-success criteria (e.g., vegetation cover and stem densities) specified in the current reclamation permit, despite having a number of characteristics of diverse and functioning ecosystems.

In 2013, at the request of Endako and with the support of the B.C. Ministry of Energy and Mines, the Integral Ecology Group (IEG) implemented a pilot reclamation-assessment program to develop more appropriate "ecosystem-based" criteria for reclamation assessment. The purpose of this assessment was to provide updated information on reclamation conditions at Endako, and to support potential revision of reclamation-success criteria and corresponding permit conditions for the mine.

In 2014 and 2015, implementation of the initial pilot program was extended, with new sites added in both years. This report presents combined results from all years of assessment (2013-15).

Results from the 2013-14 monitoring program were used to propose a criteria-and-indicators framework for evaluation of reclamation-success, as an alternative to the current reclamation/vegetation permit conditions at Endako. These proposed criteria and indicators were used to evaluate reclamation success of all reclaimed sites established to date, with the intent that criteria and indicators will be comprehensively re-evaluated following completion of the fifth year of sampling in 2017.

2. STUDY APPROACH AND OBJECTIVES

The 2015 program maintains the following key design elements from the 2013 and 2014 reclamation-assessment programs:

- **use of long-term permanent sample plots ("PSPs") –** in order to understand reclamation trajectories (the way reclamation sites change as they develop and age), and thus predict long-term performance, permanent sample plots are required (to the extent possible given changes in mine planning). Some temporary plots may be required from time to time, or on an ongoing basis, to address particular questions, such as planting and regeneration surveys, but a central premise of this program is that a PSP network will form the foundation of reclamation assessment at Endako.
- **use of a "reference-condition approach" –** conditions found in the adjacent environment

("reference conditions") provide information to develop targets for reclamation, and to evaluate its success. A component of the reclamation-assessment program design therefore includes installation of PSPs on reference sites. The reference PSPs installed in 2013 and 2014 ranged from young forests in recently harvested cutblocks to mature forests, in order to provide chronosequence information on how reference site conditions develop over time. The reference PSPs installed in 2015 were primarily regenerating stands under 25 years old, in order to improve our understanding of natural variation among sites that are closer in stand age to reclaimed sites. All reference sites fall within the Sub-boreal Spruce (SBS) biogeoclimatic zone, in either mc2 or dw3 subzones.

- **use of common sampling methods –** the same plot-establishment and sampling methods were used on all sites from 2013-2015. Common sampling and survey methods at all PSPs will facilitate comparisons over time: between reclaimed sites, and of reclaimed sites to reference conditions.

Specific objectives of the 2015 program were to:

1. ensure an evenly-spaced sampling density of 1 plot per 2 ha on reclaimed sites, and a density of no more than 1 plot per 2 ha in non-mined (reference) areas;
2. establish PSPs in all remaining reclaimed site polygons except for S-7, which will be established in 2017;
3. establish PSPs on reference sites that are under 25 years old to increase the representation of younger reference site conditions;
4. re-sample sites according to the sampling protocol established in 2014, wherein reclaimed sites are sampled in years 1, 2, 5, and every 5 years thereafter (until sites are considered successfully reclaimed and their continued sampling would not add to our understanding of reclaimed-site trajectories);
5. provide information on reclamation progress based on data collected from all sampled sites;
6. describe methods and results to allow this program to be reviewed by internal Endako personnel, regulators and other key stakeholders; and
7. use the criteria and indicators framework proposed in 2014 to evaluate reclamation success at the site level and at the mine level, and revise criteria if necessary.

2.1. STUDY TEAM

This project was completed for Kosta Sainis of Endako. The study team consisted of Justin Straker, MSc, PAg (project lead); Jeff Anderson, MSc; Trevor Baker, BSc; and Meghan Laidlaw, MSc of the Integral Ecology Group Ltd. (IEG), and Barb Riordan of FM

Environmental Services. Data analyst Jay Ver Hoef, PhD, supported IEG on statistical analyses. Supporting laboratory analyses were conducted by Pacific Soils Analysis Incorporated (Richmond, B.C.), Maxxam Analytics (Burnaby, B.C.), Caro Analytical Services (Burnaby, B.C.), and the Ministry of Environment (Victoria, B.C.).

2.2. RECLAMATION ASSESSMENT AND STUDY OBJECTIVES

Reclamation assessment is an ongoing process, involving the study and documentation of reclamation-development trajectories over time, and the comparison of reclaimed-site conditions to reference conditions. The overall objective of the proposed 2015 work is to continue to build on the assessment program initiated in 2013.

More specific study objectives are as follows:

1. to assess vegetation, soil and wildlife parameters on reclaimed sites;
2. to measure and observe vegetation, soil and wildlife parameters on reference sites from the adjacent environment to provide information on:
   a. ranges of natural variation; and
   b. thresholds for key indicators; and
3. to evaluate reclamation success using the criteria and indicators identified in the C&I framework.

3. METHODS

3.1. STUDY SITES

A total of 30 PSPs were installed during the 2015 field program: 27 PSPs on reclaimed sites at Endako, and 3 PSPs in adjacent non-mined forests of the SBSdw3 biogeoclimatic subzone. A further 6 PSPs were re-sampled at Endako following the established re-sampling protocol.

3.1.1. Site classification

In this report, reclaimed sites are evaluated on a site-by-site basis (e.g. T-1, S-3), while reference sites are averaged by age range (0-5 years, 6-10 years, 11-20 years and 21+ years). For some analyses, reclaimed sites are grouped according to waste material type (tailings sand – TS; waste rock – WR) and/or presence or absence of a soil cover (cover present – YC; cover absent – NC). Reference sites include sites in two SBS subzones/variants: the Dry Warm Stuart subzone/variant (SBSdw3) and the Moist Cold Babine subzone/variant (SBSmc2).

3.1.2. Plot selection

Reference plot selection was influenced by proximity to Endako, accessibility, and state of forest regeneration. To select reference site PSP locations and ensure a sampling density of no more than 1 plot per 2 hectares, a grid of 140 m x 140 m cells, each containing a centroid, was superimposed on a map of the mine and surrounding area. Forestry maps were used to identify 1 – 25-year-old cut blocks in the area surrounding the mine, and all centroids that fell within these blocks were assigned a number. A random number generator was then used to determine the order in which we would attempt to reach each centroid, with the intent of establishing new PSPs at the first 3 centroids that were accessible by road. Centroids that were greater than 500 m from a road were skipped. In 2014, reference sites were selected to represent a range of forest ages, in order to understand developmental trajectories of reference sites. In 2015, regenerating forest stands under 25 years old were selected in order to increase our understanding of natural variation among sites that are closer in stand age to reclaimed sites.

Reclaimed site PSP locations were selected using the same 140 m x 140 m cell grid used to select reference PSP locations. Reclaimed PSPs were established at centroids that fell within reclaimed site polygons that were to be sampled in 2015, provided that the centroid was at least 10 m from the polygon perimeter, did not fall on a road, and contained only one type of polygon or ecosystem type. If centroids did not meet these conditions, they were moved to a different location within the same grid cell where these conditions were met, and if this was not possible, they were not installed.

Table 3-1 provides a summary of site characteristics and plot counts for all sites sampled since 2013. Maps of each reclamation area with plot locations are provided in Appendix A; plot coordinates are provided in Appendix B.

3.1.3. Site ages

Ages for reclamation sites were determined by the date reclamation work was completed, provided by Endako; ages for reference sites were determined by aging tree species by increment core, with the site age determined to be equal to the age of the oldest aged tree that was representative of stand, excluding remnant trees that had survived the last stand-regenerating disturbance. For reference sites where trees were too small to age, whorl counts were used to estimate age (this method was used for REF-1, REF-2, REF-3, REF-9, REF-10, and REF-13).

Table 3-1. Characteristics of reclamation and reference sites surveyed at and near Endako from 2013-2015.

Site	# of plots (2013)	# of plots (2014)	# of plots (2015)	Total plots sampled	Polygon size (ha)	Year est.	Sampling age[1]	Treatment	Operational group	Slope (deg)	Aspect (deg)	Elev. (m.asl)	Hydro seeded?	Tree species planted	Location	Other site details
F-1	3	0	3	3	6.36	2005	8	reclamation	Tailings/ No Cover	0-5	0-340	934	yes	Pl, Fd	North Dam, TP1	bench and slope section
F-2	0	0	3	3	4.87	2005	10	reclamation	Tailings/ No Cover	2-27	44-54		yes	Fd	North Dam, TP1	wood-fibre mulch crust
F-3	0	0	1	1	2.86	1995	20	reclamation	Tailings/ No Cover	31	102		yes	Pl, Fd	1A Dam, TP1	wood-fibre mulch crust
F-4	2	0	0	2	4.12	1993	20	reclamation	Tailings/ No Cover	9-10	12-208	935	yes	Pl, Fd	South Dam, TP2	bench and slope section
G-1	0	0	1	1	1.64	1990	25	reclamation	Tailings/ Cover	5	102	651	no	Pl	toe of East Dam, TP2	cover includes coarse material from a dyke, natural regeneration
G-2	3	2	0	5	9.47	1993	21	reclamation	Tailings/ No Cover	0-16	0-186	962	yes	Pl, Fd	Saddle Dam, TP2	bench and slope section
R-1	1	0	0	1	2.38	2001	12	reclamation	Waste Rock/ No Cover	26	340	1024	yes	Pb	North WR Dump slope	Green alder, willow, rose and soopalallie also planted
R-2	2	0	0	2	4.71	1998	15	reclamation	Waste Rock/ Topsoil	16-36	320-322	1002	yes	Pl, Sw, Pb, Act	Pit shop WR Dump slope	Green alder, willow, rose and soopalallie also planted
S-1	0	0	4	4	7.86	1990	25	reclamation	Tailings/ No Cover	20-34	0 to 46	901-917	no	Pl, Sx, Lt, Act	North Dam, TP1, slope above toe of dam	seeded (by hand or by tractor)
S-2	3	3	0	6	12.43	1998	16	reclamation	Tailings/ Topsoil	3-8	0-206	943	no	Pl, Sw, Fd, Pb, Act	North Dam, TP1	Bearberry and rose also planted, natural regeneration.
S-3	0	0	2	2	3.36	1995	20	reclamation	Tailings/ No Cover	16-25	128-156	923-929	yes	Pl, Fd	1A Dam, TP1, slope above bottom road	
S-4	2	0	0	2	4.32	1986	27	reclamation	Waste Rock/ Topsoil	0-3	0-282	1045	no	Pl	North WR Dump Surface	waste rock dump surface, seeded (by hand or by tractor)
S-5	0	0	4	4	6.00	1990	25	reclamation	Tailings/ No Cover	2-35	82-128	940-980	yes	Pl, Fd	East Dam, TP2, middle bench	wood-fibre mulch crust
S-6	3	0	0	3	6.42	1999	14	reclamation	Tailings/ Topsoil	0-5	0	976	no	Pl, Fd, Pb, Act	South Dam, TP2	natural regeneration
S-1w[2]	0	0	0	1	1.97	1990	25	reclamation	Tailings/ No Cover	14	44	901	no	---	North Dam, TP1, toe of dam	No trees, seepage area, within S-1 polygon but very different
T-1	0	3	0	3	5.57	2012	2	reclamation	Tailings/ Topsoil	0-25	0-344	949-974	no	---	North Dam, TP1	large coarse materials
T-2	3	2	0	5	10.20	2008	5	reclamation	Tailings/ Topsoil	7-23	132-326	944	no	Fd	1A Dam, TP1	natural regeneration
T-3	3	0	14	14	29.23	2010	5	reclamation	Tailings/ Topsoil	2-15	73-96	999	no	Fd	East Dam, TP2	natural regeneration
REF-1	1	0	0	1	NA	NA	2	reference	SBSdw3	1-10	85-276	913	n/a	Pl	cut block east of mine	forest regen., near Endako Mine Rd,

[1] Although reference sites have been established for an indefinite amount of time, the age of each site in the reference condition was determined to be equal to the age of the oldest tree that was representative of stand age.
[2] a PSP within the S-1 polygon that represented a different ecosystem type due to shallow seepage, therefore analyzed as a separate polygon

Site	# of plots (2013)	# of plots (2014)	# of plots (2015)	Total plots sampled	Polygon size (ha)	Year est.	Sampling age[1]	Treatment	Operational group	Slope (deg)	Aspect (deg)	Elev. (m.asl)	Hydro seeded?	Tree species planted	Location	Other site details
																Sxw may also have been planted
REF-2	1	1	0	2	NA	NA	5	reference	SBSdw3	3-4	85-132	906-917	n/a	Pl	cut block east of mine, south of mine road	forest regen., near Endako Mine Rd, Sxw may also have been planted
REF-3	1	0	0	1	NA	NA	2	reference	SBSdw3	10	244	893	n/a	Pl, Sxw	cut block east of mine	forest regen., near Endako Mine Rd
REF-4	0	1	0	1	NA	NA	29	reference	SBSmc2	5	221	1004	n/a	Unknown	remnant stand W of TPI and E of north dump	forest regen., near Endako, old cut block
REF-5	0	1	0	1	NA	NA	36	reference	SBSmc2	4	18	965	n/a	Unknown	remnant stand west of TPI, east of North dump	forest regen., near Endako, old cut block
REF-6	0	1	0	1	NA	NA	103	reference	SBSdw3	2	52	932	n/a	Unknown	stand east of TP2 off FW 1 Line road	forest regen., near Endako
REF-7	0	1	0	1	NA	NA	27	reference	SBSdw3	18	154	937	n/a	Unknown	south of saddle dam TP2	forest regen., near Endako, cut block
REF-8	0	1	0	1	NA	NA	19	reference	SBSdw3	2	354	848	n/a	Unknown	cut block east of mine	forest regen., near Endako
REF-9	0	1	0	1	NA	NA	4	reference	SBSdw3	3	18	884	n/a	---	cut block east of mine	natural regen., near Endako
REF-10	0	1	0	1	NA	NA	3	reference	SBSdw3	1	320	896	n/a	---	cut block on west side of Glennan Rd	forest regen., near Endako, possibly not planted
REF-11	0	1	0	1	NA	NA	30	reference	SBSmc2	3	6	1014	n/a	Unknown	West of TP1	forest regen., near Endako, old cut block
REF-12	0	1	0	1	NA	NA	46	reference	SBSdw3	10	148	916	n/a	Unknown	old stand east of #2 pump house	forest regen., near Endako
REF-13	0	0	1	1	NA	NA	6	reference	SBSdw3	3	170	896	n/a	Pl	cut block east of mine, south of Endako Rd	forest regen., near Endako Mine Rd
REF-14	0	0	1	1	NA	NA	15	reference	SBSdw3	5	130	950	n/a	Unknown	off of old logging road on N side of Quartz Rd	forest regen., near Endako Mine Rd
REF-15	0	0	1	1	NA	NA	22	reference	SBSdw3	2	164	900	n/a	Unknown	150 m off logging road east of Glennan Rd.	forest regen., near Endako Mine Rd, old cut block

3.2. SITE DESCRIPTIONS AND PLOT INSTALLATION

Site descriptions were based on the *Field Manual for Describing Terrestrial Ecosystems 2nd Edition* (BCMFR/BCMOE, 2010), with some modifications, and additional data collected in order to fulfill the sampling design and project objectives. Site descriptions were performed at each PSP.

A PSP is a circular plot with a radius of 5.64 m (centre plot, in green), as shown in Figure 3-1. The PSP constitutes the primary sampling unit for each sampling location. An aluminium plot marker, stamped with project and unique plot identification details, was installed at the geographic coordinates that correspond to the centre-point of each PSP. At each PSP, data was collected as discussed below.

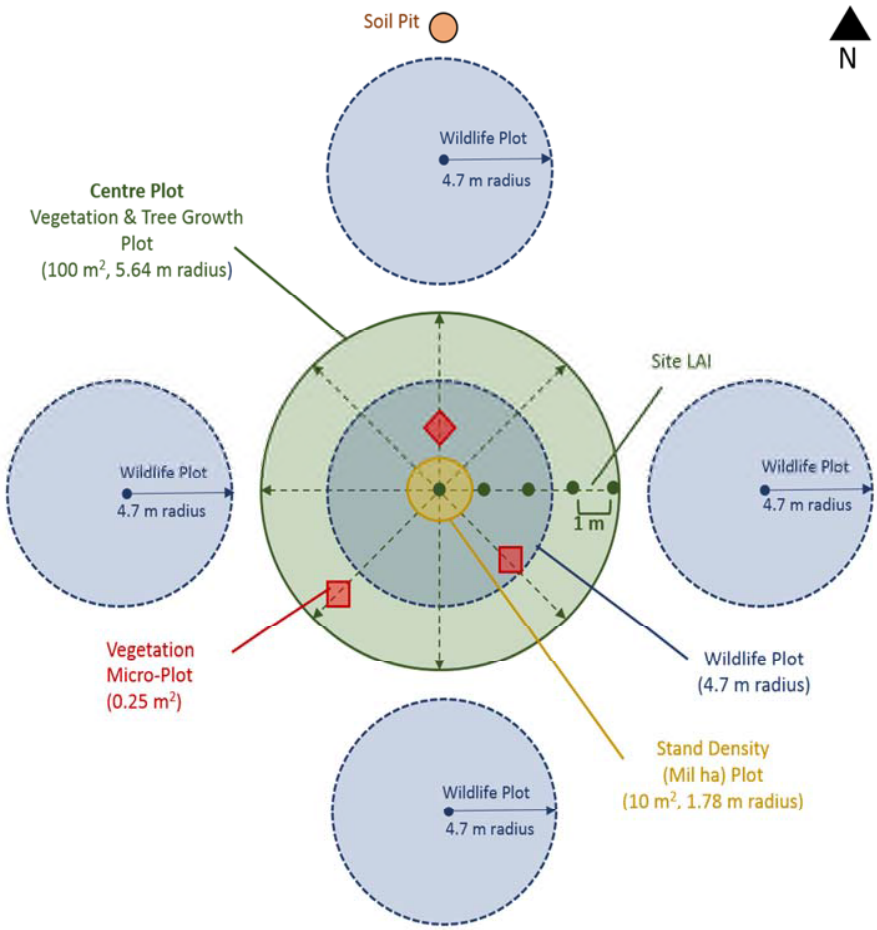


Figure 3-1. Permanent Sample Plot (PSP) layout.

3.3. DATA COLLECTION

3.3.1. Soil[3]

Soil survey and sampling consisted of description of layers/horizons, with a focus on noting accumulation and characteristics of organic (litter) layers, and collection of soil samples from the 0-20-cm and 20-50-cm layers.

Soil profile descriptions

Soil pits were excavated to a depth of 50 cm for the purposes of profile description and sample collection of the surface layer. Soil profiles were characterized using the *Field Manual for Describing Terrestrial Ecosystems 2nd Edition* (BCMFR/BCMOE, 2010). On reference sites, soils were described by horizon. On reclaimed sites where differentiation of horizons had not yet occurred, substrates were described using layer-based designations, following precedent for characterizing reclamation soils in western Canada (Alberta Environment's Land Capability Classification System for Forest Ecosystems in the Oil Sands, 2006), with the 0-20-cm layer designated as the "topsoil" or "TS" layer, and the 20-50-cm layer designated the "upper subsoil" or "US" layer. A photo was taken of each soil profile.

In the field, the distribution of particles greater than 10 cm was visually estimated for each horizon or layer, and the distribution of particles between 4.75 mm - 10 cm was determined using a custom-made coarse-sized sieve and hand scale. A subsample of sieved soil under 4.75 mm in diameter was taken from each horizon or layer for further lab analysis. In the event of extremely wet field conditions, PSD measurements were ineffective and a large soil sample was taken to determine PSD for particles under 10-cm in diameter in the lab.

Laboratory analyses

Samples were stored in coolers with ice, and refrigerators before being sent to Pacific Soils Analysis Inc. (PSAI) (Richmond, BC) for sample preparation and analytical testing. The following soil properties were analyzed: pH, electrical conductivity, organic matter content, available phosphorus, nitrate, ammonium, and particle-size distribution under 4.75 mm in diameter.

3.3.2. Vegetation community composition

Within the PSP, the presence and abundance of all vegetation species (vascular and non-vascular) was visually estimated as percent cover (0-100%).

[3]The term "soil" is used to describe the surficial/rooting-zone materials included in this program component, but many of these materials are mine wastes, and technically not soils.

3.3.3. Leaf-area index (LAI)

Leaf-area index (LAI) is a measure of plant leaf area (and, by extension, of photosynthetic capacity and evaporative demand), which was measured using a LI-COR LAI-2200 Plant Canopy Analyzer that calculates LAI based on the differences between light readings taken with no plant canopy ('above' readings) and readings taken beneath the plant canopy ('below' readings).

Above-canopy readings were taken in the nearest possible location to the plot without plant canopy in view, and were repeated frequently during the process of collecting below-canopy readings, at least 8 times per plot. The LAI of each centre plot was measured with 40 'below' readings taken just above ground-level in eight radial transects spaced evenly around the plot, with 5 readings per transect at 1 to 5 metres from the plot centre. Appropriate view caps were used for all measurements to obscure the operator and direct sunlight. When necessitated by the presence of trees, 'above' measurements were made using a second sensor on a tripod positioned in the nearest clearing, while at other sites 'above' and 'below' measurements were made with the same sensor. At sites with a distinct tree canopy, understory LAI was calculated by the difference between measurements made at ground level and those made just above the vast majority of understory vegetation, with the former measurement representing total LAI and the latter measurement representing canopy LAI.

3.3.4. Forest stand characterization

On forested sites, including reference stands, overstories were characterized using standard mensuration techniques (stem density, growth parameters) for individuals that met tagging limits. Conifers were tagged and measured for height and diameter at breast height (dbh, 1.3 m) if greater than 0.3 m in height; deciduous trees were tagged and measured if greater than 1.3 m in height. Conifer foliar tissue was collected for analysis of nutrient status, as per Ballard and Carter (1986). Tree condition (healthy, unhealthy) was also recorded. Site trees (the largest-dbh tagged tree meeting selection criteria with dominant or co-dominant canopy position, no severe damage, no evidence of suppression, healthy, etc.) were cored and core samples were kept in a cool location until they could be sent to the UBC tree ring lab for ring count analysis.

3.3.5. Vegetation tissue sampling

A composite foliar sample was collected from current annual growth of the dominant trees species at each site (excluding the site tree), with samples taken from at least three individuals. Where two species were co-dominant, both were sampled. Collection methods followed those outlined by Ballard and Carter (1986). Nitrile gloves were used for collection

and samples were placed in sealed bags and chilled before being shipped to PSAI for nutrient analysis of unwashed material.

For chemical analysis of forage species, species were selected for sampling that appeared to be the preferred forage type. This forage material consisted of alfalfa, milk-vetch, rose, fireweed, strawberry, and willow on reclaimed sites, and willow, rose, green alder, and lodgepole pine on reference sites. Nitrile gloves were used for collection and samples were placed in sealed bags and chilled before being shipped to Caro Analytical Services for element analysis of unwashed material.

3.3.6. Wildlife

The objective of the wildlife monitoring program is to measure and compare wildlife utilization in the reclaimed sites with that in the reference sites. The results will determine if the reclaimed sites are providing animals with the habitat requisites such as foraging, cover and home sites that are provided in the reference sites.

Within-site habitat use

Five nested wildlife subplots consisting of a centre subplot and four additional subplots were superimposed on the vegetation plots (Figure 3-1). Each subplot had an area of 70 m^2 (radius of 4.7 m) (Luttmerding et al. 1990). Pellet groups, observations of browsing, and nests or burrows were tallied by species in each subplot and summed to get a plot total. Indirect signs of use (i.e., tracks, trails, and sightings) were also recorded. Pellet group counts, browsing counts, and observations of nests or burrows for each species category (identified in the C&I framework) were determined per hectare for each site, and this data was used to map wildlife usage across the mine site.

3.4. DATA ANALYSES

3.4.1. Available water-storage capacity (AWSC) and estimation of soil moisture regime

Available water storage capacity (AWSC) of surficial materials was calculated based on particle-size distribution data using the mechanistic model of Arya and Paris (1981). Fine-fraction (< 2 mm) bulk density data for this model was estimated based on texture classes (Saxton, 2005), with 10% increases applied to any layers in which compaction was observed during sampling. Whole-soil bulk density was calculated inclusive of coarse fragments (> 2 mm) using our assumed particle density value of 2700 kg/m^3 for all mineral materials. AWSC for each sample was calculated from its water-retention curve output using the difference in volumetric water contents between a field capacity tension determined from curve inflections

and a standard permanent wilting point of 1500 kPa. The increase in AWSC caused by layering fine materials over coarse materials was accounted for, where applicable, by applying the model of Clothier at al. (1977) to these water-retention curves using field capacity tensions for each layered material determined as described above. The relative benefit of organic matter content to the AWSC of each sample was computed using the model of Saxton and Rawls (2006) and applied to the Arya and Paris model results. These AWSC calculations were performed for every sampled layer and depth-weighted for each profile to produce a single value representing the upper metre of soil, to which the estimated AWSC of any accumulated organic material above the soil surface was added.

AWSC and topographic information (slope and aspect) were used to estimate Soil Moisture Regime corresponding to the B.C. Biogeoclimatic Ecosystem Classification (BEC) hygrotope (Pojar et al., 1985). In the British Columbia BEC system, the topographic effect on energy is recognized through "warm" and "cool" site modifiers. These modifiers are applied to slope angles >25% (14°), with warm aspects being southerly or westerly (135°-285°), and cool aspects being northerly to easterly (285°-135°; Resources Inventory Committee, 1998). The concepts behind this approach were adapted to the current classification system by using modelled solar radiation differences across slope and aspect gradients to produce modifiers (additions or deductions) to the PSD-derived AWSC estimate. Short-wave radiation was calculated for different slope, aspects and latitudes as the sum of the direct- and diffuse-beam component. The theoretical direct-beam component of solar radiation was determined after Garnier and Ohmura (1968, 1970). Diffuse clear-sky radiation was calculated assuming a standard atmosphere after Iqbal (1983). These modelled values were then converted to percentage additions or deductions to AWSC (Table 3-2) by treating values above the mean as deductions and values below the mean as additions, with the magnitude of the modifier for each slope-aspect position calculated by the percent difference of its solar radiation from the mean radiation for all slopes and aspects at this latitude. These modifiers are not intended to imply actual reductions or additions to AWSC on different slopes and aspects, but are intended as surrogate modifier to AWSC based on increased or decreased evapotranspirative demand driven by varying energy regimes.

Table 3-2. AWSC energy modifiers.

Energy class	Class definition	AWSC modifier
Neutral	Slopes <10°[4]	none, 0
Warm	Slope >10°; aspects ~080-280°[4]	Calculated AWSC minus 0-22%[5]
Cool	Slope >10°; aspects ~280°-080°[4]	Calculated AWSC plus 0-37%

Adjusted AWSC values were used to determine Soil Moisture Regime, as outlined in Table 3-3. This table uses the SMR classes of the BEC potential hygrotope, but replaces the relative ranking of various criteria with quantified ranges of adjusted AWSC. AWSC ranges for each SMR class are modified from the oil-sands reclamation land-capability classification (Alberta Environment, 2006). Note that these moisture regimes are intended to reflect dominant soil-water conditions over a multi-year period, consistent with the B.C. BEC-system hygrotope. The AWSC method for SMR determination applies only to upland (very xeric – mesic) SMRs, as wetter SMRs require input of seepage water or the presence of a water table within 100 cm of the soil surface, and are not dependent on soil storage. Thus determination of SMRs wetter than mesic in this system is based on observations of shallow groundwater seepage and/or the presence of a water table within the top 1 m of surficial materials.

All sites in this study but one are subxeric or drier, with no evidence of seepage or water-table influences within the surface 1 m. One site (S-1w) has been presented as a clear outlier; it is receiving considerable process-effected water, which is sufficient to cause seepage. Site S-1w is subhygric, and is presented separately throughout the results.

[4] Specific classification depends on slope/aspect combination – some slopes >10° have neutral aspects, and aspects may vary between warm and cool classifications depending on slope.
[5] Modifier values depend on specific slope and aspect, where the maximum value for warm slopes occurs at slope angles of 25° and aspects of 170-190°, and maximum value for cool slopes occurs at slope angles of 35° and aspects of 350-010°.

Table 3-3. Determination of SMR from adjusted AWSC.

SMR	Primary water source	Water-table depth (cm below ground surface)	Available water storage, surface 1 m (mm)
Very Xeric (0)	Precipitation and soil storage	>100	<55
Xeric (1)	Precipitation and soil storage	>100	55-84
Subxeric (2)	Precipitation and soil storage	>100	85-114
Submesic (3)	Precipitation and soil storage	>100	115-144
Mesic (4)	Precipitation and soil storage	>100	>145
Subhygric (5)	Precipitation and seepage	>100	>145, seepage contributes to supply
Hygric (6)	Seepage	30-100	n/a
Subhydric (7)	Seepage or permanent water table	0-30	n/a
Hydric (8)	Permanent water table	Water table permanently at or above soil surface	n/a

3.4.2. Shannon diversity index (SDI)

The SDI is an index that accounts for the number of species observed, the abundance of these species, and the evenness of abundance (cover) distributions between species. The SDI was calculated using a Microsoft Excel routine developed by the University of Reading[6], based on the following formula:

$H' = -\Sigma p_i \ln p_i$

where H' is the SDI; and $p_i = n_i/N$, where n_i is the abundance of the ith species, and N is the total abundance of all species (Magurran, 2004).

3.5. EVALUATION OF RECLAMATION SUCCESS CRITERIA AND INDICATORS

In 2014, following an analysis of reference site data collected in 2013-2014, a suite of criteria, indicators, and associated parameters were proposed for use in formal assessment of reclamation at Endako. One objective of the 2015 work is to evaluate reclamation success on a site-by-site basis using site-level indicators, and across the total reclaimed area using mine-level indicators. A review of the criteria and indicators (C&I) hierarchical structure can be found in Appendix D, and is summarized in Table 3-4. Criteria and indicators are numbered

[6] http://www.reading.ac.uk/ssc/n/software/diversity/Diversity.html

to facilitate tracking through the report.

Table 3-4. Upper hierarchy of an ecosystem-based C&I framework of reclamation success at Endako.

Goal	Lands disturbed by mining at Endako are returned to their pre-disturbance land use of wildlife habitat		
Objectives	Reclaimed land has pre-disturbance capability, similar to adjacent non-mine ecosystems		Reclaimed land has wildlife utilization similar to that observed in adjacent non-mine ecosystems
Criteria	1 - Biological diversity	2 - Ecosystem function	3 - Wildlife utilization
Indicators	1.1 - Ecosystem Diversity	2.1 - Native vascular-vegetation functional groups	3.1 - Medium-high ungulate activity observed
	1.1.1 - Range of Soil Moisture Regimes observed	2.2 - Total vegetation cover	3.2 - Predator activity observed
	1.2 - Species Diversity	2.3 - Forest stands established	3.3 - Utilization by red squirrel observed
	1.2.1 - Shannon Diversity Index (SDI)	2.4 - Soil organic-horizon depth	3.4 - Utilization by birds of prey observed
	1.2.2 - Cover of native vegetation species		3.5 - Utilization by snowshoe hare observed
	1.2.3 - Number of native vegetation species		
Core indicator[7]			
Supporting indicator[8]			

It was proposed that all sites be tested against the C&I framework at ages 10 and 20 years following reclamation and revegetation. The final evaluation of reclamation success for each site would be based on the second assessment, and for the mine-level indicators, would be determined once reclamation is complete and the youngest sites have reached an age of 20 years. At this time, all sites that have been sampled to date are included in the evaluation to provide greater understanding of reclamation performance across the mine site and to identify under-performing sites early for potential remedial treatment.

Minor revisions were made to the indicator assessment process proposed in 2014:

- Indicator 1.2.1 was revised for greater clarity and objectivity. The previous measure – convergence of reclaimed sites on a diversity-richness plot with reference sites – proved

[7] Core indicators are mandatory indicators that will be used to assess reclamation success in the proposed C&I framework.
[8] Supporting indicators will not be used to formally assess reclamation success, but to provide added understanding of reclamation developmental trajectories.

to be too subjective and difficult to interpret. The revised indicator is based on the range of natural variation (RNV) in Shannon Diversity Index (SDI) observed in reference areas. This indicator was subsequently added to the site-level evaluation criteria; as such the threshold for success becomes at least three of five criteria, rather than two of four.

- For all indicators that are based upon RNV, assessment is now based on RNV observed on reference sites of a comparable age range, as opposed to RNV from all reference sites. This more specific comparison within similar age ranges is a more valid comparison between reclaimed and reference sites.
- Ungulate utilization categories were altered slightly to better reflect the ranges of utilization observed on reference sites, including the three sites added in 2015.

Measures, methods, and standards corresponding to the proposed indicators are presented in Table 3-5. The results presented in this report follow a similar order. Site characteristics that were measured at study sites but not included in the indicators framework are presented at the end of the results section.

Table 3-5. Measures, methods and thresholds for the Endako C&I framework

Indicators	1.1.1 SMR	1.2.1 Shannon Diversity Index (SDI)	1.2.2 Native cover	1.2.3 Native richness		2.1 Functional groups		2.2 Total cover	2.3 Forest stands	2.4 Soil organics depth	3.1 Ungulate activity	3.2 Predator activity	3.3 Red squirrel use	3.4 Birds of prey use	3.5 Snowshoe hare use
Measure	Estimate energy-corrected AWSC	Mean values per site	Mean values (%) per site	Mean values (n) per site	Values (n) observed across the mine	Mean values (n) native vascular per site, and across the mine		Mean values (%) per site	Mean stems per ha per site	Depth (cm)	Level of activity per site	Presence of use per site	Observed on the mine site	Observed on the mine site	Observed on the mine site
Method[9]	Sections 3.3.1, 3.4.1	Sections 3.3.2, 3.4.3	Section 3.3.2	Section 3.3.2	Section 3.3.2	Section 3.3.2		Section 3.3.2	Section 3.3.4	Section 3.3.1	Section 3.3.6	Section 3.3.6	Section 3.3.6	Section 3.3.6	Section 3.3.6
Threshold[10]	Same range as RNV	Presence within RNV	≥30%	≥10	≥75	≥3, 1 woody	90% of assessed areas ≥4, 1 woody	Presence within RNV	≥1000 sph on 33% of reclaimed area	Trend only	Medium-high ungulate activity on ≥30% of sites, ≤25% of sites with no activity	≥25%	Presence	Presence	Presence
Trend[11]	N	N	Stability or increase	Stability or increase	Stability or increase	Stability	Stability	Stability or increase	N	Trajectory towards RNV	N	N	N	N	N

[9] Methods specific to each measure are listed in the table. General methods on plot selection and layout (Sections 3.1.2, 3.2) also apply to all indicators.
[10] The quantified value identified using reference conditions that determines whether or not desired outcomes are being achieved for each indicator.
[11] Indicates whether there is a temporal component to assessment, where "N" indicates no need for assessment of temporal trends.

4. RESULTS

There are two ways we intend to interpret the results of this reclamation monitoring program:

1. **Comparison of reclamation to reference conditions** – measurements on reference sites provide data that define:
   - **Ranges of natural variation (RNV)** – two standard deviations above and below the reference means of four site age-ranges (0-5 years, 6-10 years, 11-20 years, and 21+ years).
   - **Thresholds** – the lower limit of RNV for all reference sites (two standard deviations below the reference mean), based on the data collected when these indicators were initially proposed in 2014.

   By comparing data from reclaimed sites to RNV and reference thresholds, we can gain an understanding of the degree of similarity between reclaimed sites and surrounding ecosystems, and identify whether reclaimed sites are meeting the minimum limits measured in reference ecosystems. Both RNV and thresholds are used as indicators in the C&I framework, depending on which variable of interest is being evaluated.
2. **Comparison over time** – as reclaimed sites are relatively young (<30 years old) and are undergoing assisted primary succession following severe disturbance, we would anticipate that many values for variables of interest will not currently fall within RNV defined by reference conditions. In these cases, our interest may be primarily in trend data: that is, whether reclaimed sites, regardless of initial differences from reference sites, are becoming more similar to reference conditions over time. In order to assess these trajectories, we will require multiple sampling events (at least 2) on permanent sample plots at reclaimed sites.

Our ability to compare sites over time is limited because reclaimed and reference sites are still being installed, and only two reclaimed sites have been re-sampled so far. Thus the focus of data interpretation at this time is the first of the above methods.

4.1. INTERPRETATION OF FIGURES

Most figures in this report are presented in a similar format, as demonstrated in Figure 4-1. Blue bars represent reclaimed site means ± standard error of the mean, in increasing order from youngest to oldest. Reference site data is averaged by age-range, and these means are presented as green bars on the right of each age-range section. This method of presenting sites facilitates the use of a chronosequence approach to provide some indication of developmental trends over time, as well as allowing direct comparison between reclaimed

sites and reference sites within the same age-range. When RNV is used as an indicator, extended error bars with wide bar caps represent the upper and lower limits of RNV, and when thresholds are used as an indicator, a solid red line is used.

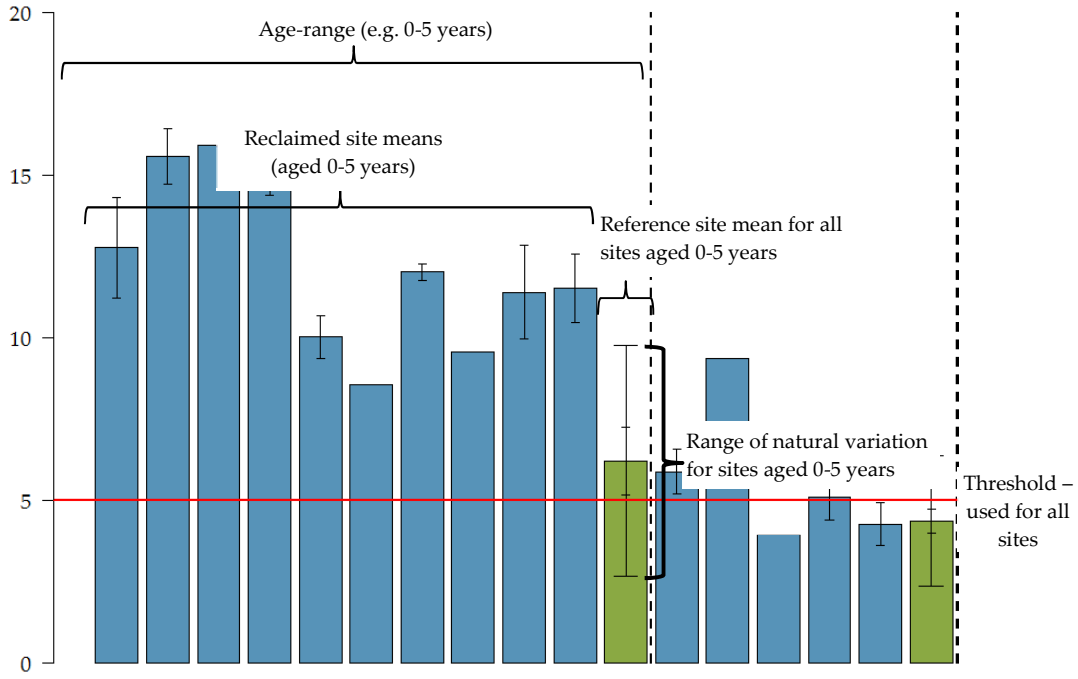


Figure 4-1. An example of how data is typically presented in this report.

4.2. BIOLOGICAL DIVERSITY INDICATORS

4.2.1. Soil moisture regime (SMR) distribution (Ind. 1.1.1)

The distribution of reclaimed and reference sites among SMRs is presented in Figure 4-2. For both reference and reclaimed sites, this distribution is heavily skewed towards drier SMRs. One reclaimed site, where seepage is contributing to a high surface water content, falls into the subhydric category.

The presence of a range of SMRs at reclaimed sites that is similar to the range of SMRs at reference sites was identified as key indicator of ecosystem diversity in the C&I framework. As Figure 4-2 illustrates, the majority of both reclaimed and reference sites lie on the dry end of the soil moisture regime spectrum. However, the range of reference site SMRs extends into slightly wetter moisture regimes, whereas the range of reclaimed site SMRs is restricted to the driest regime. Therefore, the distribution of sites among SMRs is similar between reclaimed and reference sites, but the full range of reference SMRs is not represented in the reclamation area.

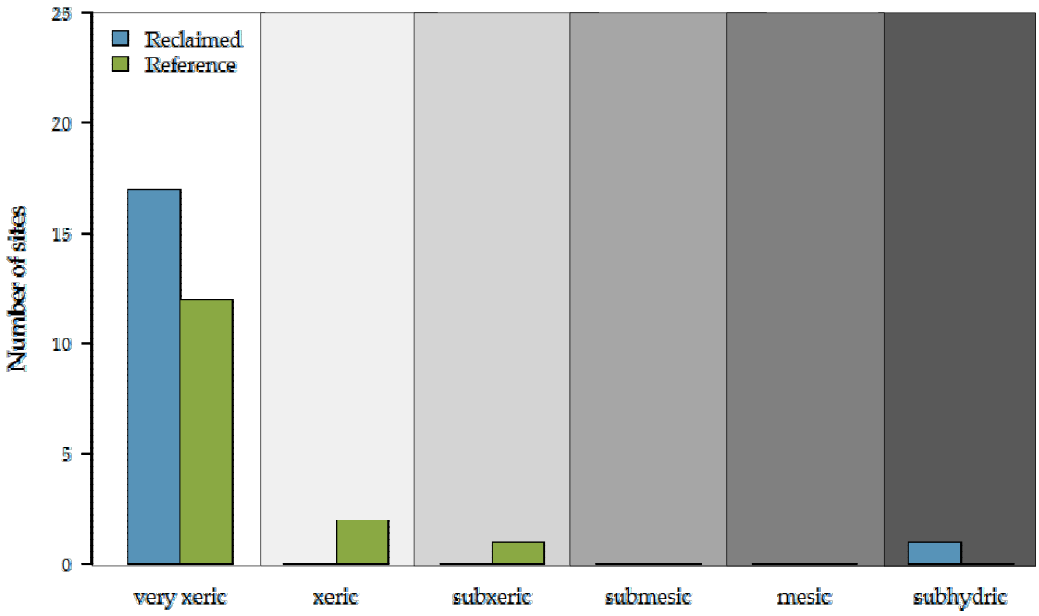


Figure 4-2. The distribution of reclamation and reference sites among SMR categories.

4.2.2. Shannon Diversity Index (SDI) (Ind. 1.2.1)

SDI is an important plant-community metric because it takes into account total species richness and the relative abundance of each species. Figure 4-3 presents SDI by site and age range, with extended error bars representing RNV for each age range. Reclaimed sites with an SDI within the RNV of reference sites are considered successful relative to the SDI indicator (as discussed in Section 3.5). Seven reclaimed sites fall within the RNV for SDI, while 11 sites are below this range, although most sites are within 0.5 index units of the RNV. The sites that fall below this range are primarily non-covered tailings sites. S-1w stands out as having the lowest SDI, due to the wet moisture regime leading to dominance of horsetail at this site. Overall, this indicator illustrates that reclaimed ecosystems are falling short of species diversity targets. As T-1, T-2 and T-3 illustrate, reclamation that includes placement of a "topsoil" cover and that allows native seeds to propagate from the seedbank can support the development of diverse sites at young ages.

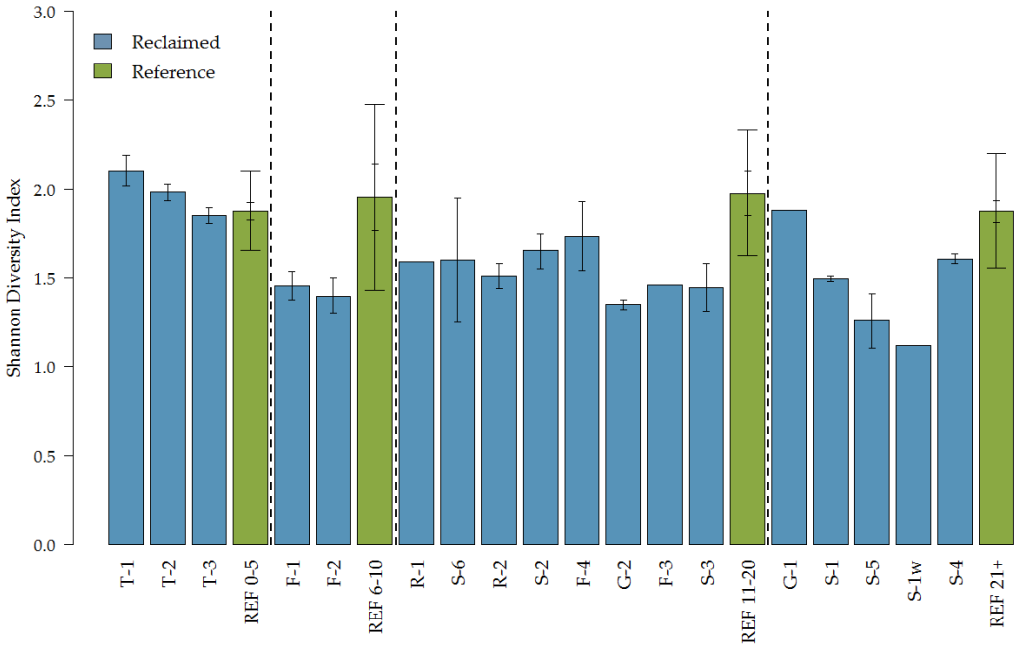


Figure 4-3. Shannon Diversity index by site and age range (0-5 years, 5-10 years, 10-20 years, and 21+ years). Error bars represent standard error and extended error bars on reference sites represent RNV for that age range.

4.2.3. Native species cover (Ind. 1.2.2)

Native species covers at reclaimed and reference sites are presented in Figure 4-4. The red line that appears in this figure addresses the reclamation success indicator that native species cover be greater than or equal to 30% at reclaimed sites. Reclaimed sites in the 21+ age range have the highest native species covers and all exceed the 30% threshold, except S-5, which is a non-covered tailings sand site. F-4, G-2, (both 20 years) and T-1 (2 years) also exceed 30% native cover, while the remaining 10 sites range from 10-25% native cover. Site age appears to be the main factor determining native species cover at reclaimed sites, as older sites have had more time for growth and colonization by native species than younger sites. The presence of a topsoil cover is also beneficial for native species colonization, as demonstrated by T-1, which is the youngest site, yet it has an average native cover of 35%.

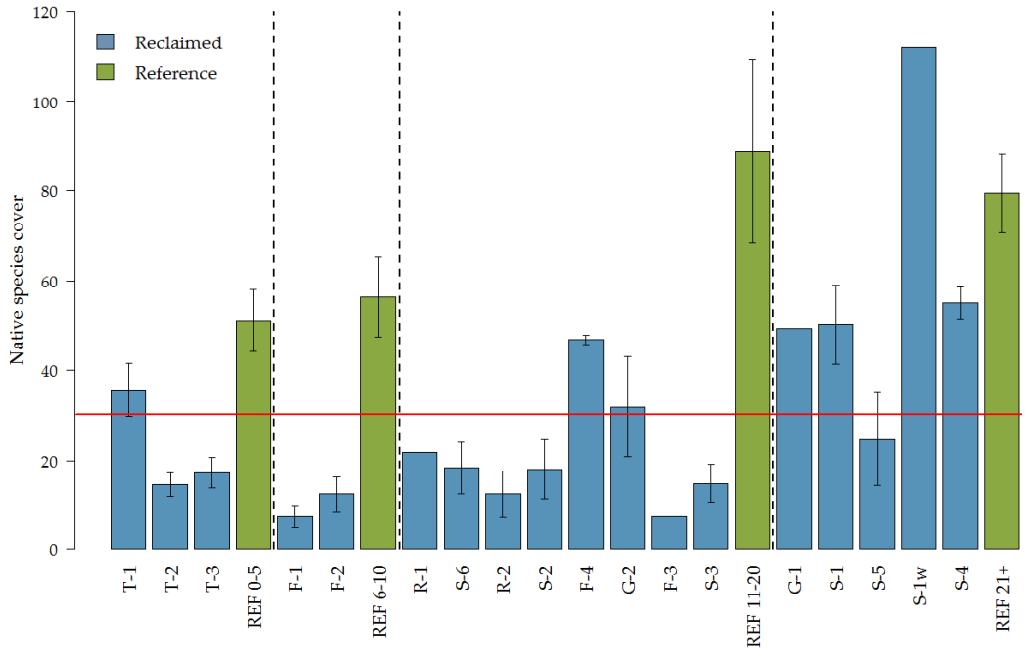


Figure 4-4. Average percent cover of native species by site, and age range (0-5 years, 6-10 years, 11-20 years, and 21+ years). Error bars represent standard error and the red line represents a reclamation success threshold for native cover.

4.2.4. Native richness (Ind. 1.2.3)

Native species richness represents the total number of native species observed at a site, and is useful as a measure of plant community diversity while omitting exotic species, which are factored into SDI. Native species richness by site and age range is presented in Figure 4-5. The red line represents a reclamation success threshold identified in the C&I framework. Reclaimed sites with a native species richness of 10 or more are considered successful relative to the native richness indicator. This information shows that 8 reclaimed sites meet or exceed this threshold, and 10 sites fall below the threshold. This figure also illustrates that age is not a strong predictor of native species richness at reclaimed or reference sites.

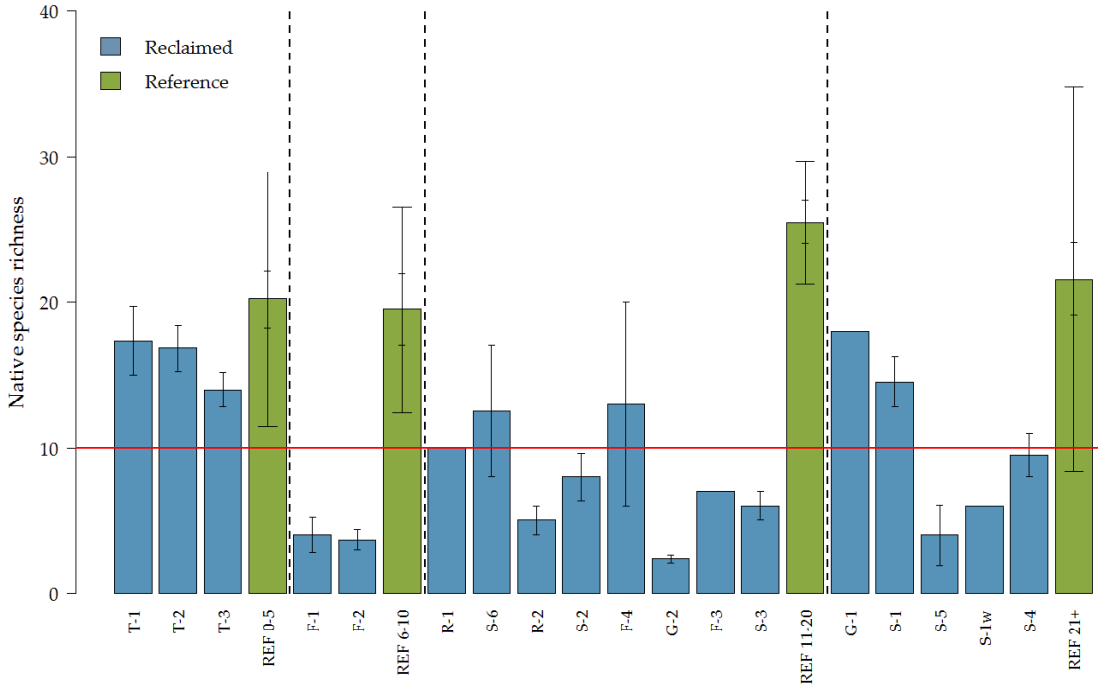


Figure 4-5. Native-species richness by site and age range (0-5 years, 6-10 years, 11-20 years, and 21+ years). Error bars represent standard error and extended error bars on reference sites represent RNV for that age range. The red line represents a reclamation success threshold.

At the mine level, the requirements for native richness are considered to be met when reclaimed sites have 75% of the number of native species observed at reference sites. Species-accumulation curves show the total number of species observed at reclaimed and reference sites as well as the rate at which new species are expected to be observed as new plots are added. The trajectories of these curves can be used to identify the degree to which the current sampling design is capturing the estimated total number of species in the reclaimed and reference populations. This information shows that 128 native species have been observed on 62 reclaimed plots, or 6200 m^2 of surveyed area, while 119 native species have been observed on 16 reference plots, or 1600 m^2. Based solely on the total number of species observed, reclaimed sites meet this reclamation-success indicator. However, the total sampled reclaimed area is almost four times as large as the total sampled reference area, which means that it is much more likely that a greater number of native species will be found on reclaimed sites. The native species accumulation curve for reference areas also suggests that native species accumulation increases rapidly (expectation of more than one new species observed per plot) with the addition of each new plot up until ~40 plots, whereas the rate of native species accumulation at reclaimed sites is more gradual. To avoid a biased comparison, we recommended that the number of reference plots be increased to facilitate comparison between similar reclaimed and reference area.

The position of the "actual" sampling intensity, in relation to the curve of the "estimated" species accumulation with a higher sampling intensity shows the degree to which current sampling is capturing the diversity of the vegetation. Ideally, sampling intensity will be thorough enough that the "actual" sampling intensity is within the plateau of the species accumulation curve. Within both reclaimed and reference areas, sampling was sufficient to capture the diversity of exotic species. However, sampling intensity was insufficient in capturing the diversity of the native species in both reclaimed and reference areas. Based on Figure 4-6, native species accumulation in reference areas plateaus at 170 species, which means that the 119 species recorded with the current sampling intensity represents approximately 70% of the overall diversity. For reclaimed sites, species accumulation plateaus at approximately 180 species, which means the 128 species recorded with the current sampling intensity represent approximately 71% of the overall diversity. As new PSPs are established, sampling intensity will increase the validity of the study findings, particularly with respect to species richness and diversity.

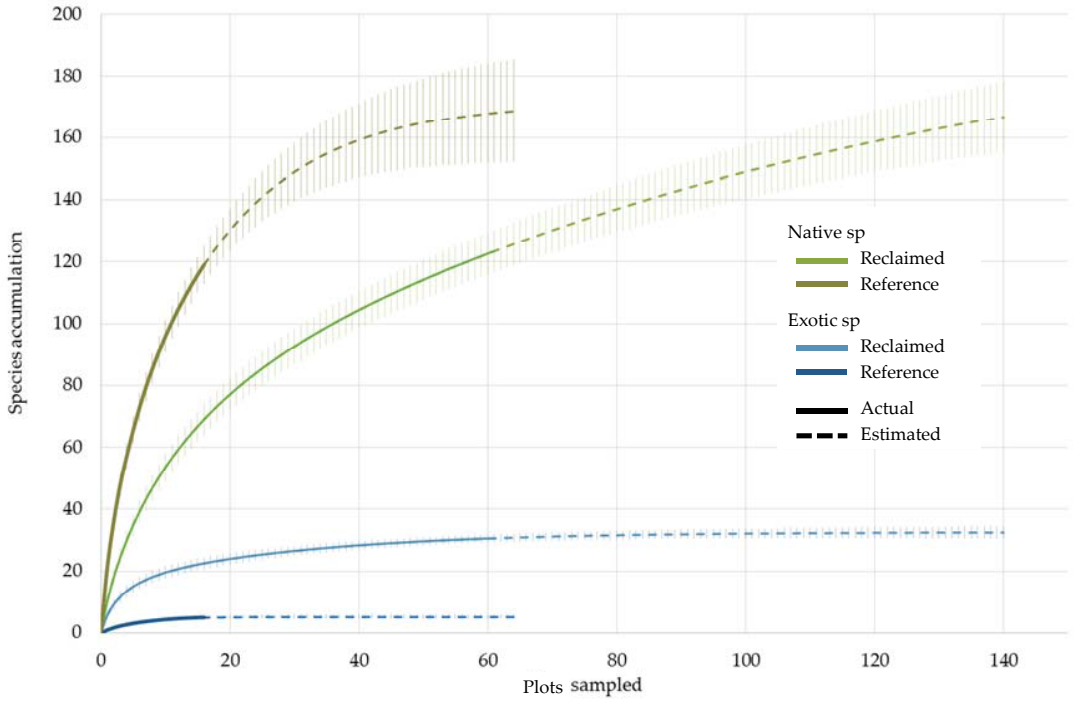


Figure 4-6. Species-accumulation curves by reclamation sites and reference sites. Vertical markings along the lines show the standard error.

4.3. ECOSYSTEM FUNCTION INDICATORS

4.3.1. Native vascular functional group diversity (Ind. 2.1)

Vascular-plant functional diversity is a measure of ecosystem complexity, and when re-established, will indicate that a reclaimed site is developing ecological "layers" similar to the reference sites in the surrounding area. Development of native-species layers can also provide shading pressure, which can help to dislodge exotic species from the site. Native vascular functional group cover is presented in Figure 4-7. Reclaimed sites with 3 or more native vascular functional groups present, including one woody group, are considered successful with respect to the functional diversity indicator. Average counts of native functional groups are listed above each site, and red numbers show those sites that do not meet the functional diversity threshold. This information shows that most reclaimed sites have 3 or more native functional groups, including one woody functional group. Reclaimed sites that are older than 20 years, and sites with topsoil covers tend to have similar functional diversity to reference sites.

The four sites with less than 3 functional groups are primarily non-covered tailings sites, as well as one covered waste rock site. Failure of a site to meet the functional-group diversity threshold can be indicative of an ecosystem trajectory which has stalled; either due to poor overall development, such as at G-2 or S-5; or due to dominance by a few agronomic species, such as at R-2. F-1 is still a relatively young site (10 years), and may develop greater functional diversity as it matures. S-1w is an obvious outlier due to its subhydric moisture regime, which has resulted in thick horsetail cover at this site. Dwarf woody plants are conspicuously absent from almost all reclaimed sites, but are present at reference sites of all age ranges. Where dwarf woody plants do occur on reclaimed sites, they were either planted (kinnikinnick at S-2) or they were part of the seedbank in the topsoil cover (T-1), suggesting that if topsoil is not available as a cover, dwarf woody species should be planted in order to facilitate their establishment on reclaimed areas.

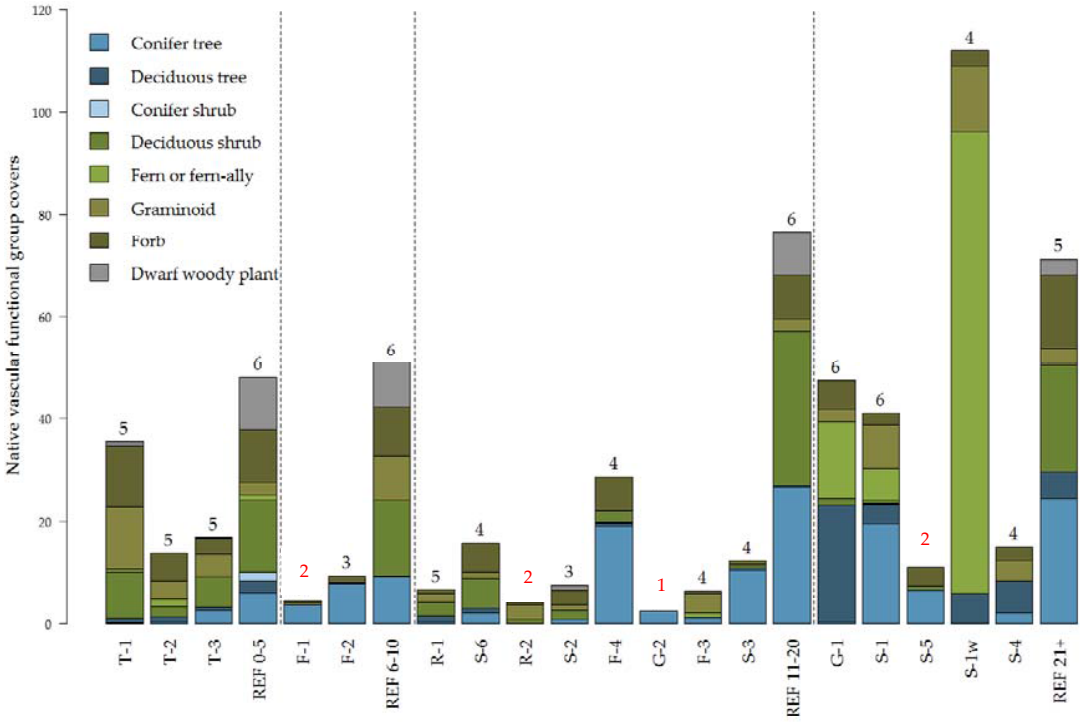


Figure 4-7. Native-plant community structure based on functional diversity of species observed at each site. Sites are separated into the following age ranges: 0-5 years, 6-10 years, 11-20 years, and 21+ years. Functional-group counts that appear above each stack are averaged by site and rounded, so it is possible for there to be more coloured bars in a stacked site bar than the average number that appears above the stack.

At the mine level, 4 or more native vascular functional groups are required to be present on at least 90% of the reclaimed mine area to be considered successful relative to this indicator. Figure 4-8 maps native vascular functional group count averages by site across Endako. This map illustrates that more than half of the reclaimed mine area has 4 or more native functional groups present. However, the total mine area that meets this indicator threshold is only 65% of the mine area, indicating a failure to meet functional diversity requirements at the mine level. It is expected that as young sites develop, functional diversity will increase, and more of the mine area will meet this requirement.

Figure 4-8. Average native-vascular-plant functional diversity at each site. Sites above the threshold are cross-hatched in black.

4.3.2. Total species cover (Ind. 2.2)

Total vegetation covers at reclaimed sites and corresponding RNV are shown in Figure 4-9. Most reclaimed sites have total vegetation covers within the RNV of reference sites, and in some cases, reclaimed site covers exceed reference vegetation covers. F-1, F-2, and F-3, which are all non-covered tailings sites, fall below the RNV for total cover. F-1 and F-2 were measured at 10 years, and may still develop greater vegetation cover over time, however F-3 was measured at 20 years, and therefore failed to meet total cover requirements within the 20-year time frame.

Reference sites are comprised primarily of native species, whereas exotic species cover at reclaimed sites represents a greater proportion of total cover, up to 60 % in some cases. This is due to the nature of many exotic species, in that they tend to thrive in disturbed habitats with little competition from natural species.

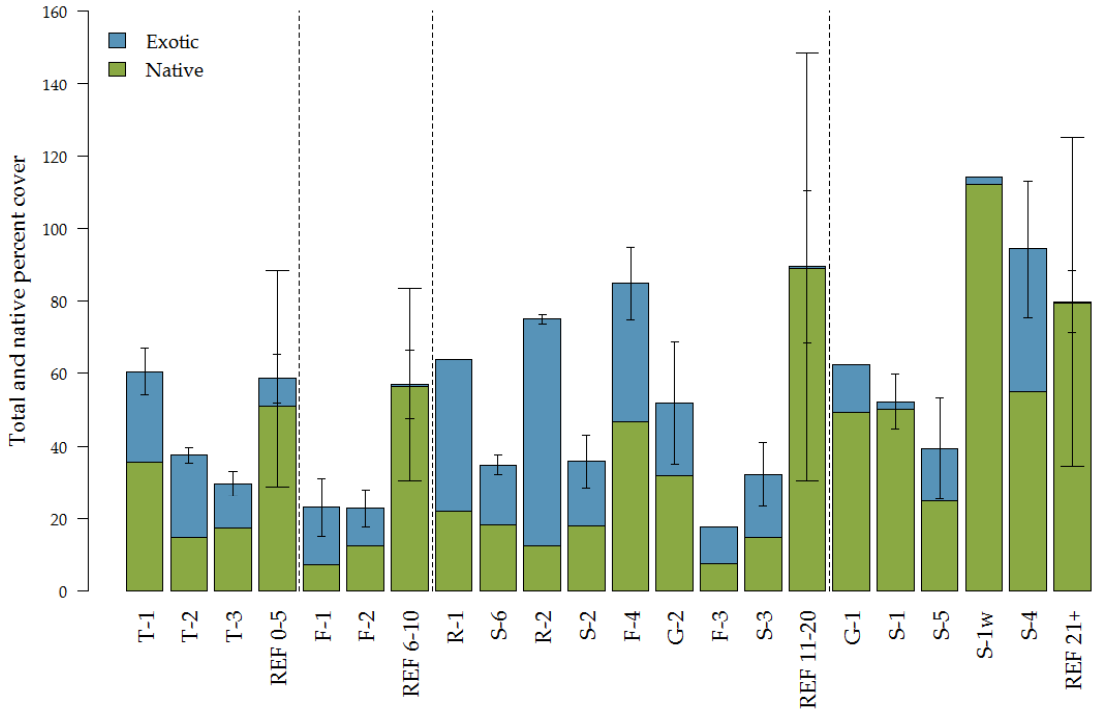


Figure 4-9. Average total percent cover, divided into native and exotic species covers, by site, and age range (0-5 years, 6-10 years, 11-20 years, and 21+ years). Error bars represent standard error and extended error bars on reference sites represent RNV for that age range.

4.3.3. Forest stand development (Ind. 2.3)

At the mine level, tree densities of 1000 stems/hectare (sph) or more are required on at least 33% of the reclaimed mine area to be considered successful relative to the forest establishment indicator. Figure 4-10 maps stand-density averages by site across Endako. This

map demonstrates that despite trees being present on the majority of reclaimed mine area, only 18% of the mine has over 1000 sph. Natural ingress of tree species on reclaimed areas is expected to occur slowly. Thus, to achieve a stem density of over 1000 sph on a greater portion of the reclaimed area:

- fill planting needs to occur at sites that are understocked;
- future reclamation should focus on facilitating successful tree establishment through the use of soil covers or fertilization; and/or
- higher tree densities should be planted initially.

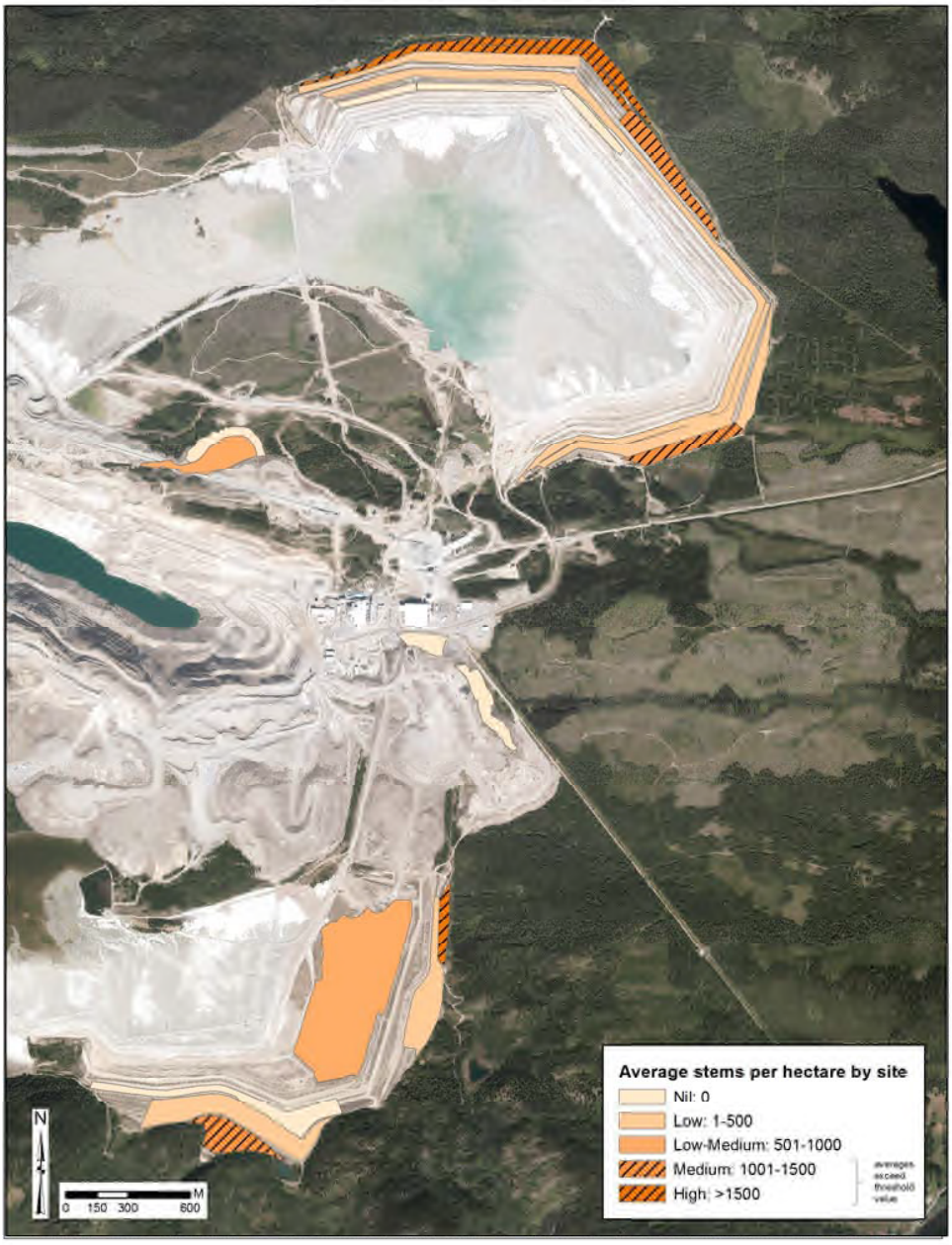


Figure 4-10. Average tree stems per hectare at each site. Sites above the threshold are cross-hatched in black.

Tree species distributions at reclaimed and reference sites can be found in Appendix E. This information indicates that reference sites generally have higher tree densities than reclaimed sites (averaging approximately 3000 sph), and are predominantly lodgepole pine (Pl), hybrid white spruce (Sxw), and subalpine fir (Bl). In contrast, the average tree density at reclaimed sites is 640 sph, and the dominant species are Douglas-fir (Fd) and lodgepole pine.

4.3.4. Organic matter depth (Ind. 2.4)

Surface organic-matter layers are an important component of forest ecosystems, and develop over time as organic matter (OM) accumulates on the soil surface. Organic-horizon depth was identified in the C&I framework as an indicator of ecosystem functioning. It is a supporting indicator, meaning that it does not have to be formally evaluated; instead it can be used to provide better understanding of reclamation development trajectories. Organic matter can take a long time to accumulate and consequently, only 7 reclaimed sites have organic horizons, ranging from 0.5 – 1.5 cm (R-2, G-1, G-2, F-4, S-1, and S-2). In comparison, reference site OM horizons ranged from 0.5 – 7 cm. Organic-matter horizon depth and form will be a useful metric for older reclaimed areas, and will not rely on a direct comparison to reference areas; many reference areas have organic matter horizons which were relatively undisturbed through timber-harvesting.

4.4. WILDLIFE UTILIZATION INDICATORS

4.4.1. Ungulate activity (Ind. 3.1)

Wildlife activity on both reclaimed and reference sites is dominated by moose and mule deer, as illustrated in Figure 4-11. Ungulate activity was observed on all but 3 of the 18 reclaimed sites, and on all but 3 of the 15 reference sites.

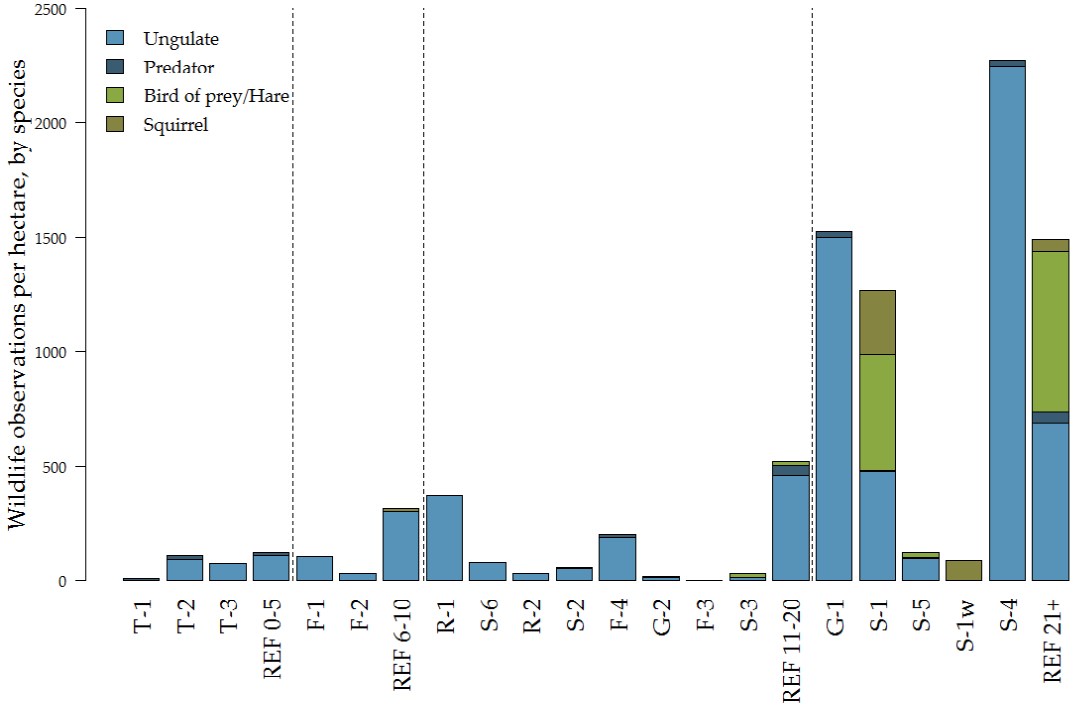


Figure 4-11. Wildlife utilization by site and age range, divided into animal groups of interest according to the C&I framework.

Ungulate utilization at each site is rated in Table 4-1 and illustrated in Figure 4-12. The categories for utilization have been slightly modified from those in the 2014 report based on data from additional reclaimed and reference sites installed in 2015.

Table 4-1. Ungulate utilization by site, using the C&I-framework rating system.

Utilization	Number of Signs	Site Names
nil	0	T-1, F-3, S-1w, REF-1, REF-3, REF-8
low	1 - 100	F-1, F-2, G-2, R-2, S-2, S-3, S-5, S-6, T-2, T-3, REF-2, REF-10
low - medium	101 - 300	F-4, REF-4, REF-11, REF-12
medium	301 - 600	R-1, S-1, REF-5, REF-6, REF-9, REF-13,
high	>600	G-1, S-4, REF-7, REF-14, REF-15,

The average number of ungulate signs exceeded 600/ha on two reclaimed sites (G-1 and S-4) and three reference sites. The high ungulate activity at G-1 is likely driven by the close proximity to natural areas and a nearby water-way. The high ungulate activity at S-4 may be due to its proximity to natural areas, but a relatively high cover of agronomic grasses may also be a food source.

Two reclaimed sites (R-1 and S-1) contain medium ungulate utilization. S-1 is an older site (+21 years) and contains at least four native vascular functional groups that include deciduous trees and/or deciduous shrubs (Figure 4-7). R-1 is a younger site (12 years) with five functional groups including potential food-sources for ungulates such as deciduous shrubs and agronomic grasses. Its location in a less active area of the mine, adjacent to natural forest, likely provides a safe environment for ungulates to browse. The four sites with medium or high ungulate activity represent 18% of the reclaimed mine site area. Therefore, the wildlife utilization indicator of $\geq$30% area with medium to high utilization by ungulates has not been met (Ind. 3.1).

Reclaimed sites T-1, F-3 and S-1w show no signs of ungulate utilization and represent 8% of the reclaimed mine site area. Therefore, the wildlife indicator of $\leq$25% of the reclaimed mine area with no utilization by ungulates has been met. T-1 is a very young site (<5 years) with no tree canopy for cover, although browse species are abundant. F-3 is similar in age to R-1 but contains very low tree and shrub cover. Although S-1w is an older site (+21 years) with four native vascular functional groups, it is a wet site dominated by horsetail and is not suitable to ungulates.

Figure 4-12. Average ungulate utilization at each site. Sites above the threshold are cross-hatched in black, and sites with no ungulate utilization are filled with black points.

4.4.2. Predator activity (Ind. 3.2)

Signs of predator activity in the reclaimed and reference sites include canids (fox, coyote) and black bears. Although sightings of wolf, cougar, lynx and fisher on and adjacent to the mine site are not uncommon, signs of their activity have not yet been observed in the established wildlife plots of reclaimed sites or reference sites.

Wildlife plots on ten reclaimed sites and five reference sites contained signs of predator activity (Figure 4-13). Fox and coyote appear to be the most active predators on reclaimed sites, while bears are most common in reference sites. Two of the 10 reclaimed sites contained bear signs, and only one reference site contained signs of a canid.

The reclaimed sites with predator signs represent 50% of the reclaimed mine site area. This exceeds the indicator requiring that ≥25% of the mine area have predator activity (Ind. 3.2).

Figure 4-13. Average predator utilization at each site. Sites with predator utilization are cross-hatched in black.

4.4.3. Red squirrels (Ind. 3.3)

The presence of red squirrels is used in this assessment as an indicator of a functioning mature conifer stand. Wildlife plots in two reclaimed sites (S-1, S-1w), and five reference sites (REF-4, 5, 6, 13, 15) contained signs of squirrel activity, as illustrated in Appendix C. Therefore, the indicator for the presence of squirrels on the mine site has been met (Ind. 3.3). Both of the reclaimed sites and four of the reference sites are forest stands that are 21 years and older.

The tree cover at S-1 is dominated by lodgepole pine which provide pine seeds, an important food for squirrels. S-1w does not contain conifer trees but is close enough in proximity to S-1 that squirrel middens were present. G-1, S-4 and S-5 are also mature reclaimed sites but do not contain squirrel activity. The tree covers in G-1 and S-4 are dominated by deciduous species so these sites are not expected to support squirrels (Figure 4-7). S-5 has low conifer tree cover and only two native vascular functional groups. The lack of squirrels suggests S-5 does not yet provide the requisite habitat features.

4.4.4. Hares/birds of prey (Ind. 3.4; Ind. 3.5)

Hares are used in this assessment as an indicator of ecosystems that provide sufficient cover for larger prey species (compared to mice and voles), and/or attract birds of prey. The most important habitat feature for hare is escape and thermal cover, and for this reason, hare prefer habitats with a dense shrub cover, or tree canopy.

Signs of hare activity were observed in the wildlife plots of three reclaimed sites (S-1, S-3, S-5) and five reference sites (REF's 4, 6, 8, 14, 15), signifying that the presence of hares/birds of prey on the mine site has been met (Ind. 3.4) (Appendix C). A regurgitated owl pellet was also observed in REF-4. Although reclaimed site S-1 contains low shrub density, it provides sufficient tree canopy for cover, and native graminoids and forbs for browse (Figure 4-7). Sites S-3 and S-5 have low shrub and tree densities, however, the plots where activity was observed are close to the adjacent forest. The escape cover provided by the forest may provide hare the security to browse on the Douglas-fir seedlings and graminoids growing on the reclaimed sites. Tree and shrub cover is expected to increase over time on these sites.

4.5. NON-C&I FRAMEWORK VARIABLES

4.5.1. Soil and substrate particle-size distribution

Particle-size distributions (PSDs) are a critical property of growth-medium materials, as they control water storage and transport, and influence nutrient retention. PSDs for reference surface horizons and reclamation materials are presented in Figure 4-14. The coarsest

reclamation material is waste rock, with 70-90% coarse fragments, while tailings are primarily sand, with very little coarse fragments. Reclamation cover soils exhibit a similar PSD range to reference A and B horizons, with 20-80% coarse fragments and less than 20% fine material (≤0.05 mm) in most cases.

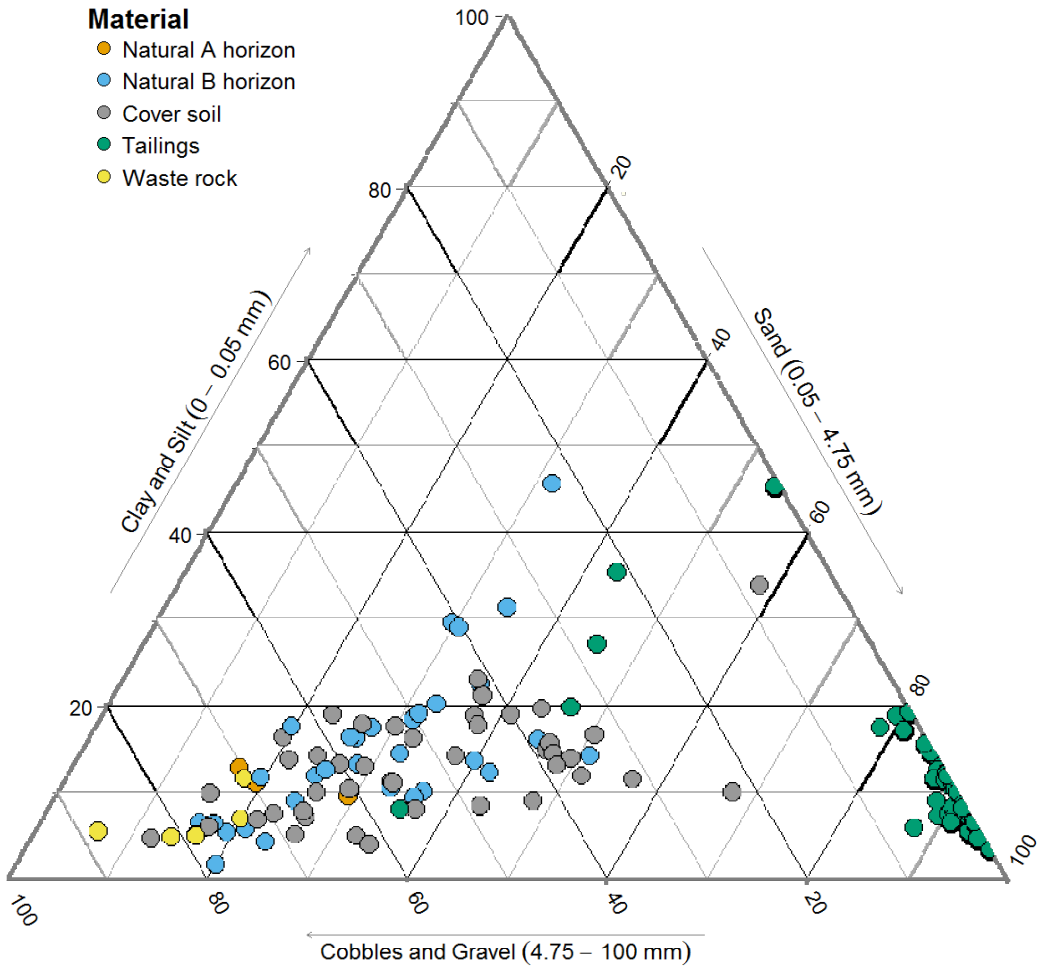


Figure 4-14. Particle-size-distribution ternary diagram for reclamation-site materials (tailings, waste rock, and cover soil) and reference-site soils (natural A horizon and natural B horizon).

4.5.2. Available water storage capacity

Available water storage capacity (AWSC) in the top metre of reclamation growth medium is presented by operational group and compared to the reference RNV in Figure 4-15. Both reclaimed and reference sites have mean AWSCs below 55 mm/m, which indicates that they have relatively dry soil moisture regimes (SMRs). All reclaimed operational groups fall within the natural range of AWSC. Reference sites have the highest mean AWSC, followed

closely by non-covered tailings sand sites, which have the highest AWSC of the reclaimed sites. At the other end of the spectrum, non-covered waste rock sites have the lowest mean AWSC. These results show that there is little or no AWSC benefit from use of cover on tailings sand. However, assessment of other variables strongly indicates that cover on tailings sand can be beneficial for other ecosystem characteristics, particularly vegetation development. In synthesis, these results suggest that the optimum use of limited cover-material resources would be placement of relatively thin covers over tailings sand substrates – to introduce biota, including vegetation propagules, and to reduce wind erosion – and placement of thicker covers over waste rock substrates, to realize the above benefits and also increase soil water storage.

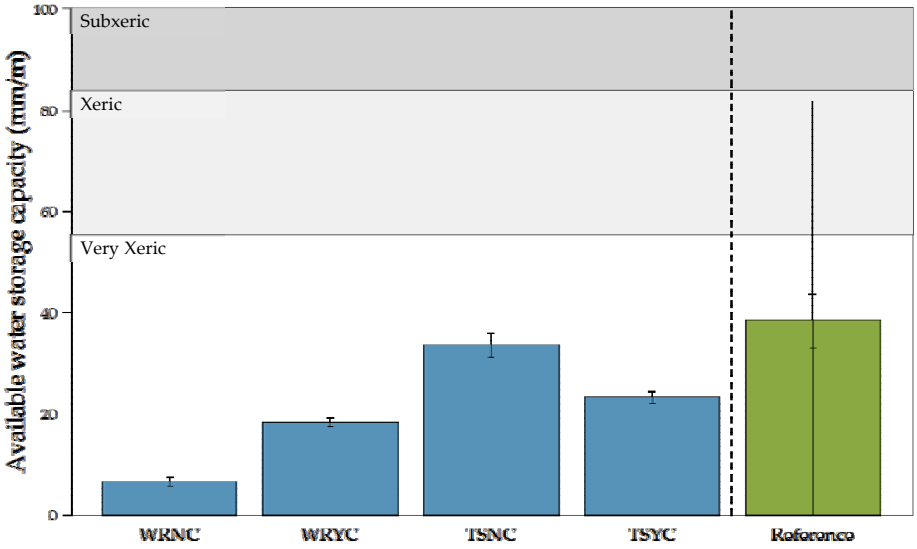


Figure 4-15. Average soil available water storage capacity (AWSC) by operational group. Error bars represent standard error and extended error bars on the reference bar represents RNV. Operational group acronyms represent the following: WRNC – non-covered waste rock; WRYC – covered waste rock; TSNC – non-covered tailings sand; TSYC – covered tailings sand.

4.5.3. Native richness at covered and non-covered reclamation sites

Figure 4-16 summarizes total and native-species richness at covered and non-covered reclamation sites compared to reference sites. This graph demonstrates that covered reclamation sites have a higher native-species richness than non-covered sites. A topsoil cover facilitates rapid native species establishment through seedbank propagation and an active soil biotic community. Non-covered sites can take a longer time to reach similar levels of native richness, and based on these findings, some may not or do not reach the threshold for native species richness in the 20-year timeframe.

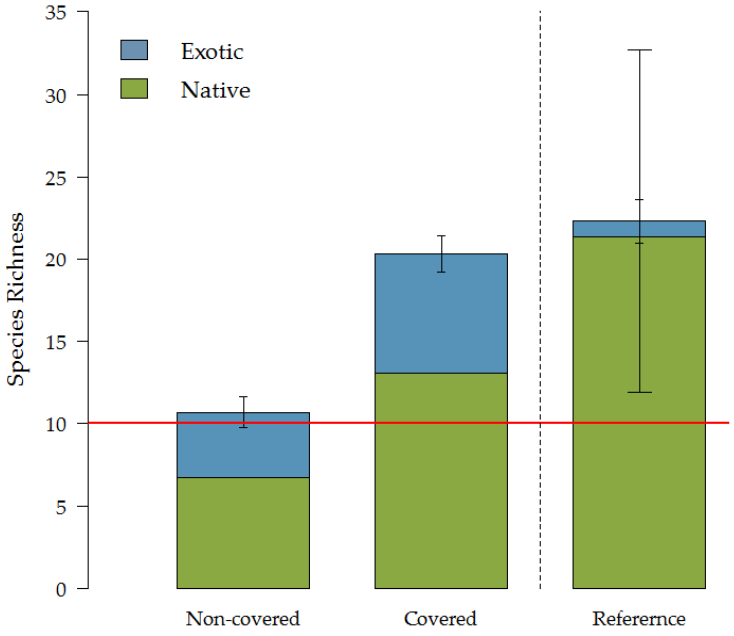


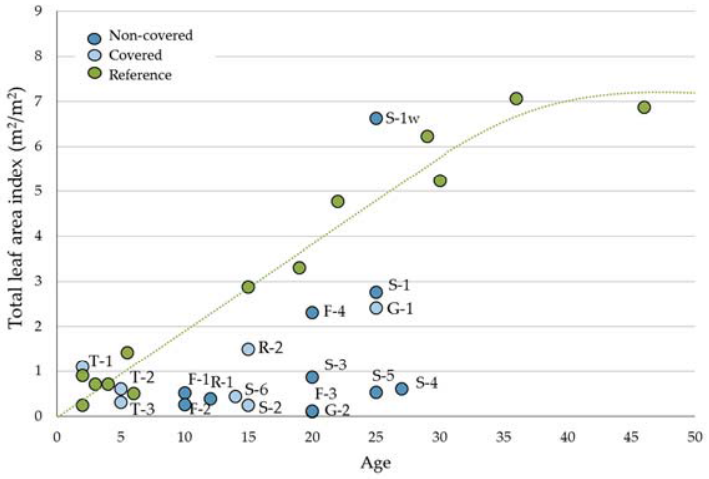
Figure 4-16. Total and native-species richness at covered and non-covered reclaimed sites, and reference sites. The red line represents the reclamation success threshold for native species.

4.5.4. Leaf-area index

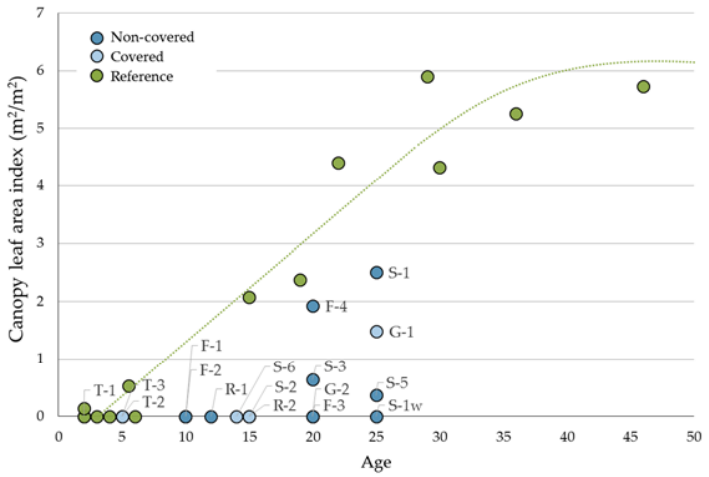
Leaf-area index (LAI) is a measure of leaf area per square meter of ground, and relates well to plant photosynthetic capacity and transpirative demand. Total LAI on reclaimed and reference sites is shown in Figure 4-17a. Using a chronosequence approach, there is a clear positive trend between LAI and age at reference sites. The oldest reference site was excluded from this figure to provide greater detail of the distribution of sites under 50 years old, but it has an LAI similar to the 30 – 50 year old reference sites, which suggests that LAI values gradually reach a steady-state equilibrium in mature reference stands. Reclaimed site data indicate that some young sites with soil covers (e.g. T-1, T-2) and a few older sites (e.g. F-4, R-2, G-1, S-1) may be on similar trajectories to reference sites, but there are also a suite of older sites (>10 years old) with LAI values <1, which are on substantially divergent trajectories. Similar to the total vegetation cover results, S-1w surpasses most reference-site LAI values due to the thick horsetail cover and wet soil moisture regime at this site.

Figure 4-17b and c provide information on the two components that make up total LAI: canopy (predominantly tree-layer) and understory vegetation (grasses, forbs and shrubs). This information indicates that the developing canopy layer drives overall LAI development on reference sites, and thus, successful establishment of trees is important to achieving similar vegetation development on reclaimed systems.

a)



b)



c)

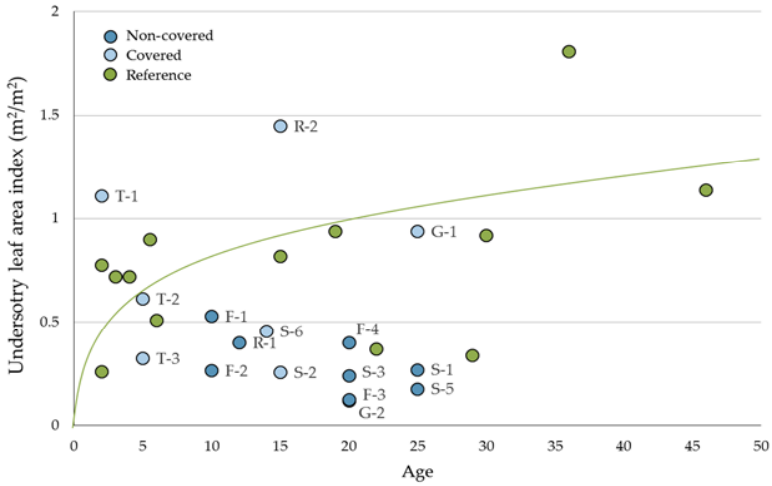


Figure 4-17. Total LAI (a), canopy-level LAI (b), and understory-level LAI (c) at reclaimed covered and non-covered sites, and reference sites. The dashed line represents the trend of reference-site LAI over time.

4.5.5. Small rodent activity

The second highest number of observations was for small rodent activity (e.g. mice, voles). Observations of squirrels and hares were recorded separately and are discussed below.

Rodents are important to healthy forest ecosystems as they are not only prey for many species of mammals and birds, they also spread seed, soil biota and nutrients through their foraging activity. Although no success indicator was developed for small rodents, it is important to track their activity to monitor the health of the population.

Rodent utilization at each site is rated in Table 4-2. The categories for utilization have been slightly modified from those in the 2014 report based on data from additional reclaimed and reference sites installed in 2015. Squirrel signs were also included in the rodent counts for 2013 and 2014. They are now represented in their own category, which has resulted in changes to the previous small rodent counts, as reflected in the table.

Table 4-2. Rodent utilization by site.

Utilization	Number of Signs	Site Names
nil	0	F-1, F-3, G-1, G-2, R-1, S-3, S-6, REF-2, REF-5, REF-6, REF-7, REF-8, REF-9, REF-10, REF-11
low	1 – 50	F-2, R-2, S-1, S-2, S-5, T-1, T-2, T-3, REF-1, REF-3, REF-12
medium	51 – 100	F-4, S-1w, S-4, REF-13, REF-14
high	>100	REF-4, REF-15

Rodent utilization was similar between reclaimed and reference sites, with the exception of a few reference sites with high rodent activity. At most reclaimed and reference sites, rodent utilization was low or non-existent. Three reclaimed sites had medium utilization by rodents and none had high utilization. Rodent activity in subsequent reclamation assessments will be compared with this table.

4.5.6. Ants and other insects

Although there is no indicator for insects, their activity in wildlife plots is noted as they are important in the process of soil development, and provide a source of food for many species of birds and mammals. Ants have been observed in plots on eight of the eighteen reclaimed sites. In 2015, an abandoned wasp's nest constructed in tailings sand was discovered in a wildlife plot in F-2. Nearby in S-1, a small rodent burrow was found lined with paper from a wasp's nest.

4.5.7. Birds and other sightings

Bird species, and animal sightings/signs observed outside of wildlife plots, are noted to track the diversity of species that may be using areas of the mine site.

In 2015, a colony of bank swallows was observed nesting in a vertical bank of tailings sand that had been created by an excavator cut on Tailings Pond 2. The swallows were observed swooping over the adjacent T-3 reclaimed site and feeding on flying insects.

While assessing reclaimed site S-3 at the toe of Tailings Pond 1 in 2015, three common terns were observed harassing a hawk (possibly a northern harrier) over the tailings pond. It is suspected that at least one pair of terns nests each year on the crest of the tailings pond, as it has been reported that mine employees have been harassed by terns in the past while working on the tailings crest.

Hummingbirds, grey jays, northern flickers and sparrows have been observed in reclaimed sites further away from the mine infrastructure.

In 2013, two mule deer fawns were flushed from their hiding spot on reclaim site T-3 while observers walked towards a vegetation plot. In 2015, a mule deer doe was observed bedding down on T-3 in an area where tailings slopes provide protective cover.

A fox was observed at S-4 in 2013. A pair of foxes was seen in 2014 while observers drove away from T-2, where a fox burrow and tracks were found in a wildlife plot. Also in 2014, wolf tracks were observed on G-2 and on the above tailings road.

Site observations and data collected from wildlife plots show that wildlife from the adjacent forest is utilizing reclaimed areas for home sites, foraging/hunting, and cover. Some wildlife species were observed using un-reclaimed areas (roads, tailings banks and crests), however most of these species relied on reclaimed areas to provide some of their habitat requirements, and might not otherwise be present.

4.5.8. Foliar chemistry

Foliar nutrient concentrations can provide important information on the ability of plant species to find and use soil nutrients to support their metabolism and growth. Figure 4-18 presents foliar nitrogen (N) concentrations of coniferous tree species at reclaimed and reference sites. Lodgepole pine (light blue and light green bars) is the only species where RNV is presented because it is the only species for which a direct comparison between reference and reclaimed sites is possible. However, evaluating the nutrient status of managed forest stands is a routine silvicultural practice, and foliar nutrient concentrations that represent deficient N thresholds have been established (Fd - Ballard and Carter (1985); Pl - Brockely (2001)) and are labelled on Figure 4-18. N concentrations in pine foliage on

reclaimed sites fall within the RNV of reference sites. However, N concentrations in Douglas-fir foliage at G-2, S-2, S-3, and S-6 fall below the severe N deficiency threshold, and are likely inhibiting growth at these sites. Deciduous trees are not common in the study area, so were not included in Figure 4-18, but among them, measured N concentrations are not deficient.

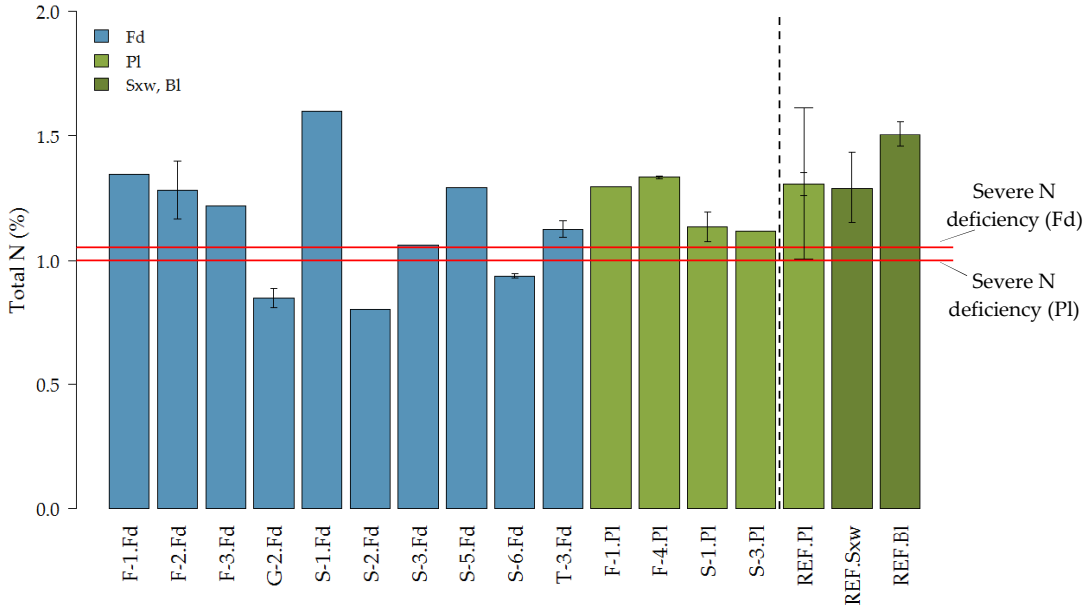


Figure 4-18. Average tree foliar nitrogen (%) by site and species at reclaimed sites, and by species at reference sites. Error bars represent standard error, and the extended error bar represents RNV for lodgepole pine. Red lines represent nutrient deficiency thresholds for Fd and Pl (Ballard and Carter, 1985; Brockely, 2001). (Fd – Douglas-fir; Pl – Lodgepole pine; Sxw – Hybrid white spruce; Bl – Subalpine fir)

4.5.9. Forage chemistry – molybdenum and copper

Molybdenosis is a secondary copper deficiency that occurs when grazing ruminants ingest high levels of molybdenum and sulphur, with the resulting thiomolybdates binding copper in the rumen and making it unavailable for animal uptake (National Research Council, 2005). Molybdenosis can be produced by moderately high dietary Mo concentrations in combination with low dietary Cu concentrations (< 5 ppm), dietary Cu:Mo ratios <2:1, or when dietary Mo concentrations exceed 100 ppm (National Research Council, 2005).

Information on soil/substrate Mo concentrations is discussed, and vegetation-tissue Mo and Cu:Mo concentrations by plant type and site are presented, below in Figure 4-19 and Figure 4-20. These data indicate:

- **Soil/substrate Mo –** Mo concentrations of mine soils and substrates, which were measured in 2013 and 2014 were generally above RNV.
- **Vegetation-tissue Mo –** mean vegetation-tissue concentrations of Mo on reclaimed sites

range from approximately 40-600 ppm, while mean concentrations on reference sites range from approximately 0-200 ppm. Agronomic legumes such as clover and alfalfa (l) typically exhibit higher element uptake than other vegetation groups, thus the elevated Mo tissue concentrations on the reclaimed sites are partially attributable to a shift in the dominant vegetation species towards legumes. S-1, S-5, and T-1 have Mo concentrations in forb tissues within RNV, however it is important to note that reference forbs also have elevated Mo concentrations relative to the threshold of 100 ppm.

- **Vegetation-tissue Cu –** similar to Mo, Cu concentrations are also elevated in vegetation tissue from reclaimed sites. While elevated Cu can help alleviate molybdenosis caused by elevated Mo, the ratio of Cu:Mo remains below the critical dietary ratio of 2:1 at reclaimed and reference sites (Figure 4-20), suggesting that the occurrence of molybdenosis in grazing ruminants is possible at these sites.

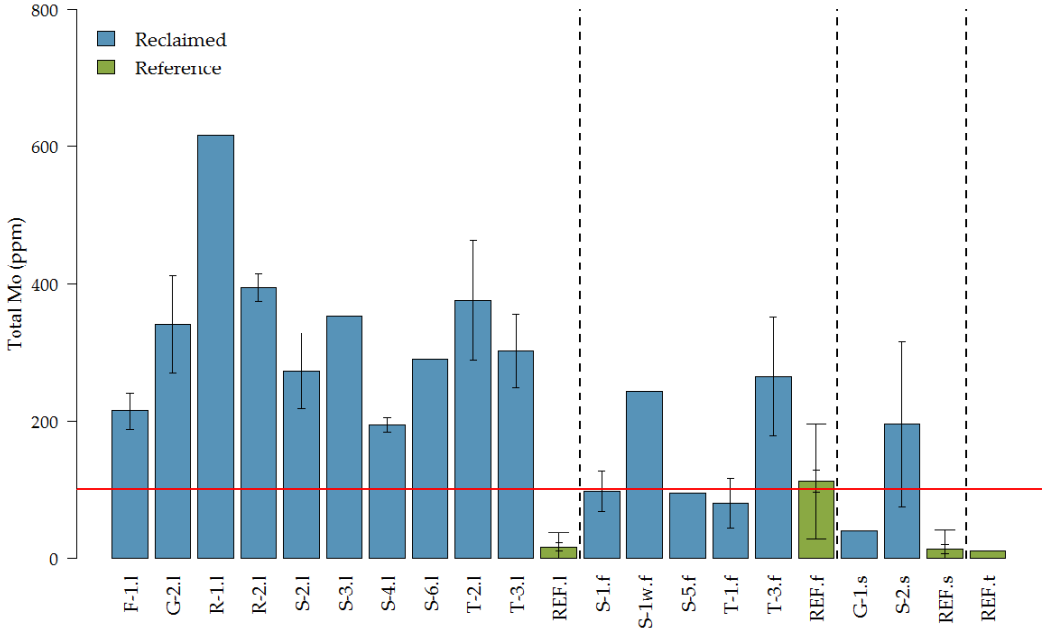


Figure 4-19. Total molybdenum (ppm) in forage material by site and plant type. Error bars represent standard error and extended error bars represent RNV. Dashed lines separate different plant types (l – legume; f – forb; s – shrub; t – tree). The red line represents the Mo concentration above which molybdenosis can occur.

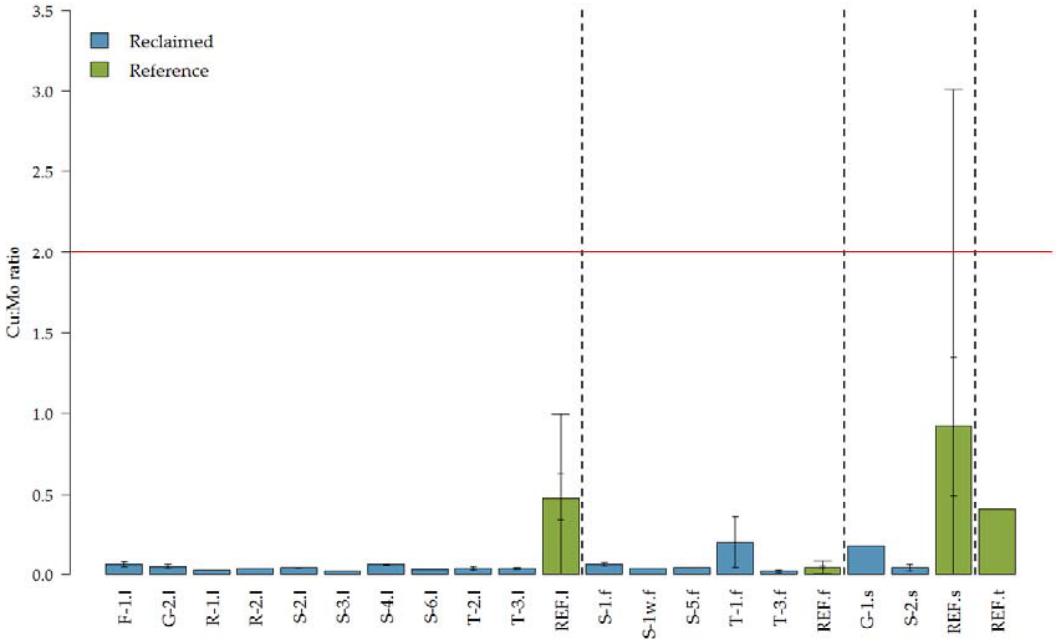


Figure 4-20. Copper: molybdenum ratios in forage material by site and plant type. Error bars represent standard error and extended error bars represent RNV. Dashed lines separate different plant types (f – forb; l – legume; s – shrub; t – tree).

The information above suggests that molybdenosis could occur in wild ruminants utilizing the Endako for forage/browse, due to tissue Mo concentrations >100 mg/kg and Cu:Mo ratios < 2:1. For a more thorough review of potential Mo toxicosis (molybdenosis), the reader is directed to Riordan (2003) – this publication indicates that molybdenosis is likely not a risk at Endako, based on the following interpretations:

1. although measured soils Mo concentrations are elevated in comparison to the 2013-14 reference sites, pre-mine soils sampling indicated Mo concentrations over 80 mg/kg[12] directly above the mine ore bodies, equivalent to concentrations observed on reclaimed sites sampled in this study;
2. although measured foliar Mo concentrations are elevated in comparison to published literature (e.g., National Research Council, 2005), they are within the range of approximately 50-1400 mg/kg reported by Riordan (2003) for pre-mine foliage of a variety of species, most of which would be expected to have lower foliar Mo concentrations than legumes; and
3. Riordan's 2003 review of potential molybdenosis on the mine site indicates that vegetation studies, studies of ungulate tissue, and observational evidence suggest no signs of molybdenosis in local wildlife.

5. SUMMARY

The focus of this program is to establish permanent sample plots on reclaimed and reference sites, and to evaluate reclamation success by comparing key ecosystem parameters at reclaimed sites to thresholds and ranges of natural variation identified from reference-site data. Since 2013, 78 plots (62 reclamation and 16 reference) have been installed on 18 reclamation sites and 15 reference sites on Endako and adjacent non-mine areas.

Evaluation of the key indicators of reclamation success identified in the C&I framework suggest that 11 of the 18 reclaimed sites, representing 62% of the current reclaimed-mine area, meet the requirements for successful reclamation. Three sites, representing 15% of the reclaimed area, are classified as non-successful, and 4 sites (23%) do not currently meet requirements, but still have time to develop before the final evaluation (at 20 years) (Table 5-1; Figure 5-1). Out of the 11 successful reclaimed sites, 6 sites are 20 years or older, which means that this would be considered a final evaluation and would not require further testing against the C&I framework again.

A comparison of reclaimed-site data to reference-site data collected to date indicates:

- **Biological diversity** – species diversity tends to be lower at reclaimed sites than at

[12] No maximum value for soil Mo concentrations is given by Riordan (2003).

reference sites, although some reclaimed sites where topsoil was used (e.g. T-1, T-2, T-3) have higher SDI and native-species richness than reference sites in the same age range. However, 5 reclaimed sites (F-1, F-2, R-2, S-2, S-5) fall below all 3 species diversity indicators (SDI, native species cover, native species richness), and one of these sites is 20+ years old (S-5). This suggests that additional remediation at some sites may be required to fulfill species-diversity goals, and that facilitating increased diversity through the use of topsoil covers at newly reclaimed sites should be prioritized where possible. While the total number of native species observed on reclaimed sites is higher than on reference sites, this indicator is biased towards reclaimed sites because the total sampled area is almost four times as large. Reclaimed sites represent a slightly drier range of ecosystems than reference sites, which likely restricts ecosystem diversity in the reclamation area[13].

- **Ecosystem function** – the establishment of closed forest canopies and the development of surface organic-matter layers is currently restricted to a few older reclaimed sites (e.g. S-1). These ecosystem characteristics are slow to develop, and are more relevant evaluations of success in later stages of ecosystem development.
- **Wildlife utilization** – 3 of the 4 indicators for wildlife utilization have been met (predator activity, presence of squirrels, presence of birds of prey and snowshoe hare), suggesting that reclaimed areas are functioning as wildlife habitat. Wildlife data show that predators are present on the mine, which suggests that reclaimed areas may be supporting predator/prey relationships. Reclaimed conifer stands support red squirrels and hares, which is a strong indication of a functional ecosystem. Medium to high utilization by ungulates on ≥30 % of the reclaimed mine site area has yet to be achieved. It is expected this indicator will be met as reclaimed areas develop over time.

[13] S-1w is the exception, in which seepage is contributing to a wetter ecosystem than reference site conditions.

Table 5-1. Indicator assessment on all reclaimed sites installed since 2013. Green cells indicate success relative to the indicator, red cells indicate failure relative to the indicator, and orange cells indicate that final evaluation cannot be completed due to site age.

Site	Total plots to date	Site age (yrs)	Success/Sustainability Indicators																
			1. Biological diversity					2. Ecosystem function				3. Wildlife utilization				Site-level evaluation		Mine-level evaluation
			1.1.1	1.2.1	1.2.2	1.2.3		2.1		2.2	2.3	3.1	3.2	3.3	3.4, 3.5			
			Soil moisture regime distribution	Shannon Diversity Index	Native species cover	Native species richness		Native vascular functional group diversity		Total species cover	Forest stand development	Ungulate activity	Predator activity	Red squirrel utilization	Bird of prey/hare utilization	Tally of met criteria (must have ≥3 of 5)	Overall	Overall
			Mine-level	Site-level	Site-level	Site-level	Mine-level	Site-level	Mine-level	Site-level	Mine-level	Mine-level	Mine-level	Mine-level	Mine-level			
F-1	3	10	Very xeric sites well represented, no xeric or subxeric sites					✓	65% has at least 4 native vascular functional groups		18% has closed forest with ≥1000 sph	13% has medium-high ung. activity, <10% with no activity	55% has predator activity	Observed on 8% of mine area	Observed on 14% of mine area	1		4 of the 8 mine-level indicators have been met
F-2	3	10						✓								1		
F-3	1	20		✓	×	×		✓		×						2	×	
F-4	2	20		✓	✓	✓		✓		✓						5	✓	
G-1	1	25		×	✓	✓		✓		✓						4	✓	
G-2	5	20		×	✓	×		×		✓						2	×	
R-1	1	12				✓		✓		✓						3	✓	
R-2	2	15						✓		✓						2		
S-1	4	25		×	✓	✓		✓		✓						4	✓	
S-1w	1	25		✓	✓	×		✓		✓						4	✓	
S-2	6	15						✓		✓						2		
S-3	2	20		✓	×	×		✓		✓						3	✓	
S-4	2	27		×	✓	×		✓		✓						3	✓	
S-5	4	25		×	×	×		✓		✓						2	×	
S-6	3	14		✓		✓		✓		✓						4	✓	
T-1	3	2		✓	✓	✓		✓		✓						5	✓	
T-2	5	5		✓		✓		✓		✓						4	✓	
T-3	14	5		✓		✓		✓		✓						4	✓	

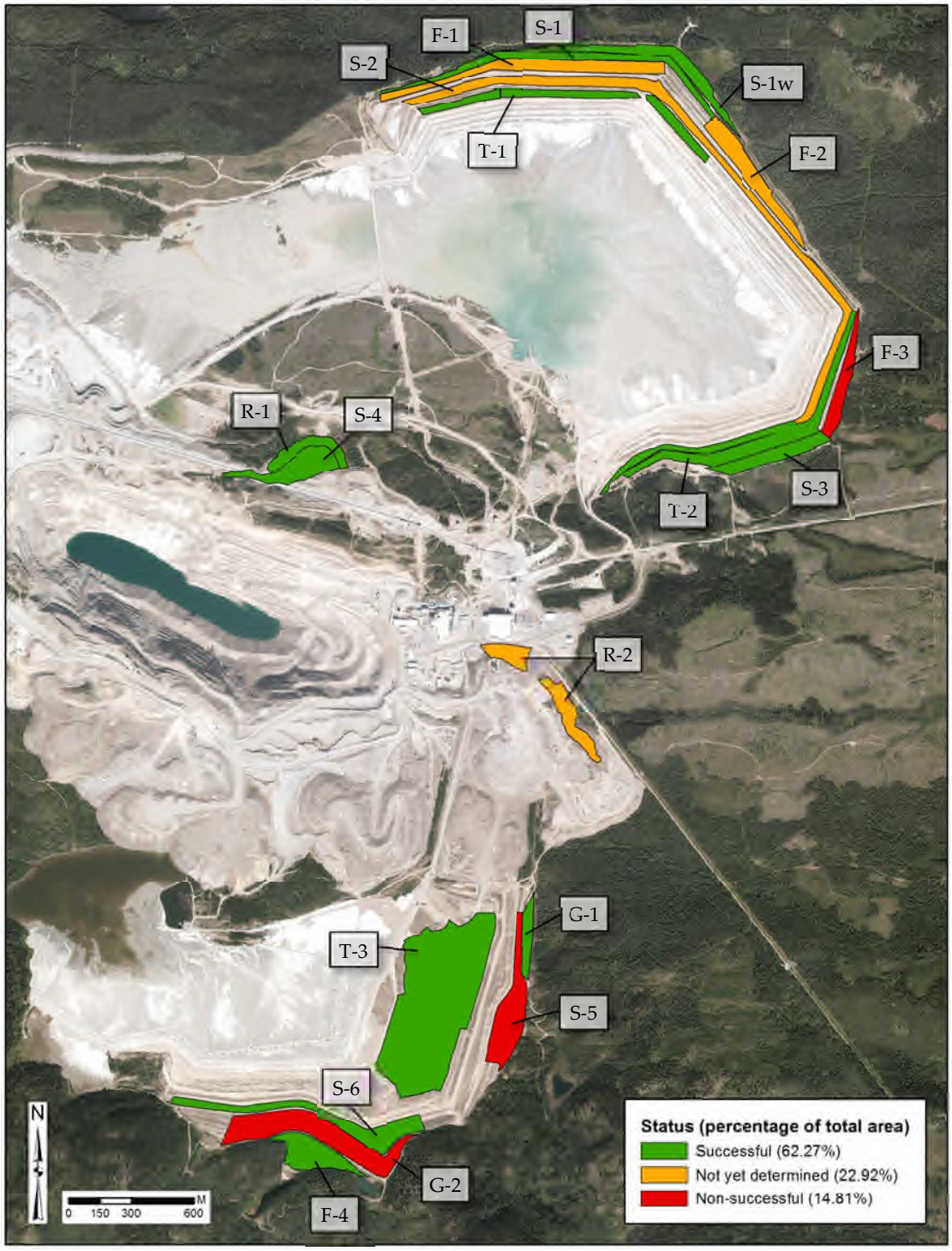


Figure 5-1. The distribution of successful, non-successful and not-yet-determined sites, and the proportion of total mine area that each status represents.

Although not directly identified in the indicator framework, conifer foliar-nutrient data (for nitrogen) was analyzed and indicates generally similar nutrient status between young forest stands on reclaimed sites and reference sites, although a few reclaimed sites have a pronounced nitrogen deficiency. Concentrations of molybdenum in forage material was elevated at reclaimed sites compared to reference sites. Both absolute Mo concentrations and Cu:Mo ratios are at levels that indicate a potential for occurrence of molybdenosis, based on maximum tolerable levels for farm animals (National Research Council, 2005). However, research conducted at the Endako site indicates that elevated Mo concentrations in both soils and vegetation were present in the area prior to mining, and that there is no evidence to date of any Mo toxicosis resulting from these elevated concentrations.

The discussion presented above focuses on a comparison of reclamation-site data to reference-site data from a similar age range. However, it is also important to understand the development trajectories of individual reclaimed sites, and of the reclaimed area as a whole. The chronosequence approach is one way of comparing reclaimed ecosystem trajectories to reference trajectories, and was used to assess LAI development at reclaimed sites over time. This analysis revealed that only 6 reclaimed sites appeared to be on a similar trajectory to reference sites, which suggests that ecosystem development on some reclaimed sites is delayed in comparison to development of ecosystems recovering from less severe disturbances. The best way to understand these site trajectories is to track change over time in permanent sample plots, once multiple measurements at these sites are available. Currently, only 2 sites have been re-sampled, but as more sites reach a re-sampling year, we anticipate that this will be a critical component of the program. Over time, we would expect successfully reclaimed sites to become more similar to reference sites, and thus show converging values for key indicators.

6. RECOMMENDATIONS

The following recommendations are offered for consideration, based on a synthesis of data collected to date (2013-2015) in this program.

6.1. REMEDIATION OF UNDER-PERFORMING SITES

- **F-3** – this site suffered some damage when sand from the seepage ditch was dumped on to the plot. It would likely benefit from removal of this seepage ditch material, as well as fill planting and fertilization to increase vegetation cover.
- **G-2** – this site is a mix of slopes and benches. The slopes are performing somewhat better than the benches, as the benches appear to be subject to repeated vehicle traffic, which is negatively affecting reclamation success. While the presence of a wood-mulch crust at

this site is likely reducing wind erosion, it may also be preventing seeds that land on the surface from accessing nutrients and water beneath the crust. This site could benefit from fill planting, to increase stem densities and provide cracks in the crust through which seeds can enter. Fertilization and restriction of vehicle traffic would also be beneficial to reduce initial seedling mortality.

- **S-5** – similar to G-2, this site is a mix of slopes and benches, and could also benefit from fertilization and restriction of vehicle traffic. The wood-mulch crust is more broken up at this site, but stem densities are still low and fill planting could be beneficial.

6.2. TREATMENTS FOR FUTURE RECLAMATION SUCCESS

Based on observations to date, information is provided below on reclamation treatments that have been successful on existing reclaimed areas, and that should be incorporated into future reclamation efforts. More detailed reclamation treatments ("prescriptions") will be developed in advance of new reclamation at Endako, based on reclamation history and classification systems developed and data collected through this assessment program.

- **Cover placement** – the use of "topsoil" covers at Endako has consistently facilitated successful reclamation. Applying a thin (e.g., 20 cm) surface-soil cover to tailings-sand sites will encourage native-species establishment at an early age and facilitate greater native cover and richness as sites develops. Applying a thicker cover (e.g., 50 cm or greater, potentially consisting of a subsoil lift overlain by a surface-soil lift) at waste-rock sites will provide the above benefits, as well as increasing soil water storage. Recently salvaged surface soils contain more viable seeds and soil microorganisms than stockpiled soil, and should be used when possible (i.e., in "direct-placement" programs, where salvaged surface soils are immediately placed on reclamation-ready areas rather than being stored).[14]
- **Site preparation –** techniques such as roughening the surface by creating rips or mounds can help stabilize the reclamation material against erosion and create microsites for seedling establishment.[15] The application of coarse woody debris (sourced from nearby logging or from mine-clearing operations) will create microsites for seed germination,

[14] R-2 and S-2 are the only covered sites that failed to meet reclamation requirements. In the case of R-2, the combination of a topsoil cover and hydroseeding with agronomic legumes resulted in dense cover of primarily exotic species that have low functional diversity. Thus, hydroseeding should be restricted to uncovered sites where surface stabilization is required. S-2 experienced substantial dust deposition from nearby Tailings Pond 1, which likely restricted plant growth. Sites that are located close to the top of tailings dams may require recently-salvaged topsoil covers to facilitate rapid plant establishment that can resist the negative effects of dust deposition (e.g. T-1).

[15] These techniques are primarily applicable to waste-rock or soil-cover sites.

and could help reduce erosion on tailings-sand sites.[16] Application of fine woody debris ("slash") including branches with cones could potentially provide a source of tree seeds and other biota.

- **Revegetation –** where soil covers cannot be placed, hydroseeding could be useful for stabilizing the surface and adding organic material; however, native-seed mixes should be used to minimize the likelihood of dominance by a few agronomic exotic species. Applying fertilizer to sites without soil covers or underperforming sites that require remediation, particularly those with wood mulches, may assist in decomposing the wood mulch over time and facilitating vegetation establishment. Certain functional groups, such as dwarf woody species, are an important food source for ungulates and are only present in reclaimed areas where they were planted or where topsoil covers were used. Therefore, planting dwarf woody species (e.g. kinnikinnik, twinflower) at non-covered sites is recommended to facilitate their establishment across the reclaimed area.
- **Forestry prescriptions –** considering the low stem densities observed on most reclaimed sites and limited evidence of recruitment, planting higher densities and/or fill planting could ensure greater stem densities when sites reach maturity and increase the likelihood of achieving a closed forest canopy that would provide cover for wildlife. In addition, spot fertilizer application for seedlings (either in-hole slow-release fertilizer [e.g. fertilizer tablets or teabags] during planting or foliar fertilization for established seedlings) could be used to reduce early mortality and/or stunted growth.

As we begin to assess individual site trajectories over time, our ability to design future site prescriptions will continue to improve, and a greater emphasis will be placed on treatment planning in future reports.

6.3. IMPROVEMENTS TO THE RECLAMATION-ASSESSMENT PROCESS

- **Increased reference-site representation** – particularly for indicator 1.2.3 (at the mine-level), the limited sampled reference area (in comparison to the much larger sampled reclaimed area) area makes it difficult to fairly compare the total number of native species observed on reference and reclaimed areas. Increasing the number of reference sites will provide better information on ranges of natural variation and improve the comparison of reclaimed sites to reference sites. Addition of reference sites is planned for the 2016 program.
- **A 2017 re-evaluation of the C&I framework –** once the full complement of PSPs have been installed, to ensure that indicators and thresholds reflect the full dataset, and that

[16] Coarse woody debris was observed on the surface of T-3 (refer to cover photo), and may be contributing to high functional and species diversity at this site.

the selected indicators are correctly distinguishing between successfully reclaimed sites and those that are under-performing.

- **Use of structural stages to classify reclaimed and reference sites –** structural-stage classification takes into account vegetation cover, vegetation layering, functional groups, and forest-stand dynamics. A higher structural stage (larger number in the B.C. classification system) is indicative of increased structural diversity, which increases the capacity for vegetation diversity and wildlife usage. In contrast, a greater site age is not necessarily indicative of increased structural diversity, particularly for reclaimed sites, and it is difficult to interpret site trends in wildlife data when they are arranged by site age. For example, greater snowshoe hare activity would be expected on reclaimed sites that have shrub-layer dominated cover (structural stage 3), which was identified on reclaimed sites aged 5, 10, 14, and 20.
- **Continued monitoring of all reclamation PSPs –** regardless of whether they have passed or failed according to the C&I framework, to facilitate a deeper understanding of reclamation performance and site trajectories over time. We anticipate that most sites would be monitored for assessment purposes only, but that a "core" network of PSPs would be maintained to provide longer-term information on reclamation success.
- **Continued spatial analysis of reclamation success –** continued spatial analysis of the total mine area and proportions of reclamation sites meeting success criteria (e.g., Figure 5-1) should be conducted and reported on an annual basis, so that the need for remediation of non-successful sites vs improved reclamation at future sites can be evaluated during each assessment.

6.4. FUTURE RECLAMATION ASSESSMENT WORK

To date, 18 of the 19 reclaimed sites have had PSPs installed, with the last reclaimed site, S-7, scheduled to be sampled in 2017. The intent of the field program in 2016 is to re-sample PSPs installed on R-1, S-4 and T-2, in accordance with the sampling schedule. Due to the low number of reclaimed PSPs (5) that require re-sampling in 2016, it is proposed that 9 reference PSPs be added to increase the total sampled reference area to 2500 m^2, and further improve our understanding of natural variation across reference site ages and biogeoclimatic subzones.

In 2017, once the full complement of reclaimed PSPs has been installed and the total reference area has been increased to 3000 m^2,or 30 PSPs, we recommend a re-evaluation of the C&I framework to ensure that indicators and thresholds reflect the full dataset, and that the selected indicators are correctly distinguishing between successfully reclaimed sites, and those that are under-performing.

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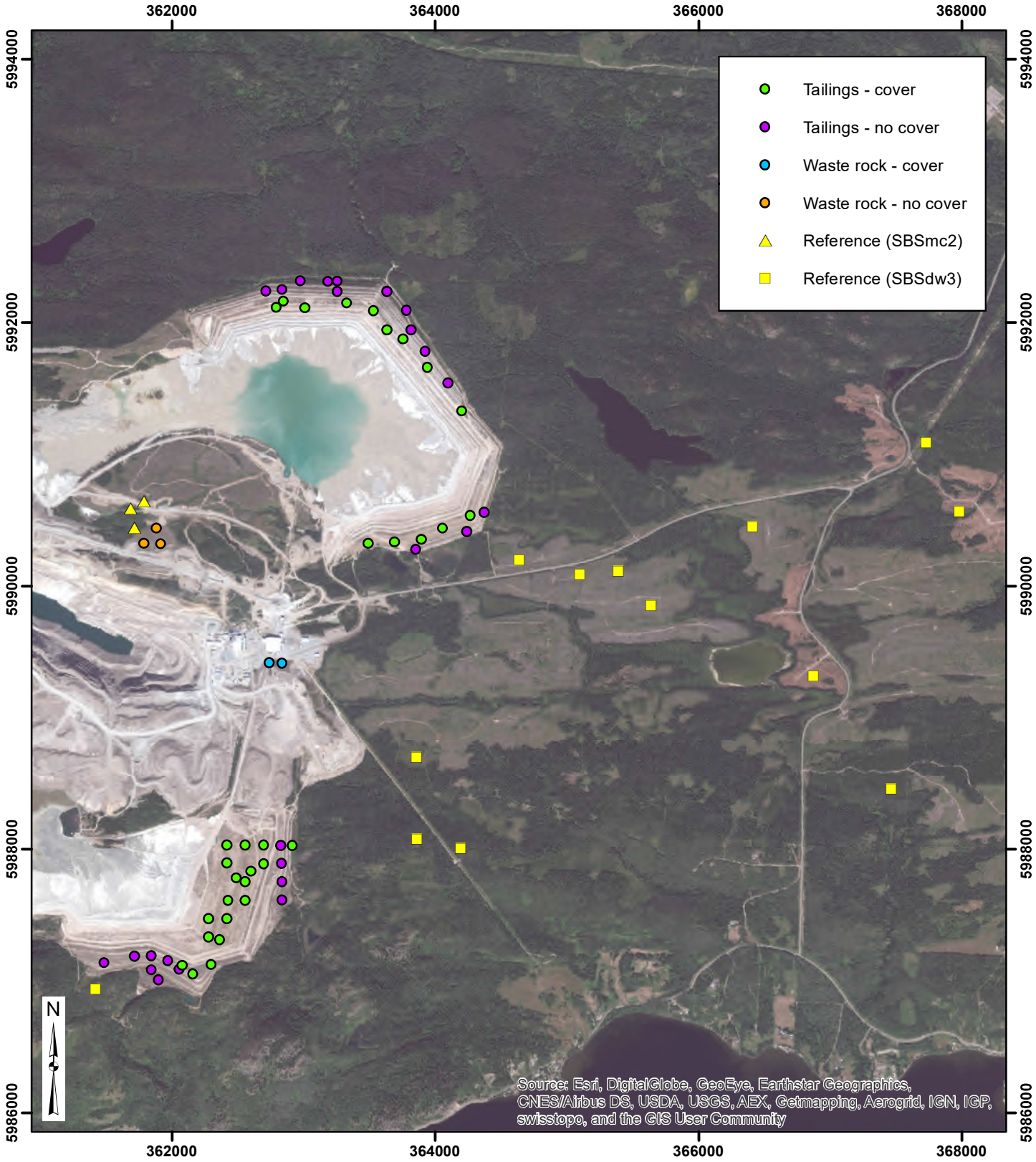
LIST OF APPENDICES

APPENDIX A – SITE MAPS

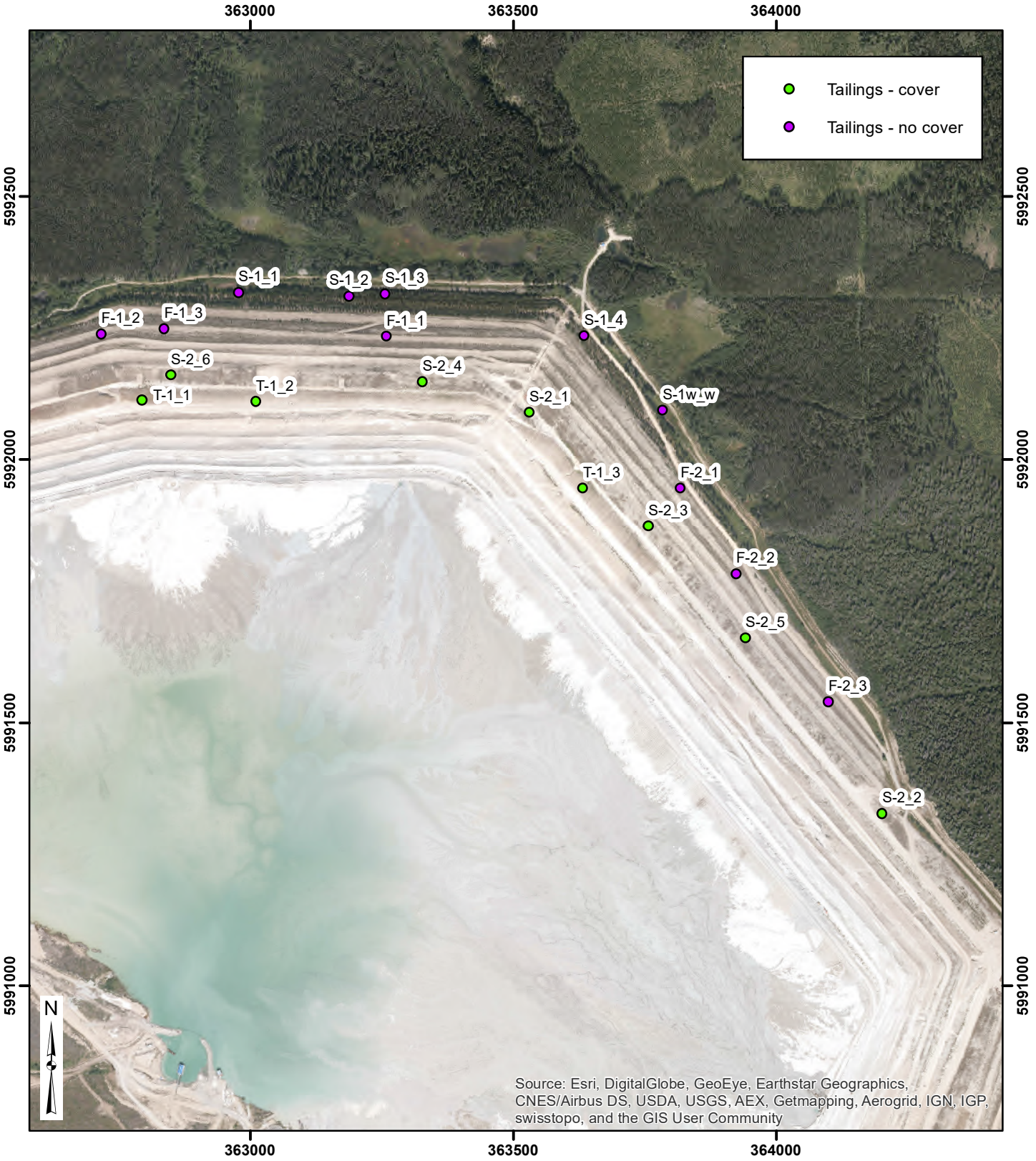


IEG Integral Ecology Group

Reclamation Assessment: Map 1 Overview of Study Area Sites

0 0.25 0.5 1 Km

Created by: Melissa Iverson
Date: January 18, 2016
Project code: ENDRAS-15
Datum/Projection: NAD83 UTM ZONE 10N

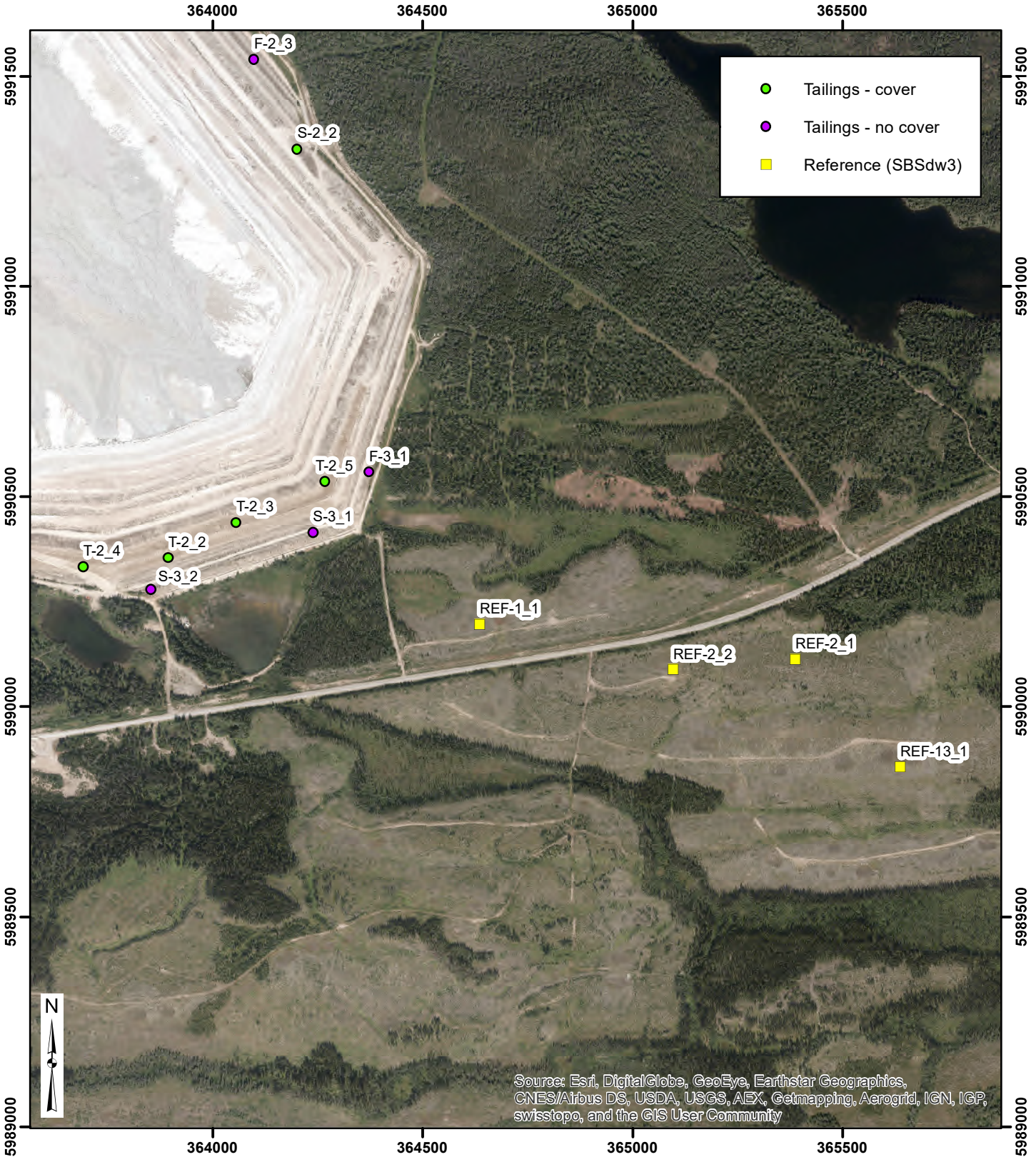


IEG Integral Ecology Group

Reclamation Assessment: Map 2 Northern Study Area Sites

0 75 150 300 M

Created by: Melissa Iverson
Date: January 18, 2016
Project code: ENDRAS-15
Datum/Projection: NAD83 UTM ZONE 10N

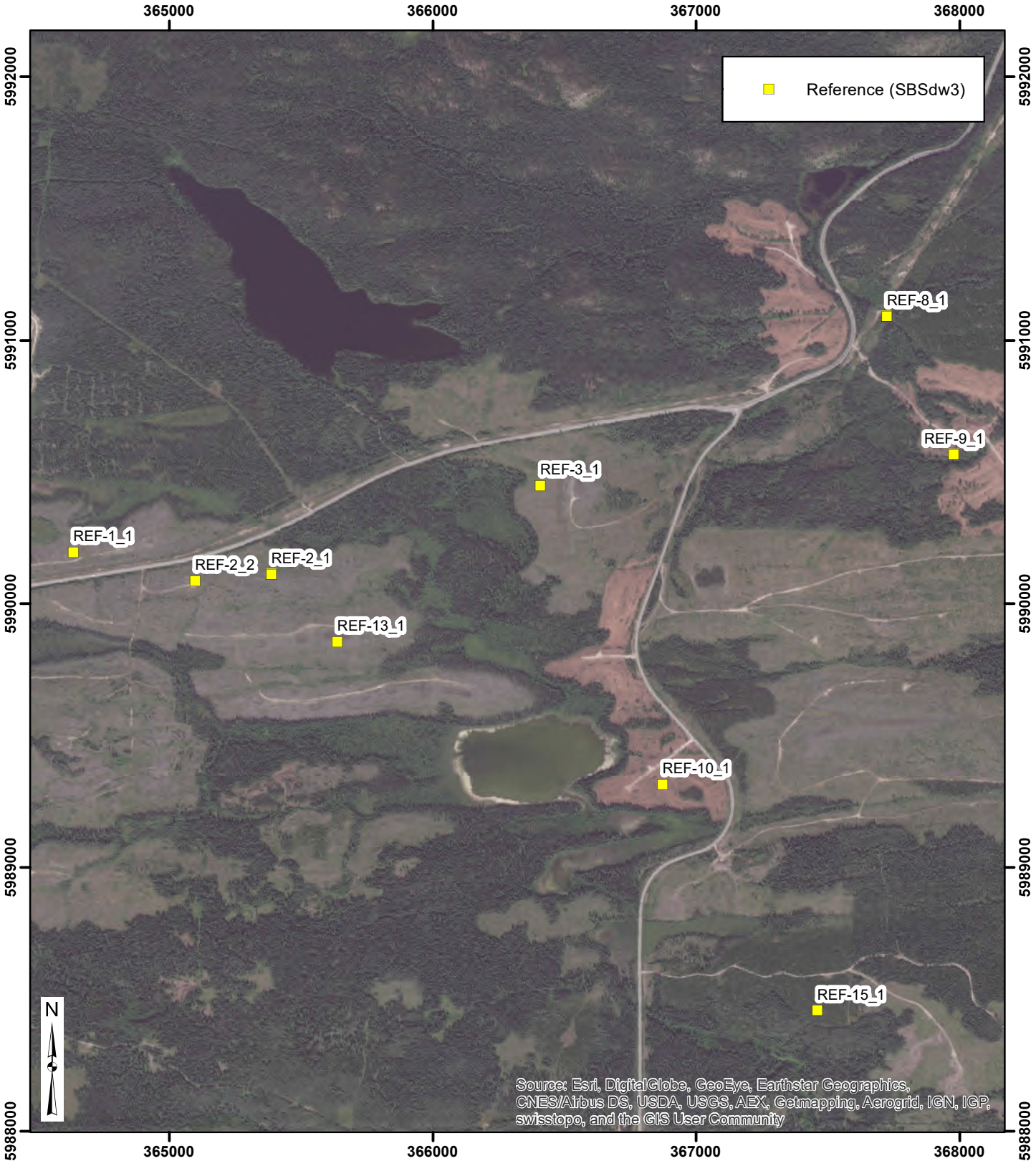


IEG Integral Ecology Group

Reclamation Assessment: Map 3 Central Study Area Sites

0 100 200 400 M

Created by: Melissa Iverson
Date: January 18, 2016
Project code: ENDRAS-15
Datum/Projection: NAD83 UTM ZONE 10N

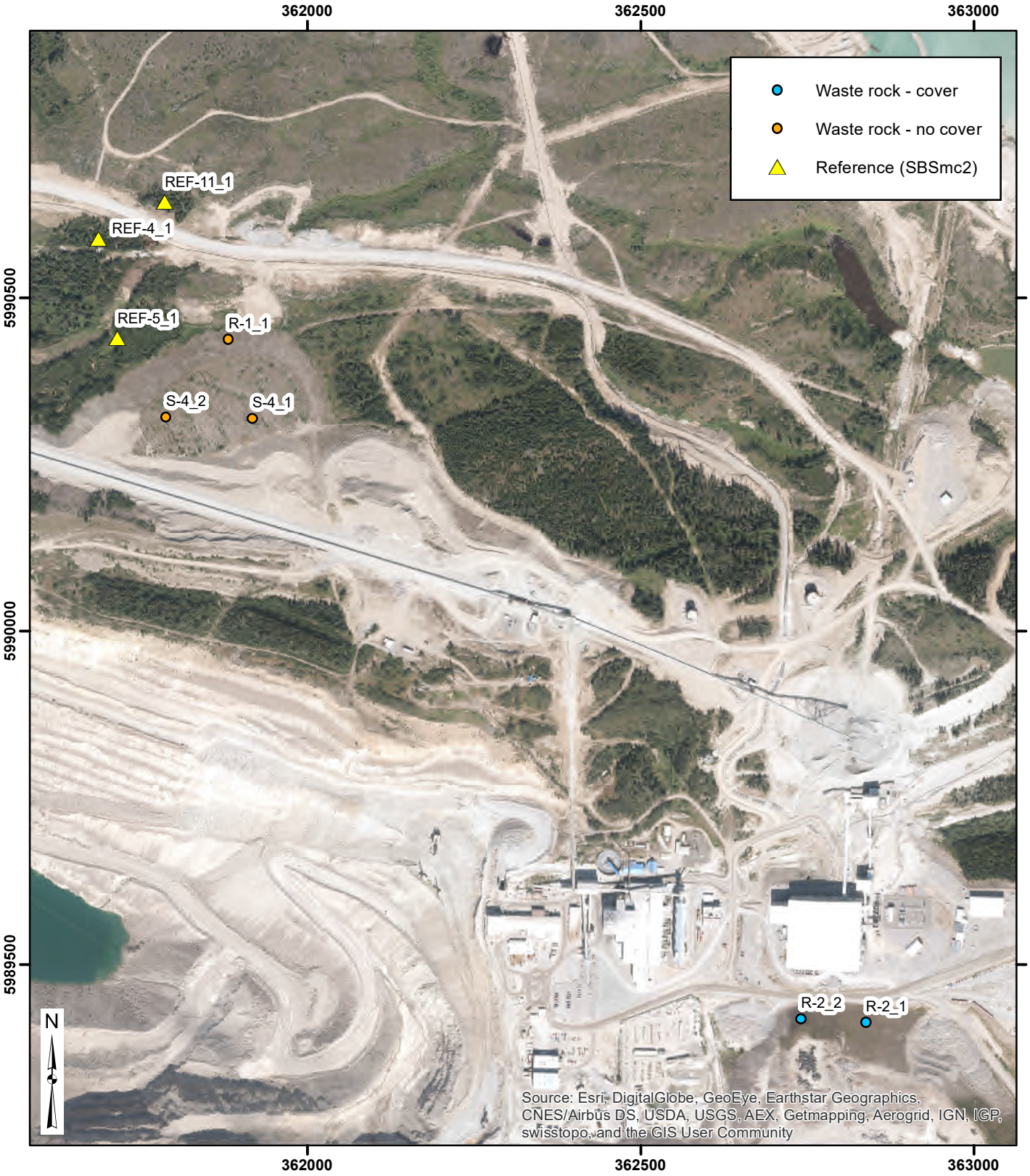


IEG Integral Ecology Group

Reclamation Assessment: Map 4 Eastern Study Area Sites

0 150 300 600 M

Created by: Melissa Iverson
Date: January 18, 2016
Project code: ENDRAS-15
Datum/Projection: NAD83 UTM ZONE 10N

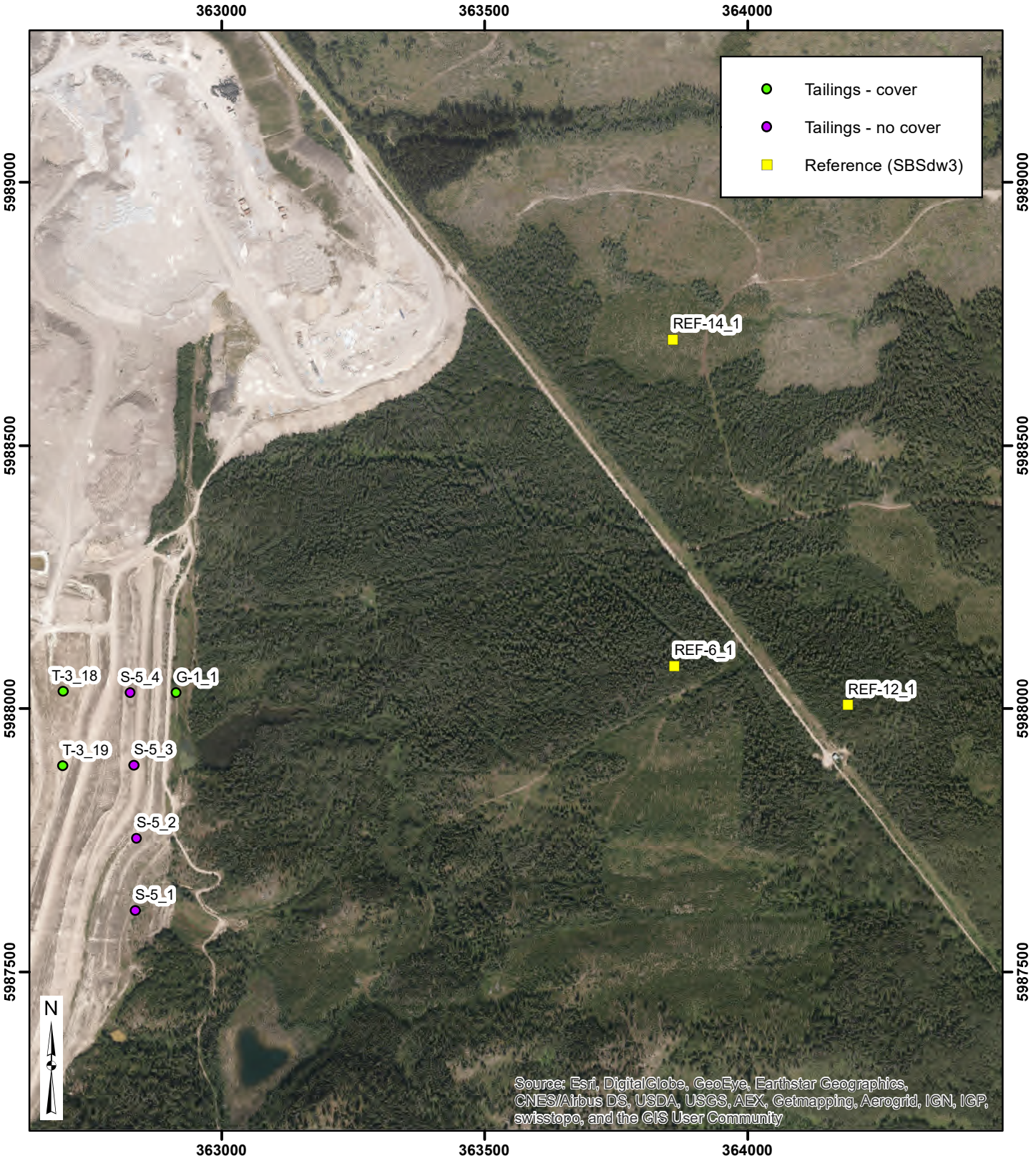


IEG Integral Ecology Group

Reclamation Assessment: Map 5 Western/Central Study Area Sites

0 50 100 200 M

Created by: Melissa Iverson
Date: January 18, 2016
Project code: ENDRAS-15
Datum/Projection: NAD83 UTM ZONE 10N



IEG Integral Ecology Group

Reclamation Assessment: Map 6 Southern/Central Study Area Sites

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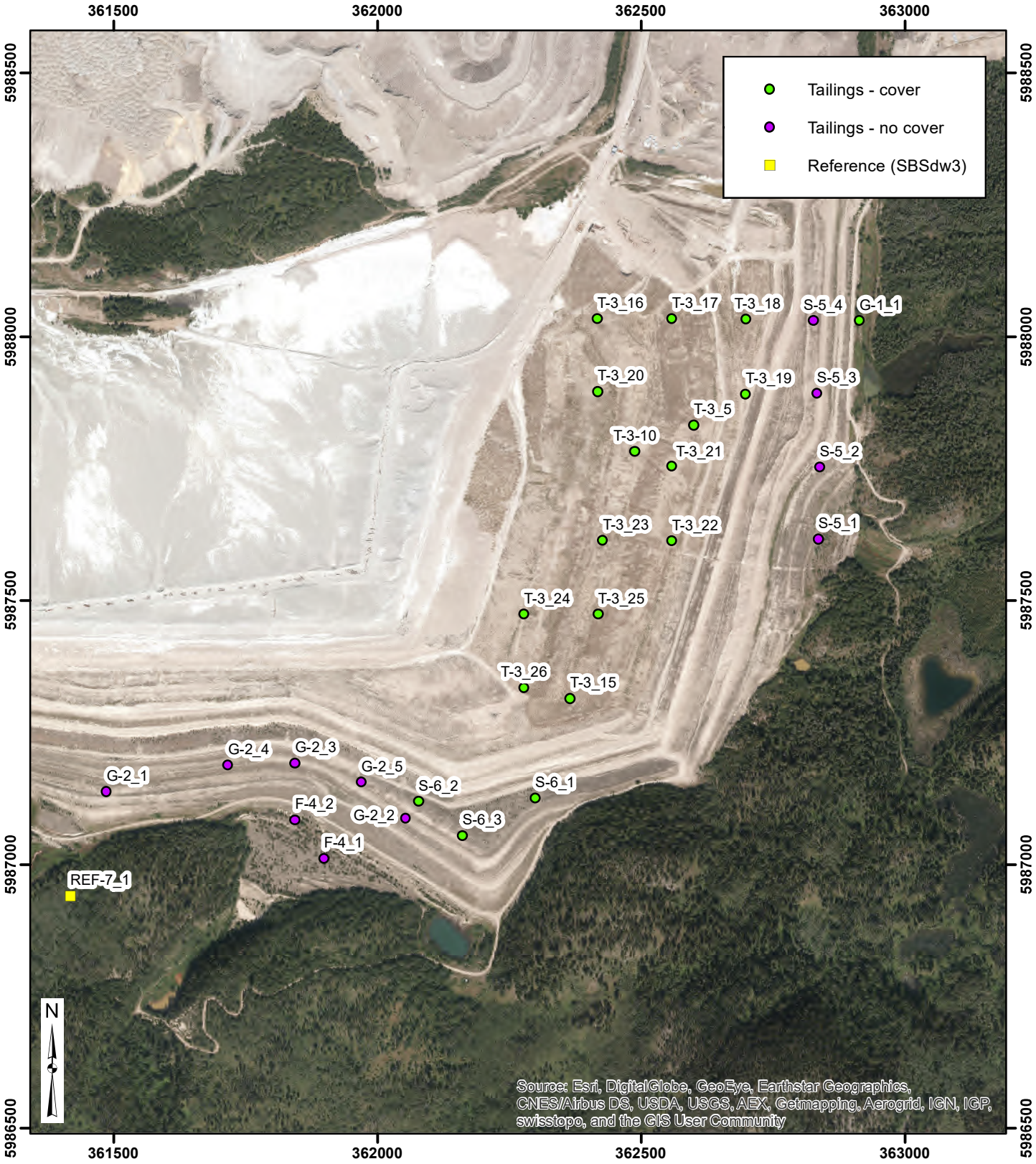
Created by: Melissa Iverson
Date: January 18, 2016
Project code: ENDRAS-15
Datum/Projection: NAD83 UTM ZONE 10N



IEG Integral Ecology Group

Reclamation Assessment: Map 7 Southern Study Area Sites

0 75 150 300 M

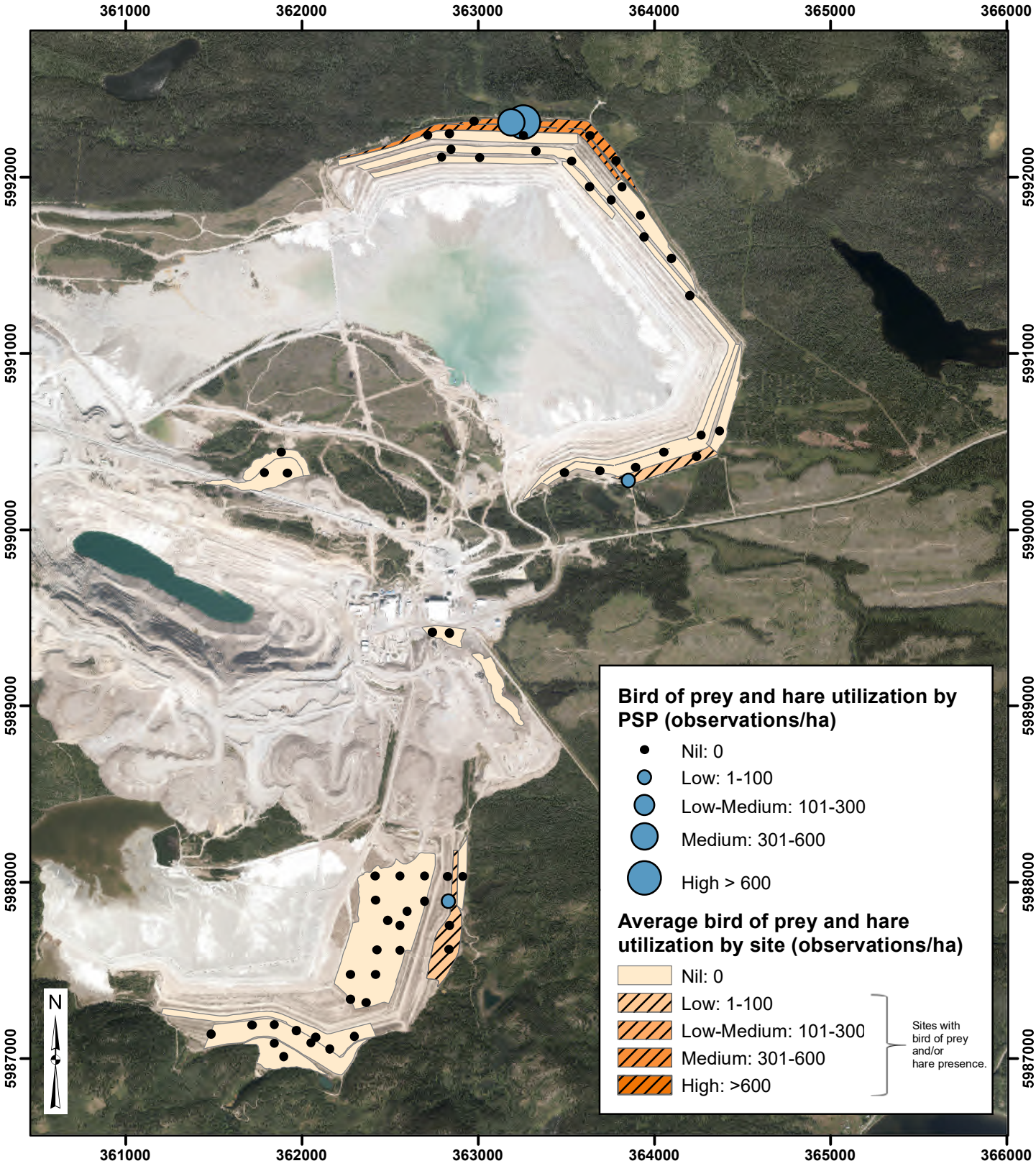
Created by: Melissa Iverson
Date: January 18, 2016
Project code: ENDRAS-15
Datum/Projection: NAD83 UTM ZONE 10N

APPENDIX B — SITE COORDINATES

PSP	Site	Year Sampled	Easting	Northing	Year_est
F-1_1	F-1	2013, 2015	363259	5992234	2005
F-1_2	F-1	2013, 2015	362717	5992238	2005
F-1_3	F-1	2013	362837	5992248	2005
F-2_1	F-2	2015	363818	5991945	2005
F-2_2	F-2	2015	363924	5991783	2005
F-2_3	F-2	2015	364099	5991540	2005
F-3_1	F-3	2015	364373	5990558	1995
F-4_1	F-4	2013	361899	5987011	1993
F-4_2	F-4	2013	361844	5987084	1993
G-1_1	G-1	2015	362914	5988030	1990
G-2_1	G-2	2013	361486	5987138	1993
G-2_2	G-2	2014	362054	5987087	1993
G-2_3	G-2	2013	361844	5987191	1993
G-2_4	G-2	2014	361717	5987188	1993
G-2_5	G-2	2013	361970	5987156	1993
R-1_1	R-1	2013	361882	5990438	2001
R-2_1	R-2	2013	362838	5989413	1998
R-2_2	R-2	2013	362741	5989418	1998
REF-1_1	REF-1	2013	364636	5990196	NA
REF-10_1	REF-10	2014	366872	5989316	NA
REF-11_1	REF-11	2014	361786	5990645	NA
REF-12_1	REF-12	2014	364191	5988007	NA
REF-13_1	REF-13	2015	365638	5989856	NA
REF-14_1	REF-14	2015	363858	5988701	NA
REF-15_1	REF-15	2015	367460	5988458	NA
REF-2_1	REF-2	2013	365388	5990113	NA
REF-2_2	REF-2	2014	365097	5990088	NA
REF-3_1	REF-3	2013	366409	5990449	NA
REF-4_1	REF-4	2014	361687	5990589	NA
REF-5_1	REF-5	2014	361715	5990440	NA
REF-6_1	REF-6	2014	363861	5988081	NA
REF-7_1	REF-7	2014	361418	5986940	NA
REF-8_1	REF-8	2014	367725	5991091	NA
REF-9_1	REF-9	2014	367979	5990566	NA
S-1_1	S-1	2015	362978	5992317	1990
S-1_2	S-1	2015	363188	5992310	1990
S-1_3	S-1	2015	363257	5992314	1990
S-1_4	S-1	2015	363635	5992235	1990
S-1w_w	S-1W	2015	363784	5992093	1990
S-2_1	S-2	2014	363531	5992089	1998
S-2_2	S-2	2013	364202	5991327	1998
S-2_3	S-2	2014	363757	5991873	1998
S-2_4	S-2	2013	363328	5992148	1998
S-2_5	S-2	2014	363942	5991661	1998
S-2_6	S-2	2013	362849	5992160	1998

PSP	Site	Year Sampled	Easting	Northing	Year_est
S-3_1	S-3	2015	364240	5990414	1995
S-3_2	S-3	2015	363853	5990279	1995
S-4_1	S-4	2013	361918	5990319	1986
S-4_2	S-4	2013	361788	5990321	1986
S-5_1	S-5	2015	362836	5987616	1990
S-5_2	S-5	2015	362839	5987753	1990
S-5_3	S-5	2015	362834	5987892	1990
S-5_4	S-5	2015	362827	5988030	1990
S-6_1	S-6	2013	362299	5987125	1999
S-6_2	S-6	2013	362078	5987119	1999
S-6_3	S-6	2013	362161	5987054	1999
T-1_1	T-1	2014	362794	5992113	2012
T-1_2	T-1	2014	363011	5992110	2012
T-1_3	T-1	2014	363633	5991945	2012
T-2_1	T-2	2013, 2015	363491	5990321	2008
T-2_2	T-2	2014	363895	5990354	2008
T-2_3	T-2	2013	364056	5990438	2008
T-2_4	T-2	2014	363692	5990333	2008
T-2_5	T-2	2013	364268	5990536	2008
T-3_15	T-3	2013, 2015	362365	5987314	2010
T-3_16	T-3	2015	362417	5988034	2010
T-3_17	T-3	2015	362558	5988034	2010
T-3_18	T-3	2015	362699	5988033	2010
T-3_19	T-3	2015	362698	5987891	2010
T-3_20	T-3	2015	362418	5987896	2010
T-3_21	T-3	2015	362558	5987754	2010
T-3_22	T-3	2015	362558	5987613	2010
T-3_23	T-3	2015	362427	5987614	2010
T-3_24	T-3	2015	362278	5987474	2010
T-3_25	T-3	2015	362419	5987474	2010
T-3_26	T-3	2015	362278	5987334	2010
T-3_5	T-3	2013, 2015	362600	5987832	2010
T-3-10	T-3	2013, 2015	362488	5987782	2010

APPENDIX C — WILDLIFE MAP

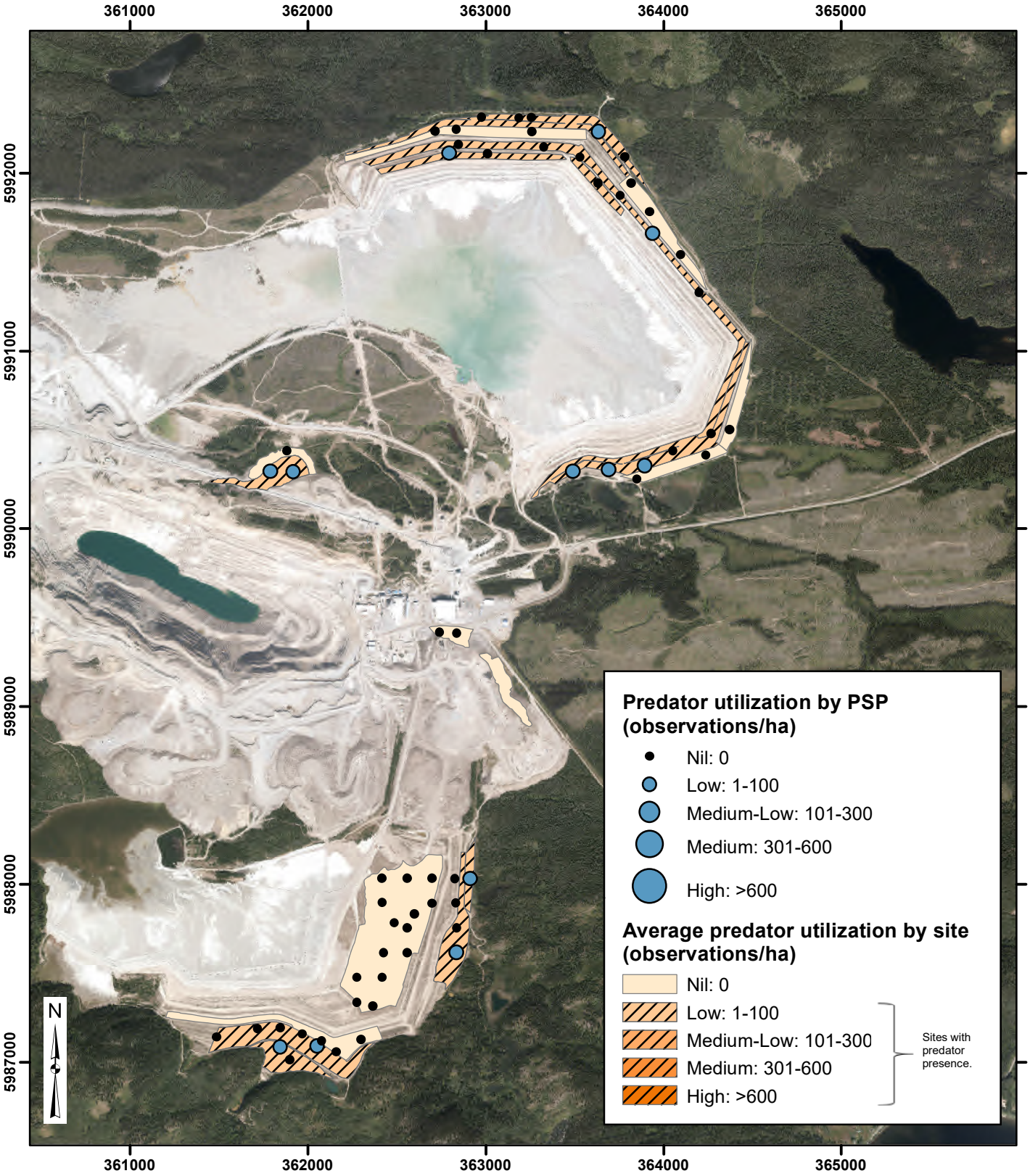


IEG Integral Ecology Group

Bird of Prey and Snowshow Hare (*Lepus americanus*) Utilization by Permanent Sample Plot (Total) and Site (Average)

0 250 500 1,000 M

Created by: Melissa Iverson
Date: January 18, 2016
Project code: ENDRAS-15
Datum/Projection: NAD83 UTM ZONE 10N



IEG Integral Ecology Group

Predator Utilization by Permanent Sample Plot (Total) and Site (Average)

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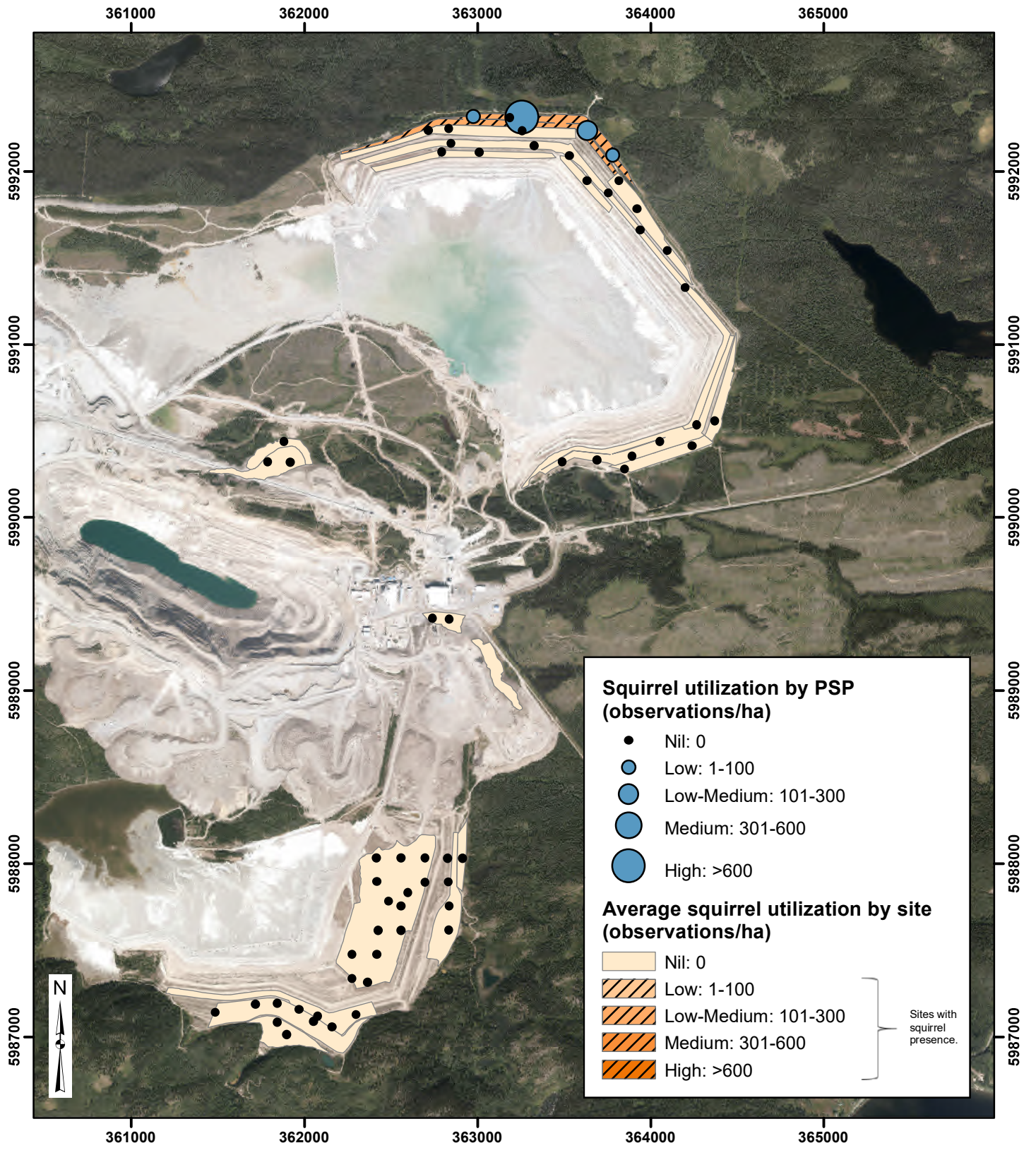
Created by: Melissa Iverson
Date: January 18, 2016
Project code: ENDRAS-15
Datum/Projection: NAD83 UTM ZONE 10N

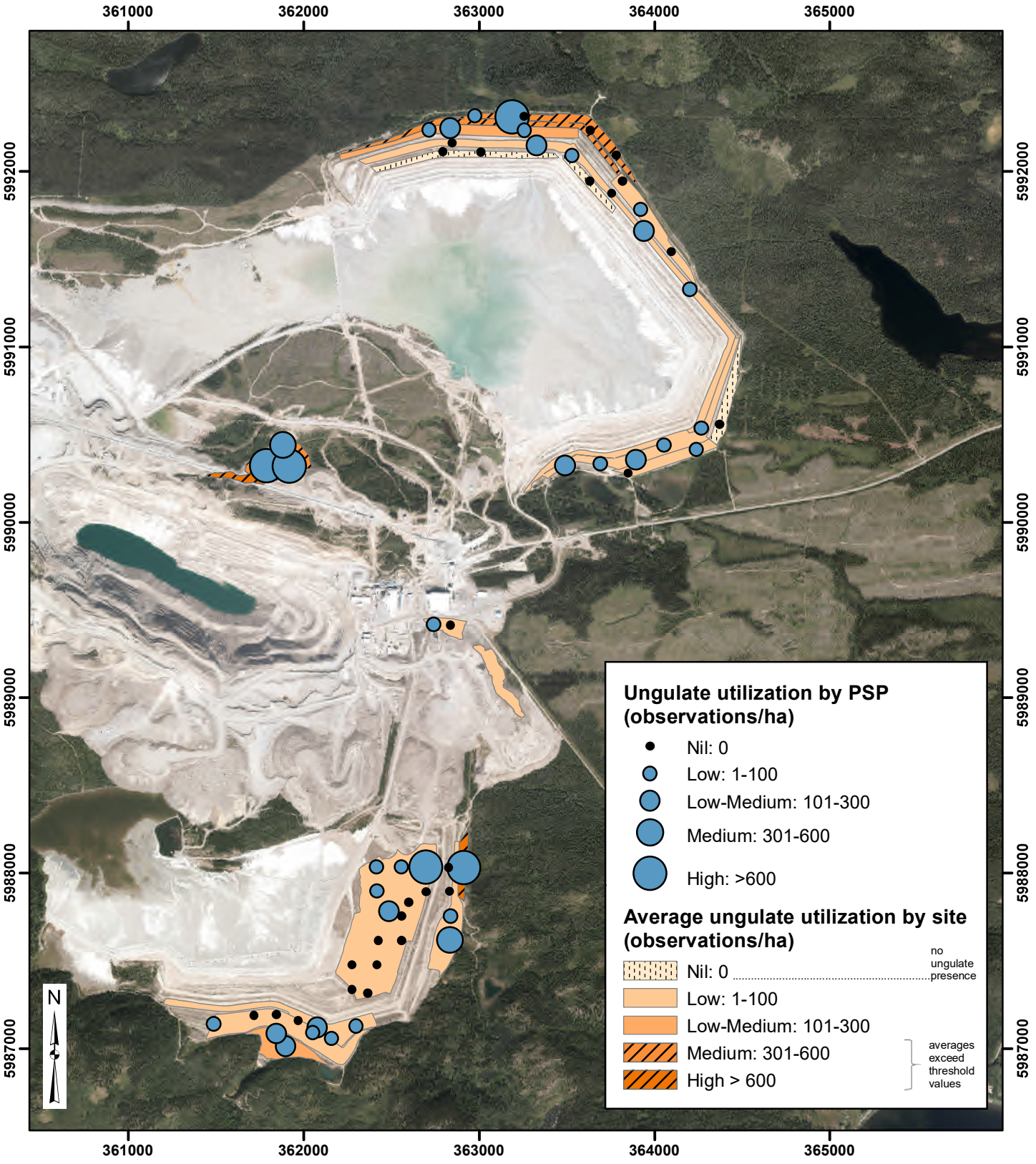


IEG Integral Ecology Group

Western Red Squirrel (*Tamiasciurus hudsonicus*) Utilization by Permanent Sample Plot (Total) and Site (Average)

0 250 500 1,000 M

Created by: Melissa Iverson
Date: January 18, 2016
Project code: ENDRAS-15
Datum/Projection: NAD83 UTM ZONE 10N



IEG Integral Ecology Group

Ungulate Utilization by Permanent Sample Plot (Total) and Site (Average)

0 250 500 1,000 M

Created by: Melissa Iverson
Date: January 18, 2016
Project code: ENDRAS-15
Datum/Projection: NAD83 UTM ZONE 10N

APPENDIX D – CRITERIA AND INDICATORS FRAMEWORK

1. CRITERIA & INDICATORS OF RECLAMATION SUCCESS

1.1. BACKGROUND

One of the objectives of this study is to develop "ecosystem-based" criteria for reclamation assessment, as alternatives to current clauses under Endako's *Mines Act* Permit M-4. The following section presents an approach and framework for these revised criteria, based on data collected in this program in 2013 and 2014. This approach and framework are being proposed for discussion and review; the intent is to finalize framework details following data collection and analysis in 2015.

There is a developing precedent for the use of a "criteria-and-indicators" (C&I) approach to reclamation "certification" in western Canada. Related use of C&I for ecosystem management began with the publication in 1992 of the International Tropical Timber Organization's *Criteria for the measurement of sustainable tropical forest management* (ITTO, 1992). This C&I approach was subsequently adopted by countries with non-tropical (temperate and boreal) forests through the "Montreal Process Working Group" (1994). Canada, as a member of the Montreal Process Working Group, produced its first document on C&I for sustainable forest management in 1995, with an updated document produced in 2003 (Canadian Council of Forest Ministers, 2003).

In the late 2000s, the Cumulative Environmental Management Association, a multi-stakeholder group mandated to produce environmental management frameworks for oil-sands development and reclamation, began a process of adapting Canada's CCFM C&I approach to certification of reclaimed lands disturbed by oil-sands mining. This culminated in the recommendation of a *Criteria and indicators framework for oil sands mine reclamation certification* to the Alberta Government in 2012 (Alberta Environment and Sustainable Resource Development, 2013).

Following the above approach, a number of criteria, indicators, and associated parameters are proposed for use in formal assessment of reclamation at Endako. Indicator selection was based on analysis of data collected to date, with the intent of selecting indicators that are:

- reliable – relatively easy to measure with precision and accuracy;
- responsive – show changes as a result of shifting ecologic processes;
- robust – to changing conditions as reclamation sites mature and develop;
- meaningful – reflect aspects of reclaimed ecosystems believed to be important to overall reclamation goals, objectives, and regulatory obligations;
- comparable – between reclaimed sites and reference conditions;
- scientifically sound and defensible; and

- cost-effective.

1.2. C&I HIERARCHICAL STRUCTURE AND TERMINOLOGY

The discussion below draws on the approach and terminology of both the CCFM and AESRD documents discussed above, and presents a hierarchical C&I framework for Endako. The following definitions are used in this discussion:

- **Goal –** the goal describes the final result or outcome of reclamation, and is related to designated end land uses.
- **Objectives –** subsets of the goal statement that more specifically delineate desired outcomes, and collectively describe the goal.
- **Criteria –** conditions or processes by which achievement of a reclamation objective can be assessed. There may be multiple criteria for each objective.
- **Indicator –** a quantifiable attribute that, when measured or monitored periodically, indicates the status or trend with respect to a criterion. There may be multiple indicators for each criterion.
- **Measure –** the specific variable that is measured for each indicator.
- **Method –** the specific methods used to collect data for each measure.
- **Threshold –** the quantified value that determines whether or not desired outcomes are being achieved for each indicator.

1.3. INDICATOR TESTING

For the purposes of evaluating reclamation success with respect to these indicators, it is proposed that indicators be evaluated at either the site or mine level, as appropriate. In addition, for site-level testing, two parallel streams of evaluation are proposed:

1. For sites reclaimed with more modern methods like surface-soil salvage and placement, or that show convergence with reference sites, it is proposed that the tested indicator for species diversity (criterion 1.2) be convergence with reference conditions on the Shannon diversity – native-species richness graph.

2. For older reclamation sites, or sites showing less convergence, different indicators are proposed for species diversity (indicators 1.2.2 and 1.2.3). In addition, it is proposed that these sites would have to meet a minimum of two (of four) indicators for species diversity and ecosystem function (indicators)

Final evaluation of whether a reclaimed site meets a criterion is conducted at age 20 years.

Testing of indicators on reclaimed sites monitored to date is presented in Table 5.1 – information supporting these evaluations is presented in Appendix I.

1.4. TESTING SCHEDULE

It is proposed that all sites be tested against the C&I framework at ages of 10 and 20 years following reclamation and revegetation. Testing at year 10 allows a first evaluation of each site at a time when initial relative stability has been achieved, and testing at year 20 allows evaluation of longer-term conditions and whether desired attributes have been maintained over time. The ultimate determination of reclamation success for each site would be based on the second assessment, and for the mine-level indicators would be determined once reclamation is complete and the youngest sites have reached an age of 20 years. Testing dates are not necessarily the same as monitoring dates – monitoring and assessment may be conducted more frequently on at least a subset of sites to provide greater understanding of reclamation performance across the mine site and over time, to allow projections of testing success rates, and to identify under-performing sites early for potential remedial treatment.

1.5. INDICATOR TESTING VERSUS LONG-TERM MONITORING

It is important to differentiate between the long-term assessment and monitoring sites included in this study, and testing sites for the C&I framework, as follows:

- **C&I testing sites –**all reclamation sites would be tested as required by the proposed C&I framework at ages 10 and 20 years. No other reclamation monitoring in excess of reconnaissance-level surveys would occur on these sites, unless they are also part of the long-term assessment network. Sampling intensity on these sites is yet to be determined, but a reasonable compromise between acceptable accuracy and costs would likely result in sampling at an intensity of 1-10% of the area, or 1-10 plots per hectare. Survey and sampling would be focussed solely on C&I measures, and would thus require the following measurements at each testing location:
    - Characterization of vegetation community composition (species presence and abundance) and tree stem tallies in a 5.64m radial plot;
    - Characterization of soil surface organic-matter (litter) accumulation;
    - Excavation of a soil pit to approximately 75 cm, with collection of samples for analysis of particle-size distribution;

- Observation of wildlife utilization within a 4.7m radial plot.[1, 2]

- **Long-term assessment sites –** we have proposed that a network of approximately 50-60 reclaimed plots and 40-50 reference plots be maintained in a long-term assessment network. The purpose of this network is to provide more detailed understanding of the ecological processes and trajectories occurring on reclaimed sites at Endako, and thus to provide an information "backstop" to the C&I framework and testing sites. Thus this long-term study-site network supports the reclamation and C&I process by providing confidence that the C&I indicators are truly indicative of overall site success, and that other critical variables are not being missed. The long-term assessment sites would likely be visited more frequently than the testing schedule (e.g., have visits between 0-10 years of age, and at 15 years of age), and would be monitored past 20 years, to understand longer-term trends in reclamation development.

Sampling intensity on both testing and study/assessment sites would continue to be evaluated over time, to avoid over-commitment of resources.

[1] On the current assessment plots, 5 wildlife plots are installed for each vegetation plot. If sampling intensity for testing sites is increased to 5-10 plots per ha, it is proposed that the ratio of wildlife plots to vegetation plots be reduced to 1:1.

[2] A rough estimate of effort for this work is that a 3-person crew consisting of a vegetation ecologist, a wildlife biologist, and a soil scientist could complete approximately 6-8 of these testing plots per day.

APPENDIX E – FOREST STAND DENSITY BY SITE

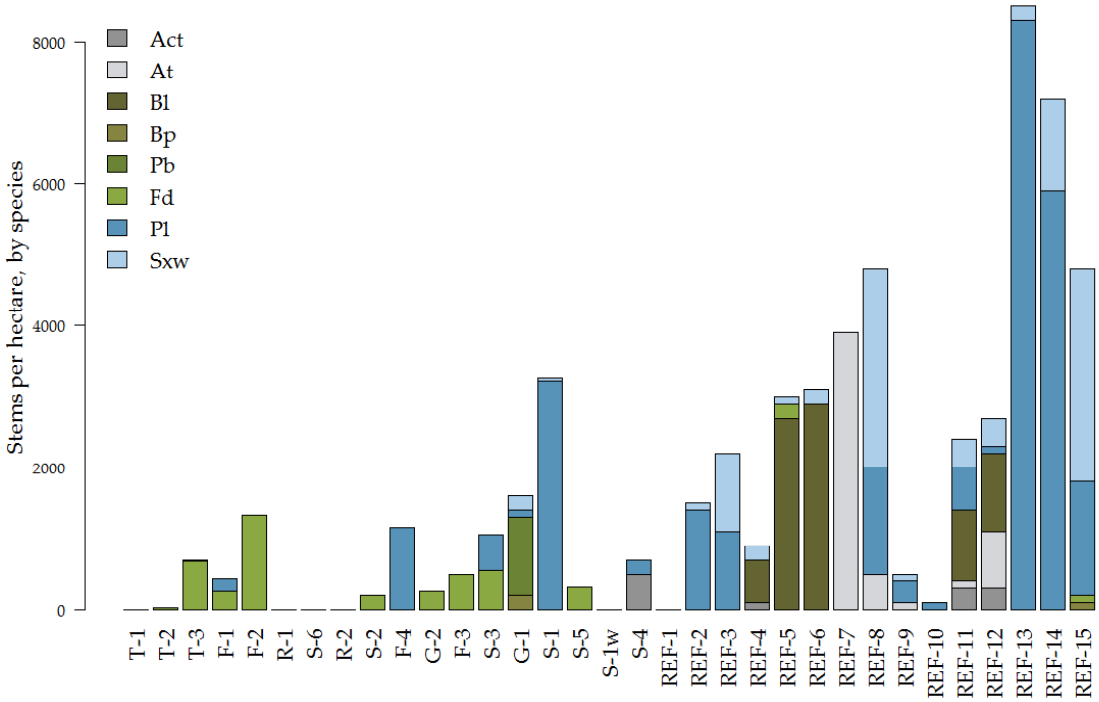


Figure A-1. Forest stand density by species at each site. (Act – Populus trichocarpa; At – Populus tremuloides; Bl – Abies lasiocarpa; Bp – Betula papyrifera; Pb – Populus balsamifera; Fd – Pseudotsuga mensiesii; Pl – Pinus contorta; Sxw – Picea glauca x engelmannii)

APPENDIX F — LABORATORY RESULTS

REPORTED TO	Integrated Ecology Group	**WORK ORDER**	5070708
PROJECT	ENDRAS-15	**REPORTED**	Jul-17-15

Analyte	Result / *Recovery*	MRL / *Limits*	Units	Prepared	Analyzed	Notes
Sample ID: S-5-1 (5070708-01) [Tissue (dry)] Sampled: Jul-08-15						
General Parameters						
Moisture	**22.3**	0.1	% wet	N/A	Jul-15-15	
Metals in Tissue						
Aluminum	**30.7**	0.4	mg/kg dry	Jul-13-15	Jul-17-15	
Antimony	**0.004**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Arsenic	**0.015**	0.005	mg/kg dry	Jul-13-15	Jul-17-15	
Barium	**4.49**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Beryllium	**0.003**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Bismuth	< 0.03	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Boron	**27.0**	0.1	mg/kg dry	Jul-13-15	Jul-17-15	
Cadmium	**0.040**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Calcium	**9890**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Chromium	**0.07**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Cobalt	**0.019**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Copper	**3.93**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Iron	**107**	1	mg/kg dry	Jul-13-15	Jul-17-15	
Lead	**0.032**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Magnesium	**2760**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Manganese	**407**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Mercury	**0.015**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Molybdenum	**95.2**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Nickel	**0.11**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Phosphorus	**1540**	5	mg/kg dry	Jul-13-15	Jul-17-15	
Potassium	**17300**	10	mg/kg dry	Jul-13-15	Jul-17-15	
Selenium	**0.05**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Silver	< 0.01	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Sodium	**5**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Strontium	**163**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Thallium	< 0.001	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Tin	< 0.03	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Titanium	**1.80**	0.05	mg/kg dry	Jul-13-15	Jul-17-15	
Uranium	**0.007**	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Vanadium	**0.08**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Zinc	**12.6**	0.5	mg/kg dry	Jul-13-15	Jul-17-15	
Sample ID: S-1-5 (5070708-02) [Tissue (dry)] Sampled: Jul-06-15						
General Parameters						
Moisture	**51.4**	0.1	% wet	N/A	Jul-15-15	
Metals in Tissue						
Aluminum	**87.9**	0.4	mg/kg dry	Jul-13-15	Jul-17-15	
Antimony	**0.005**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Arsenic	**0.031**	0.005	mg/kg dry	Jul-13-15	Jul-17-15	
Barium	**5.04**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Beryllium	**0.008**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	

REPORTED TO	Integrated Ecology Group	**WORK ORDER**	5070708
PROJECT	ENDRAS-15	**REPORTED**	Jul-17-15

Analyte	Result / *Recovery*	MRL / *Limits*	Units	Prepared	Analyzed	Notes
Sample ID: S-1-5 (5070708-02) [Tissue (dry)] Sampled: Jul-06-15, Continued						
Metals in Tissue, Continued						
Bismuth	< 0.04	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Boron	**38.8**	0.1	mg/kg dry	Jul-13-15	Jul-17-15	
Cadmium	**0.094**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Calcium	**11500**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Chromium	**0.21**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Cobalt	**0.064**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Copper	**9.38**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Iron	**254**	1	mg/kg dry	Jul-13-15	Jul-17-15	
Lead	**0.047**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Magnesium	**4100**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Manganese	**108**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Mercury	**0.033**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Molybdenum	**244**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Nickel	**0.36**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Phosphorus	**2110**	5	mg/kg dry	Jul-13-15	Jul-17-15	
Potassium	**23800**	10	mg/kg dry	Jul-13-15	Jul-17-15	
Selenium	**0.15**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Silver	< 0.02	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Sodium	**19**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Strontium	**180**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Thallium	< 0.002	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Tin	< 0.04	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Titanium	**4.65**	0.05	mg/kg dry	Jul-13-15	Jul-17-15	
Uranium	**0.018**	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Vanadium	**0.32**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Zinc	**29.5**	0.5	mg/kg dry	Jul-13-15	Jul-17-15	
Sample ID: S-1-1 (5070708-03) [Tissue (dry)] Sampled: Jul-03-15						
General Parameters						
Moisture	**12.2**	0.1	% wet	N/A	Jul-15-15	
Metals in Tissue						
Aluminum	**35.6**	0.4	mg/kg dry	Jul-13-15	Jul-17-15	
Antimony	**0.002**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Arsenic	**0.016**	0.005	mg/kg dry	Jul-13-15	Jul-17-15	
Barium	**4.55**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Beryllium	**0.003**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Bismuth	< 0.02	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Boron	**44.4**	0.1	mg/kg dry	Jul-13-15	Jul-17-15	
Cadmium	**0.032**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Calcium	**12300**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Chromium	**0.06**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Cobalt	**0.023**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Copper	**5.20**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Iron	**118**	1	mg/kg dry	Jul-13-15	Jul-17-15	

REPORTED TO	Integrated Ecology Group	**WORK ORDER**	5070708
PROJECT	ENDRAS-15	**REPORTED**	Jul-17-15

Analyte	Result / *Recovery*	MRL / *Limits*	Units	Prepared	Analyzed	Notes
Sample ID: S-1-1 (5070708-03) [Tissue (dry)] Sampled: Jul-03-15, Continued						
Metals in Tissue, Continued						
Lead	**0.037**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Magnesium	**3210**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Manganese	**565**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Mercury	**0.010**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Molybdenum	**68.7**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Nickel	**0.20**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Phosphorus	**2440**	5	mg/kg dry	Jul-13-15	Jul-17-15	
Potassium	**18300**	10	mg/kg dry	Jul-13-15	Jul-17-15	
Selenium	**0.06**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Silver	< 0.01	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Sodium	**4**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Strontium	**232**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Thallium	**0.001**	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Tin	< 0.02	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Titanium	**1.87**	0.05	mg/kg dry	Jul-13-15	Jul-17-15	
Uranium	**0.012**	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Vanadium	**0.09**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Zinc	**16.5**	0.5	mg/kg dry	Jul-13-15	Jul-17-15	
Sample ID: T-3-20 (5070708-04) [Tissue (dry)] Sampled: Jul-04-15						
General Parameters						
Moisture	**12.1**	0.1	% wet	N/A	Jul-15-15	
Metals in Tissue						
Aluminum	**77.8**	0.4	mg/kg dry	Jul-13-15	Jul-17-15	
Antimony	**0.004**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Arsenic	**0.042**	0.005	mg/kg dry	Jul-13-15	Jul-17-15	
Barium	**6.36**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Beryllium	**0.006**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Bismuth	< 0.02	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Boron	**11.4**	0.1	mg/kg dry	Jul-13-15	Jul-17-15	
Cadmium	**0.170**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Calcium	**14400**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Chromium	**0.10**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Cobalt	**0.035**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Copper	**3.65**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Iron	**156**	1	mg/kg dry	Jul-13-15	Jul-17-15	
Lead	**0.062**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Magnesium	**4010**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Manganese	**271**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Mercury	**0.018**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Molybdenum	**433**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Nickel	**0.22**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Phosphorus	**6300**	5	mg/kg dry	Jul-13-15	Jul-17-15	
Potassium	**18300**	10	mg/kg dry	Jul-13-15	Jul-17-15	

REPORTED TO	Integrated Ecology Group	**WORK ORDER**	5070708
PROJECT	ENDRAS-15	**REPORTED**	Jul-17-15

Analyte	Result / *Recovery*	MRL / *Limits*	Units	Prepared	Analyzed	Notes
Sample ID: T-3-20 (5070708-04) [Tissue (dry)] Sampled: Jul-04-15, Continued						
Metals in Tissue, Continued						
Selenium	**0.10**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Silver	< 0.01	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Sodium	**20**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Strontium	**126**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Thallium	**0.003**	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Tin	< 0.02	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Titanium	**3.15**	0.05	mg/kg dry	Jul-13-15	Jul-17-15	
Uranium	**0.014**	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Vanadium	**0.18**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Zinc	**13.9**	0.5	mg/kg dry	Jul-13-15	Jul-17-15	
Sample ID: T-3-10 (5070708-05) [Tissue (dry)] Sampled: Jul-07-15						
General Parameters						
Moisture	**39.7**	0.1	% wet	N/A	Jul-15-15	
Metals in Tissue						
Aluminum	**40.0**	0.4	mg/kg dry	Jul-13-15	Jul-17-15	
Antimony	< 0.003	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Arsenic	**0.040**	0.005	mg/kg dry	Jul-13-15	Jul-17-15	
Barium	**9.11**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Beryllium	**0.007**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Bismuth	< 0.03	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Boron	**10.5**	0.1	mg/kg dry	Jul-13-15	Jul-17-15	
Cadmium	**0.090**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Calcium	**14800**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Chromium	**0.08**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Cobalt	**0.026**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Copper	**5.61**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Iron	**196**	1	mg/kg dry	Jul-13-15	Jul-17-15	
Lead	**0.036**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Magnesium	**4530**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Manganese	**267**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Mercury	**0.023**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Molybdenum	**218**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Nickel	**0.11**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Phosphorus	**5160**	5	mg/kg dry	Jul-13-15	Jul-17-15	
Potassium	**12400**	10	mg/kg dry	Jul-13-15	Jul-17-15	
Selenium	**0.06**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Silver	< 0.02	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Sodium	**13**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Strontium	**149**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Thallium	**0.003**	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Tin	**0.08**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Titanium	**1.64**	0.05	mg/kg dry	Jul-13-15	Jul-17-15	
Uranium	**0.008**	0.001	mg/kg dry	Jul-13-15	Jul-17-15	

REPORTED TO	Integrated Ecology Group	**WORK ORDER**	5070708
PROJECT	ENDRAS-15	**REPORTED**	Jul-17-15

Analyte	Result / *Recovery*	MRL / *Limits*	Units	Prepared	Analyzed	Notes
Sample ID: T-3-10 (5070708-05) [Tissue (dry)] Sampled: Jul-07-15, Continued						
Metals in Tissue, Continued						
Vanadium	**0.13**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Zinc	**36.7**	0.5	mg/kg dry	Jul-13-15	Jul-17-15	
Sample ID: T-3-18 (5070708-06) [Tissue (dry)] Sampled: Jul-03-15						
General Parameters						
Moisture	**12.9**	0.1	% wet	N/A	Jul-15-15	
Metals in Tissue						
Aluminum	**76.0**	0.4	mg/kg dry	Jul-13-15	Jul-17-15	
Antimony	**0.005**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Arsenic	**0.051**	0.005	mg/kg dry	Jul-13-15	Jul-17-15	
Barium	**142**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Beryllium	**0.012**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Bismuth	< 0.02	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Boron	**19.1**	0.1	mg/kg dry	Jul-13-15	Jul-17-15	
Cadmium	**0.151**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Calcium	**16400**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Chromium	**0.09**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Cobalt	**0.046**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Copper	**3.57**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Iron	**143**	1	mg/kg dry	Jul-13-15	Jul-17-15	
Lead	**0.083**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Magnesium	**4150**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Manganese	**735**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Mercury	**0.013**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Molybdenum	**145**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Nickel	**0.67**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Phosphorus	**4320**	5	mg/kg dry	Jul-13-15	Jul-17-15	
Potassium	**18400**	10	mg/kg dry	Jul-13-15	Jul-17-15	
Selenium	**0.10**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Silver	< 0.01	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Sodium	**7**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Strontium	**184**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Thallium	**0.004**	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Tin	**0.02**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Titanium	**3.75**	0.05	mg/kg dry	Jul-13-15	Jul-17-15	
Uranium	**0.015**	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Vanadium	**0.16**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Zinc	**24.9**	0.5	mg/kg dry	Jul-13-15	Jul-17-15	
Sample ID: G-1-1 (5070708-07) [Tissue (dry)] Sampled: Jul-03-15						
General Parameters						
Moisture	**12.9**	0.1	% wet	N/A	Jul-15-15	

REPORTED TO	Integrated Ecology Group	**WORK ORDER**	5070708
PROJECT	ENDRAS-15	**REPORTED**	Jul-17-15

Analyte	Result / *Recovery*	MRL / *Limits*	Units	Prepared	Analyzed	Notes
Sample ID: G-1-1 (5070708-07) [Tissue (dry)] Sampled: Jul-03-15, Continued						
Metals in Tissue						
Aluminum	**45.6**	0.4	mg/kg dry	Jul-13-15	Jul-17-15	
Antimony	**0.004**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Arsenic	**0.025**	0.005	mg/kg dry	Jul-13-15	Jul-17-15	
Barium	**2.91**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Beryllium	**0.003**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Bismuth	< 0.02	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Boron	**37.9**	0.1	mg/kg dry	Jul-13-15	Jul-17-15	
Cadmium	**2.30**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Calcium	**15200**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Chromium	**0.07**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Cobalt	**0.280**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Copper	**7.14**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Iron	**113**	1	mg/kg dry	Jul-13-15	Jul-17-15	
Lead	**0.040**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Magnesium	**2210**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Manganese	**122**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Mercury	**0.024**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Molybdenum	**40.6**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Nickel	**1.59**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Phosphorus	**2960**	5	mg/kg dry	Jul-13-15	Jul-17-15	
Potassium	**17800**	10	mg/kg dry	Jul-13-15	Jul-17-15	
Selenium	**0.15**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Silver	< 0.01	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Sodium	**6**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Strontium	**621**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Thallium	**0.001**	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Tin	< 0.02	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Titanium	**1.91**	0.05	mg/kg dry	Jul-13-15	Jul-17-15	
Uranium	**0.008**	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Vanadium	**0.11**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Zinc	**197**	0.5	mg/kg dry	Jul-13-15	Jul-17-15	
Sample ID: S-1-2 (5070708-08) [Tissue (dry)] Sampled: Jul-05-15						
General Parameters						
Moisture	**54.6**	0.1	% wet	N/A	Jul-15-15	
Metals in Tissue						
Aluminum	**14.6**	0.4	mg/kg dry	Jul-13-15	Jul-17-15	
Antimony	< 0.004	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Arsenic	**0.012**	0.005	mg/kg dry	Jul-13-15	Jul-17-15	
Barium	**6.86**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Beryllium	< 0.004	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Bismuth	< 0.04	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Boron	**10.3**	0.1	mg/kg dry	Jul-13-15	Jul-17-15	
Cadmium	**0.053**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	

REPORTED TO	Integrated Ecology Group	**WORK ORDER**	5070708
PROJECT	ENDRAS-15	**REPORTED**	Jul-17-15

Analyte	Result / *Recovery*	MRL / *Limits*	Units	Prepared	Analyzed	Notes
Sample ID: S-1-2 (5070708-08) [Tissue (dry)] Sampled: Jul-05-15, Continued						
Metals in Tissue, Continued						
Calcium	**12300**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Chromium	**0.07**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Cobalt	**0.013**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Copper	**6.59**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Iron	**94**	1	mg/kg dry	Jul-13-15	Jul-17-15	
Lead	**0.013**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Magnesium	**3330**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Manganese	**129**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Mercury	**0.026**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Molybdenum	**127**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Nickel	**0.28**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Phosphorus	**3720**	5	mg/kg dry	Jul-13-15	Jul-17-15	
Potassium	**23500**	10	mg/kg dry	Jul-13-15	Jul-17-15	
Selenium	**0.07**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Silver	< 0.02	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Sodium	**13**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Strontium	**104**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Thallium	< 0.002	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Tin	< 0.04	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Titanium	**0.79**	0.05	mg/kg dry	Jul-13-15	Jul-17-15	
Uranium	**0.004**	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Vanadium	< 0.04	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Zinc	**21.4**	0.5	mg/kg dry	Jul-13-15	Jul-17-15	
Sample ID: REF 13-1 (5070708-09) [Tissue (dry)] Sampled: Jul-02-15						
General Parameters						
Moisture	**12.6**	0.1	% wet	N/A	Jul-15-15	
Metals in Tissue						
Aluminum	**65.9**	0.4	mg/kg dry	Jul-13-15	Jul-17-15	
Antimony	**0.002**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Arsenic	**0.034**	0.005	mg/kg dry	Jul-13-15	Jul-17-15	
Barium	**43.8**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Beryllium	**0.010**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Bismuth	< 0.02	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Boron	**48.2**	0.1	mg/kg dry	Jul-13-15	Jul-17-15	
Cadmium	**0.028**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Calcium	**10200**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Chromium	**0.09**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Cobalt	**0.052**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Copper	**3.80**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Iron	**166**	1	mg/kg dry	Jul-13-15	Jul-17-15	
Lead	**0.031**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Magnesium	**3020**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Manganese	**1350**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	

REPORTED TO	Integrated Ecology Group	**WORK ORDER**	5070708
PROJECT	ENDRAS-15	**REPORTED**	Jul-17-15

Analyte	Result / *Recovery*	MRL / *Limits*	Units	Prepared	Analyzed	Notes
Sample ID: REF 13-1 (5070708-09) [Tissue (dry)] Sampled: Jul-02-15, Continued						
Metals in Tissue, Continued						
Mercury	**0.008**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Molybdenum	**54.0**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Nickel	**0.64**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Phosphorus	**6520**	5	mg/kg dry	Jul-13-15	Jul-17-15	
Potassium	**18800**	10	mg/kg dry	Jul-13-15	Jul-17-15	
Selenium	**0.02**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Silver	< 0.01	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Sodium	**6**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Strontium	**99.1**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Thallium	**0.004**	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Tin	< 0.02	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Titanium	**2.27**	0.05	mg/kg dry	Jul-13-15	Jul-17-15	
Uranium	**0.009**	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Vanadium	**0.13**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Zinc	**11.0**	0.5	mg/kg dry	Jul-13-15	Jul-17-15	
Sample ID: F-1-3 (5070708-10) [Tissue (dry)] Sampled: Jul-06-15						
General Parameters						
Moisture	**56**	0.1	% wet	N/A	Jul-15-15	
Metals in Tissue						
Aluminum	**45.6**	0.4	mg/kg dry	Jul-13-15	Jul-17-15	
Antimony	< 0.005	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Arsenic	**0.019**	0.005	mg/kg dry	Jul-13-15	Jul-17-15	
Barium	**9.83**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Beryllium	< 0.005	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Bismuth	< 0.05	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Boron	**4.7**	0.1	mg/kg dry	Jul-13-15	Jul-17-15	
Cadmium	**0.096**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Calcium	**17800**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Chromium	**0.12**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Cobalt	**0.075**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Copper	**9.57**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Iron	**139**	1	mg/kg dry	Jul-13-15	Jul-17-15	
Lead	**0.025**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Magnesium	**2870**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Manganese	**70.1**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Mercury	**0.008**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Molybdenum	**232**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Nickel	**0.85**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Phosphorus	**3520**	5	mg/kg dry	Jul-13-15	Jul-17-15	
Potassium	**28500**	10	mg/kg dry	Jul-13-15	Jul-17-15	
Selenium	**0.06**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Silver	< 0.02	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Sodium	**50**	2	mg/kg dry	Jul-13-15	Jul-17-15	

REPORTED TO	Integrated Ecology Group	**WORK ORDER**	5070708
PROJECT	ENDRAS-15	**REPORTED**	Jul-17-15

Analyte	Result / *Recovery*	MRL / *Limits*	Units	Prepared	Analyzed	Notes
Sample ID: F-1-3 (5070708-10) [Tissue (dry)] Sampled: Jul-06-15, Continued						
Metals in Tissue, Continued						
Strontium	**255**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Thallium	< 0.002	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Tin	< 0.05	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Titanium	**2.46**	0.05	mg/kg dry	Jul-13-15	Jul-17-15	
Uranium	**0.017**	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Vanadium	**0.11**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Zinc	**40.5**	0.5	mg/kg dry	Jul-13-15	Jul-17-15	
Sample ID: S-3-1 (5070708-11) [Tissue (dry)] Sampled: Jul-07-15						
General Parameters						
Moisture	**40.9**	0.1	% wet	N/A	Jul-15-15	
Metals in Tissue						
Aluminum	**45.5**	0.4	mg/kg dry	Jul-13-15	Jul-17-15	
Antimony	< 0.003	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Arsenic	**0.030**	0.005	mg/kg dry	Jul-13-15	Jul-17-15	
Barium	**17.3**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Beryllium	**0.005**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Bismuth	< 0.03	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Boron	**4.2**	0.1	mg/kg dry	Jul-13-15	Jul-17-15	
Cadmium	**0.151**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Calcium	**24300**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Chromium	**0.11**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Cobalt	**0.069**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Copper	**8.56**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Iron	**185**	1	mg/kg dry	Jul-13-15	Jul-17-15	
Lead	**0.023**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Magnesium	**2410**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Manganese	**124**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Mercury	**0.018**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Molybdenum	**353**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Nickel	**0.62**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Phosphorus	**2920**	5	mg/kg dry	Jul-13-15	Jul-17-15	
Potassium	**22400**	10	mg/kg dry	Jul-13-15	Jul-17-15	
Selenium	**0.06**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Silver	< 0.02	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Sodium	**28**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Strontium	**583**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Thallium	**0.004**	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Tin	< 0.03	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Titanium	**2.41**	0.05	mg/kg dry	Jul-13-15	Jul-17-15	
Uranium	**0.018**	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Vanadium	**0.13**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Zinc	**34.3**	0.5	mg/kg dry	Jul-13-15	Jul-17-15	

REPORTED TO	Integrated Ecology Group	**WORK ORDER**	5070708
PROJECT	ENDRAS-15	**REPORTED**	Jul-17-15

Analyte	Result / *Recovery*	MRL / *Limits*	Units	Prepared	Analyzed	Notes
Sample ID: REF-15-1 (5070708-12) [Tissue (dry)] Sampled: Jul-06-15						
General Parameters						
Moisture	**36.3**	0.1	% wet	N/A	Jul-15-15	
Metals in Tissue						
Aluminum	**44.7**	0.4	mg/kg dry	Jul-13-15	Jul-17-15	
Antimony	**0.004**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Arsenic	**0.044**	0.005	mg/kg dry	Jul-13-15	Jul-17-15	
Barium	**64.5**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Beryllium	**0.015**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Bismuth	< 0.03	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Boron	**6.5**	0.1	mg/kg dry	Jul-13-15	Jul-17-15	
Cadmium	**0.750**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Calcium	**14600**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Chromium	**0.09**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Cobalt	**0.355**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Copper	**6.13**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Iron	**96**	1	mg/kg dry	Jul-13-15	Jul-17-15	
Lead	**0.036**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Magnesium	**3570**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Manganese	**134**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Mercury	**0.009**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Molybdenum	**2.06**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Nickel	**2.04**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Phosphorus	**4650**	5	mg/kg dry	Jul-13-15	Jul-17-15	
Potassium	**18800**	10	mg/kg dry	Jul-13-15	Jul-17-15	
Selenium	**0.05**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Silver	< 0.02	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Sodium	**9**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Strontium	**239**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Thallium	< 0.002	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Tin	< 0.03	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Titanium	**1.73**	0.05	mg/kg dry	Jul-13-15	Jul-17-15	
Uranium	**0.005**	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Vanadium	**0.08**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Zinc	**132**	0.5	mg/kg dry	Jul-13-15	Jul-17-15	
Sample ID: REF-14-1 (5070708-13) [Tissue (dry)] Sampled: Jul-08-15						
General Parameters						
Moisture	**41.5**	0.1	% wet	N/A	Jul-15-15	
Metals in Tissue						
Aluminum	**32.3**	0.4	mg/kg dry	Jul-13-15	Jul-17-15	
Antimony	**0.015**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Arsenic	**0.012**	0.005	mg/kg dry	Jul-13-15	Jul-17-15	
Barium	**33.8**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Beryllium	**0.012**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	

REPORTED TO	Integrated Ecology Group	**WORK ORDER**	5070708
PROJECT	ENDRAS-15	**REPORTED**	Jul-17-15

Analyte	Result / *Recovery*	MRL / *Limits*	Units	Prepared	Analyzed	Notes
Sample ID: REF-14-1 (5070708-13) [Tissue (dry)] Sampled: Jul-08-15, Continued						
Metals in Tissue, Continued						
Bismuth	< 0.03	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Boron	**4.6**	0.1	mg/kg dry	Jul-13-15	Jul-17-15	
Cadmium	**0.025**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Calcium	**8420**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Chromium	**0.04**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Cobalt	**0.431**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Copper	**4.16**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Iron	**100**	1	mg/kg dry	Jul-13-15	Jul-17-15	
Lead	**0.041**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Magnesium	**2240**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Manganese	**213**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Mercury	**0.006**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Molybdenum	**38.0**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Nickel	**1.60**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Phosphorus	**2210**	5	mg/kg dry	Jul-13-15	Jul-17-15	
Potassium	**8880**	10	mg/kg dry	Jul-13-15	Jul-17-15	
Selenium	< 0.03	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Silver	< 0.02	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Sodium	**4**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Strontium	**99.8**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Thallium	< 0.002	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Tin	< 0.03	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Titanium	**0.99**	0.05	mg/kg dry	Jul-13-15	Jul-17-15	
Uranium	< 0.002	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Vanadium	**0.04**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Zinc	**41.1**	0.5	mg/kg dry	Jul-13-15	Jul-17-15	
Sample ID: REF-14-1 (5070708-14) [Tissue (dry)] Sampled: Jul-08-15						
General Parameters						
Moisture	**59.2**	0.1	% wet	N/A	Jul-15-15	
Metals in Tissue						
Aluminum	**451**	0.4	mg/kg dry	Jul-13-15	Jul-17-15	
Antimony	< 0.005	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Arsenic	< 0.012	0.005	mg/kg dry	Jul-13-15	Jul-17-15	
Barium	**0.56**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Beryllium	< 0.005	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Bismuth	< 0.05	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Boron	**9.7**	0.1	mg/kg dry	Jul-13-15	Jul-17-15	
Cadmium	**0.061**	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Calcium	**1510**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Chromium	**0.06**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Cobalt	**0.073**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Copper	**3.51**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Iron	**34**	1	mg/kg dry	Jul-13-15	Jul-17-15	

REPORTED TO	Integrated Ecology Group	**WORK ORDER**	5070708
PROJECT	ENDRAS-15	**REPORTED**	Jul-17-15

Analyte	Result / *Recovery*	MRL / *Limits*	Units	Prepared	Analyzed	Notes
Sample ID: REF-14-1 (5070708-14) [Tissue (dry)] Sampled: Jul-08-15, Continued						
Metals in Tissue, Continued						
Lead	**0.014**	0.004	mg/kg dry	Jul-13-15	Jul-17-15	
Magnesium	**1220**	2	mg/kg dry	Jul-13-15	Jul-17-15	
Manganese	**264**	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Mercury	< 0.005	0.002	mg/kg dry	Jul-13-15	Jul-17-15	
Molybdenum	**22.9**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Nickel	**1.87**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Phosphorus	**2140**	5	mg/kg dry	Jul-13-15	Jul-17-15	
Potassium	**8580**	10	mg/kg dry	Jul-13-15	Jul-17-15	
Selenium	< 0.05	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Silver	< 0.02	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Sodium	< 5	2	mg/kg dry	Jul-13-15	Jul-17-15	
Strontium	**2.44**	0.01	mg/kg dry	Jul-13-15	Jul-17-15	
Thallium	< 0.002	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Tin	< 0.05	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Titanium	**0.40**	0.05	mg/kg dry	Jul-13-15	Jul-17-15	
Uranium	< 0.002	0.001	mg/kg dry	Jul-13-15	Jul-17-15	
Vanadium	< 0.05	0.02	mg/kg dry	Jul-13-15	Jul-17-15	
Zinc	**54.0**	0.5	mg/kg dry	Jul-13-15	Jul-17-15	

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Integral Ecology Group

September 2015

	Sample	pH	Est E.C. mmhos/cm	Total O.M. %	Total N %	Avail NH4-N ppm	Avail NO3-N ppm	Avail Cu ppm
1	F2-1 TS	7.6	0.38	0.6	0.01	2.0	0.6	4.1
2	F2-1 US	7.9	0.36	0.4	<.01	1.0	0.5	2.8
3	F2-2 TS	7.9	0.32	0.4	<.01	1.0	0.4	3.7
4	F2-2 US	8.1	0.32	0.2	<.01	1.0	0.4	3.5
5	F2-3 TS	7.5	0.30	0.8	0.02	1.0	1.6	6.0
6	F2-3 US	7.9	0.28	<.01	<.01	1.0	<.01	2.6
7	F3-1 TS	7.9	0.34	0.4	0.01	1.0	0.4	5.6
8	F3-1 US	8.1	0.30	0.2	<.01	1.0	0.8	5.9
9	G1-1 TS	7.6	0.78	10.8	0.35	8.0	10.2	0.1
10	G1-1 US	7.7	2.90	2.3	0.04	5.0	3.7	10.8
11	REF13-	5.3	0.36	5.2	0.08	3.0	1.7	1.3
12	REF13-	4.9	0.24	1.4	0.03	3.0	2.3	1.1
13	REF14-	4.8	0.34	7.0	0.13	7.0	1.9	2.3
14	REF14-	4.9	0.26	2.0	0.04	4.0	1.4	1.3
15	REF15-	4.7	0.28	4.4	0.10	4.0	1.8	1.3
16	REF15-	4.8	0.22	1.4	0.04	3.0	1.6	1.3
17	S1-1 TS	7.2	0.44	1.6	0.03	3.0	0.9	7.3
18	S1-1 US	7.8	0.26	0.2	<.01	3.0	0.7	7.0
19	S1-2 TS	6.3	0.22	1.0	0.02	3.0	1.1	7.5
20	S1-2 US	7.8	0.24	0.8	0.01	2.5	1.7	4.8
21	S1-3 TS	5.8	0.30	2.0	0.02	6.0	2.3	8.4
22	S1-3 US	7.8	0.30	0.4	<.01	3.0	1.3	3.8
23	S1-4 TS	7.5	0.24	0.8	0.01	3.0	1.4	7.3
24	S1-4 US	8.0	0.30	0.8	<.01	2.0	0.8	4.3
25	S1-5 TS	7.7	1.96	10.6	0.27	14.0	17.8	1.1

26	S1-5 US	7.3	1.10	1.0	0.02	5.0	1.2	4.2
27	S3-1 TS	7.8	0.62	0.8	0.01	4.0	1.6	15.0
28	S3-1 US	8.1	0.38	0.2	<.01	6.0	0.8	5.7
29	S3-2 TS	8.0	0.36	0.6	<.01	3.0	0.8	7.1
30	S3-2 US	7.6	0.30	0.7	0.02	4.0	0.5	6.4
31	S5-1 TS	7.7	0.46	0.4	0.01	3.0	0.9	6.5
32	S5-1 US	7.8	0.34	0.2	<.01	5.0	0.5	6.4
33	S5-2 TS	7.8	0.40	0.4	<.01	3.0	0.5	7.8
34	S5-2 US	7.7	0.40	0.4	<.01	2.0	0.5	7.7
35	S5-3 TS	7.8	0.26	0.2	<.01	2.0	0.5	7.6
36	S5-3 US	7.8	0.32	0.4	<.01	2.0	0.5	6.5
37	S5-4 TS	7.8	0.30	0.2	<.01	2.0	0.5	5.4
38	S5-4 US	8.0	0.28	0.4	<.01	2.0	<.1	9.8
39	T3-16 T	6.6	0.30	2.2	0.06	2.0	1.4	8.5
40	T3-16 U	7.6	0.28	0.4	<.01	2.0	0.3	7.1
41	T3-17 T	5.7	0.26	3.8	0.08	2.0	1.8	2.2
42	T3-17 U	7.6	0.34	0.8	<.01	2.0	1.2	7.1
43	T3-18 T	5.4	0.20	1.6	0.02	2.0	1.9	3.1
44	T3-18 U	7.3	0.40	0.8	<.01	2.0	1.2	7.6
45	T3-18A	5.3	1.02	2.6	0.04	2.0	1.3	3.0
46	T3-18A	7.0	0.48	0.6	0.01	2.0	1.4	6.3
47	T3-20 T	7.4	0.46	1.2	0.02	2.0	2.0	8.5
48	T3-20 U	7.9	0.36	0.6	<.01	2.0	1.1	3.4
49	T3-21 T	5.7	0.92	1.4	0.01	2.0	1.2	4.7
50	T3-21 U	7.2	1.08	0.5	<.01	2.0	1.3	7.8
51	T3-22 T	6.5	0.48	0.4	0.05	2.0	1.7	5.3
52	T3-22 U	7.6	0.36	0.8	0.01	2.0	0.7	5.6
53	T3-23 T	5.7	0.26	3.4	0.07	2.0	2.3	1.8
54	T3-23 U	7.6	0.36	0.6	<.01	2.0	1.8	6.0
55	T3-24 T	5.1	0.26	3.2	0.04	2.0	1.8	1.8
56	T3-24 U	6.9	0.34	0.6	0.01	2.0	1.8	4.2
57	T3-25 T	6.8	0.36	1.6	0.03	2.0	1.0	3.4
58	T3-25 U	7.8	0.32	0.8	<.01	3.0	1.0	6.0
59	T3-26 T	5.4	0.24	2.0	0.03	3.0	0.9	2.9
60	T3-26 U	6.9	0.38	0.6	<.01	3.0	0.9	4.5
61	G1-1 TS	7.4	0.58	3.2	0.06	6.0	1.3	5.8

Analysis Report

Ministry of Environment
Environmental Sustainability Division
Knowledge Management Branch

Requisition #	T1778
Submitter	Jeff Anderson
Office:	Integral Ecology Group
Project	Foliage Samples
Date In:	2015/07/10
Date Out:	2015/08/10

Sample	B PPM	C-Total %	Ca %	Cu PPM	Fe PPM	K %	Mg %
1	8.2	51.31	0.329	8.3	160.0	0.703	0.113
2	< 5.0	50.52	0.214	4.5	73.5	0.627	0.089
3	< 5.0	50.38	0.317	7.5	491.0	0.697	0.119
4	6.2	50.59	0.317	7.9	606.9	0.711	0.130
5	5.1	50.53	0.259	6.8	465.2	0.706	0.106
6	5.0	51.21	0.278	8.9	498.8	0.755	0.106
7	7.0	50.78	0.284	6.6	212.2	0.713	0.102
8	49.2	47.68	1.593	7.7	86.4	1.612	0.284
9	10.4	50.88	0.156	3.5	61.3	0.755	0.095
10	8.0	51.02	0.189	4.4	43.9	0.654	0.103
11	7.3	50.47	0.146	3.9	40.2	0.456	0.122
12	7.4	50.38	0.220	8.6	83.6	0.707	0.134
13	11.2	50.58	0.114	4.1	48.7	0.608	0.110
14	< 5.0	50.60	0.158	4.6	96.1	0.563	0.135
15	8.2	51.16	0.161	4.4	73.8	0.570	0.114
16	< 5.0	50.53	0.177	3.5	69.7	0.558	0.128
17	< 5.0	51.16	0.295	8.3	242.3	0.744	0.099
18	6.8	50.68	0.150	4.1	66.4	0.679	0.120

Analysis Report

Ministry of Environment
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Requisition #	T1778
Submitter	Jeff Anderson
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Project	Foliage Samples
Date In:	2015/07/10
Date Out:	2015/08/10

Mn PPM	Sample	Mo PPM	N %	Na PPM	P %	S-ICAP %	S-Combust %	Zn PPM
365.9	**1**	17.5	1.348	17.8	0.219	0.2152	0.2150	31.1
168.6	**2**	49.1	1.298	5.7	0.171	0.1779	0.1800	42.1
290.3	**3**	22.2	1.336	18.3	0.217	0.2240	0.2290	28.5
285.9	**4**	16.6	1.357	29.0	0.223	0.2291	0.2350	32.4
313.9	**5**	22.1	1.055	24.1	0.161	0.1672	0.1900	25.2
349.4	**6**	25.4	1.447	25.2	0.224	0.2152	0.2420	26.8
285.3	**7**	24.2	1.219	24.0	0.198	0.2185	0.2210	28.3
226.3	**8**	117.0	2.613	< 0.1	0.137	0.4786	0.5220	126.4
755.1	**9**	20.0	1.190	3.2	0.203	0.0991	0.1070	36.4
270.2	**10**	28.3	1.335	< 0.1	0.205	0.0995	0.1130	48.7
337.1	**11**	7.4	1.207	0.7	0.177	0.0953	0.1110	51.5
228.3	**12**	37.0	1.599	6.3	0.238	0.1429	0.1530	28.1
230.4	**13**	33.6	1.123	2.8	0.205	0.1200	0.1330	35.5
446.6	**14**	56.3	1.249	3.3	0.178	0.1456	0.1580	51.7
370.5	**15**	36.4	1.190	4.2	0.170	0.1292	0.1240	43.4
260.6	**16**	49.7	0.976	1.6	0.151	0.0984	0.0970	39.9
277.4	**17**	19.4	1.060	12.5	0.172	0.2079	0.2090	30.2
197.2	**18**	37.3	1.116	4.8	0.185	0.1351	0.1390	42.9

APPENDIX G — VEGETATION DATA

Site_plot_year	Site	Sp_Code	PCV	Life form	Scientific name	Common name	Origin
F-1_1.2013	F-1	ACHIMIL	0.3	7	Achillea millefolium	yarrow	N
F-1_1.2013	F-1	CERAPUR	3	9	Ceratodon purpureus	fire-moss	N
F-1_1.2013	F-1	HIERACI	0.7	7	Hieracium sp.	hawkweed	N
F-1_1.2013	F-1	MEDISAT	1	7	Medicago sativa	alfalfa	E
F-1_1.2013	F-1	PHLEPRA	0.05	6	Phleum pratense	common timothy	E
F-1_1.2013	F-1	POA COM	6	6	Poa compressa	Canada bluegrass	E
F-1_1.2013	F-1	PSEUMEN	4	1	Pseudotsuga menziesii	Douglas-fir	N
F-1_1.2013	F-1	ROSAACI	0.1	4	Rosa acicularis	prickly rose	N
F-1_1.2013	F-1	TARAOFF	0.2	7	Taraxacum officinale	common dandelion	E
F-1_1.2015	F-1	ACHIMIL	0.1	7	Achillea millefolium	yarrow	N
F-1_1.2015	F-1	BROMINE	8	6	Bromus inermis	smooth brome	E
F-1_1.2015	F-1	CERAPUR	2	9	Ceratodon purpureus	fire-moss	N
F-1_1.2015	F-1	DACTGLO	0	6	Dactylis glomerata	orchard-grass	E
F-1_1.2015	F-1	HIERGRA	1	7	Hieracium gracile	slender hawkweed	N
F-1_1.2015	F-1	MEDISAT	0.1	7	Medicago sativa	alfalfa	E
F-1_1.2015	F-1	PHLEPRA	0.1	6	Phleum pratense	common timothy	E
F-1_1.2015	F-1	POA COM	1	6	Poa compressa	Canada bluegrass	E
F-1_1.2015	F-1	PSEUMEN	5	1	Pseudotsuga menziesii	Douglas-fir	N
F-1_1.2015	F-1	TARAOFF	0.01	7	Taraxacum officinale	common dandelion	E
F-1_1.2013	F-1	FESTRUB	6	6	Festuca rubra	red fescue	E
F-1_1.2015	F-1	FESTRUB	2	6	Festuca rubra	red fescue	E
F-1_2.2013	F-1	ACHIMIL	0.1	7	Achillea millefolium	yarrow	N
F-1_2.2013	F-1	AGROCRI	3	6	Agropyron cristatum	crested wheatgrass	E
F-1_2.2013	F-1	BROMCIL	0.5	6	Bromus ciliatus	fringed brome	N
F-1_2.2013	F-1	BROMINE	6	6	Bromus inermis	smooth brome	E
F-1_2.2013	F-1	CERAPUR	35	9	Ceratodon purpureus	fire-moss	N
F-1_2.2013	F-1	DACTGLO	4	6	Dactylis glomerata	orchard-grass	E
F-1_2.2013	F-1	MEDISAT	4	7	Medicago sativa	alfalfa	E
F-1_2.2013	F-1	PHLEPRA	2	6	Phleum pratense	common timothy	E
F-1_2.2013	F-1	PINUCON	5	1	Pinus contorta	lodgepole pine	N
F-1_2.2013	F-1	POA COM	0.5	6	Poa compressa	Canada bluegrass	E
F-1_2.2013	F-1	PSEUMEN	1	1	Pseudotsuga menziesii	Douglas-fir	N
F-1_2.2015	F-1	ACHIMIL	0.1	7	Achillea millefolium	yarrow	N
F-1_2.2015	F-1	AGROCRI	2	6	Agropyron cristatum	crested wheatgrass	E
F-1_2.2015	F-1	BROMINE	8	6	Bromus inermis	smooth brome	E
F-1_2.2015	F-1	CERAPUR	4	9	Ceratodon purpureus	fire-moss	N
F-1_2.2015	F-1	DACTGLO	1	6	Dactylis glomerata	orchard-grass	E
F-1_2.2015	F-1	ELYMGLA	1	6	Elymus glaucus	blue wildrye	N
F-1_2.2015	F-1	PELTCAN	0.1	11	Peltigera canina	dog pelt	N
F-1_2.2015	F-1	PINUCON	5	1	Pinus contorta	lodgepole pine	N
F-1_2.2015	F-1	POA COM	1	6	Poa compressa	Canada bluegrass	E
F-1_2.2015	F-1	PSEUMEN	1	1	Pseudotsuga menziesii	Douglas-fir	N
F-1_2.2013	F-1	FESTRUB	10	6	Festuca rubra	red fescue	E
F-1_2.2015	F-1	FESTRUB	15	6	Festuca rubra	red fescue	E
F-1_2.2013	F-1	LICHINA	15	11	lichen	lichen	N
F-1_3.2013	F-1	AGROCRI	0.5	6	Agropyron cristatum	crested wheatgrass	E
F-1_3.2013	F-1	BROMINE	2	6	Bromus inermis	smooth brome	E
F-1_3.2013	F-1	CERAPUR	10	9	Ceratodon purpureus	fire-moss	N
F-1_3.2013	F-1	POA COM	1	6	Poa compressa	Canada bluegrass	E
F-1_3.2013	F-1	PSEUMEN	0.3	1	Pseudotsuga menziesii	Douglas-fir	N
F-1_3.2015	F-1	BROMINE	0.5	6	Bromus inermis	smooth brome	E
F-1_3.2015	F-1	CERAPUR	3	9	Ceratodon purpureus	fire-moss	N
F-1_3.2015	F-1	POA COM	3	6	Poa compressa	Canada bluegrass	E
F-1_3.2015	F-1	PSEUMEN	0.1	1	Pseudotsuga menziesii	Douglas-fir	N
F-1_3.2013	F-1	FESTRUB	15	6	Festuca rubra	red fescue	E
F-1_3.2015	F-1	FESTRUB	5	6	Festuca rubra	red fescue	E
F-2_1.2015	F-2	BROMINE	0.5	6	Bromus inermis	smooth brome	E
F-2_1.2015	F-2	CERAPUR	5	9	Ceratodon purpureus	fire-moss	N

Site_plot_year	Site	Sp_Code	PCV	Life form	Scientific name	Common name	Origin
F-2_1.2015	F-2	FRAGVIR	0.1	7	Fragaria virginiana	wild strawberry	N
F-2_1.2015	F-2	MEDISAT	2	7	Medicago sativa	alfalfa	E
F-2_1.2015	F-2	PSEUMEN	2	1	Pseudotsuga menziesii	Douglas-fir	N
F-2_1.2015	F-2	FESTRUB	6	6	Festuca rubra	red fescue	E
F-2_2.2015	F-2	ACHIMIL	0.01	7	Achillea millefolium	yarrow	N
F-2_2.2015	F-2	DACTGLO	0.01	6	Dactylis glomerata	orchard-grass	E
F-2_2.2015	F-2	ELYMGLA	0.01	6	Elymus glaucus	blue wildrye	N
F-2_2.2015	F-2	PHLEPRA	0.1	6	Phleum pratense	common timothy	E
F-2_2.2015	F-2	POA COM	5	6	Poa compressa	Canada bluegrass	E
F-2_2.2015	F-2	PSEUMEN	10	1	Pseudotsuga menziesii	Douglas-fir	N
F-2_2.2015	F-2	TARAOFF	0.01	7	Taraxacum officinale	common dandelion	E
F-2_2.2015	F-2	FESTRUB	5	6	Festuca rubra	red fescue	E
F-2_3.2015	F-2	ACHIMIL	3	7	Achillea millefolium	yarrow	N
F-2_3.2015	F-2	AGROCRI	0.1	6	Agropyron cristatum	crested wheatgrass	E
F-2_3.2015	F-2	BROMCIL	0.1	6	Bromus ciliatus	fringed brome	N
F-2_3.2015	F-2	BROMINE	1	6	Bromus inermis	smooth brome	E
F-2_3.2015	F-2	CERAPUR	4	9	Ceratodon purpureus	fire-moss	N
F-2_3.2015	F-2	DACTGLO	1	6	Dactylis glomerata	orchard-grass	E
F-2_3.2015	F-2	HIERGRA	1	7	Hieracium gracile	slender hawkweed	N
F-2_3.2015	F-2	PHLEPRA	0.5	6	Phleum pratense	common timothy	E
F-2_3.2015	F-2	POA COM	2	6	Poa compressa	Canada bluegrass	E
F-2_3.2015	F-2	PSEUMEN	12	1	Pseudotsuga menziesii	Douglas-fir	N
F-2_3.2015	F-2	FESTRUB	8	6	Festuca rubra	red fescue	E
F-3_1.2015	F-3	ACHIMIL	0.5	7	Achillea millefolium	yarrow	N
F-3_1.2015	F-3	BROMINE	8	6	Bromus inermis	smooth brome	E
F-3_1.2015	F-3	CERAPUR	1	9	Ceratodon purpureus	fire-moss	N
F-3_1.2015	F-3	ELYMTRA	4	6	Elymus trachycaulus	slender wheatgrass	N
F-3_1.2015	F-3	EQUIARV	1	5	Equisetum arvense	common horsetail	N
F-3_1.2015	F-3	FRAGVIR	0.01	7	Fragaria virginiana	wild strawberry	N
F-3_1.2015	F-3	HIERGRA	0.01	7	Hieracium gracile	slender hawkweed	N
F-3_1.2015	F-3	POA COM	2	6	Poa compressa	Canada bluegrass	E
F-3_1.2015	F-3	PSEUMEN	1	1	Pseudotsuga menziesii	Douglas-fir	N
F-4_1.2013	F-4	ACHIMIL	0.5	7	Achillea millefolium	yarrow	N
F-4_1.2013	F-4	AGROPYR	2	6	Agropyron sp.	wheatgrass	E
F-4_1.2013	F-4	BROMINE	7	6	Bromus inermis	smooth brome	E
F-4_1.2013	F-4	CERAPUR	5	9	Ceratodon purpureus	fire-moss	N
F-4_1.2013	F-4	DACTGLO	2	6	Dactylis glomerata	orchard-grass	E
F-4_1.2013	F-4	FESTTRA	0.2	6	Festuca trachyphylla	hard fescue	E
F-4_1.2013	F-4	HIERACI	0.1	7	Hieracium sp.	hawkweed	N
F-4_1.2013	F-4	PINUCON	15	1	Pinus contorta	lodgepole pine	N
F-4_1.2013	F-4	POA COM	18	6	Poa compressa	Canada bluegrass	E
F-4_1.2013	F-4	CREPNAN	0.05	7	Crepis nana	dwarf hawksbeard	N
F-4_1.2013	F-4	LICHINA	25	11	lichen	lichen	N
F-4_2.2013	F-4	ACHIMIL	0.5	7	Achillea millefolium	yarrow	N
F-4_2.2013	F-4	ANTENEG	2	7	Antennaria neglecta	field pussytoes	N
F-4_2.2013	F-4	ARCTUVA	0.1	12	Arctostaphylos uva-ursi	kinnikinnick	N
F-4_2.2013	F-4	EURYBIA	2	7	Eurybia sp.	Aster sp	N
F-4_2.2013	F-4	EURYBIA	0.05	7	Eurybia sp.	Aster sp	N
F-4_2.2013	F-4	BETUPAP	0.5	2	Betula papyrifera	paper birch	N
F-4_2.2013	F-4	BRACHYT	3	9	Brachythecium sp.	ragged-moss	N
F-4_2.2013	F-4	BROMINE	5	6	Bromus inermis	smooth brome	E
F-4_2.2013	F-4	BROMINE	12	6	Bromus inermis	smooth brome	E
F-4_2.2013	F-4	CERAPUR	3	9	Ceratodon purpureus	fire-moss	N
F-4_2.2013	F-4	EPILANG	0.5	7	Epilobium angustifolium	fireweed	N
F-4_2.2013	F-4	FESTTRA	6	6	Festuca trachyphylla	hard fescue	E
F-4_2.2013	F-4	HIERACI	3	7	Hieracium sp.	hawkweed	N
F-4_2.2013	F-4	JUNICOM	0.1	3	Juniperus communis	common juniper	N
F-4_2.2013	F-4	PELT SP	4	7	lichen sp	lichen	N

Site_plot_year	Site	Sp_Code	PCV	Life form	Scientific name	Common name	Origin
F-4_2.2013	F-4	PINUCON	20	1	Pinus contorta	lodgepole pine	N
F-4_2.2013	F-4	PINUCON	0.8	1	Pinus contorta	lodgepole pine	N
F-4_2.2013	F-4	POA COM	2	6	Poa compressa	Canada bluegrass	E
F-4_2.2013	F-4	POA PRA	0.1	6	Poa pratensis	Kentucky bluegrass	N
F-4_2.2013	F-4	PSEUMEN	2	1	Pseudotsuga menziesii	Douglas-fir	N
F-4_2.2013	F-4	ROSAACI	0.5	4	Rosa acicularis	prickly rose	N
F-4_2.2013	F-4	ROSAACI	2	4	Rosa acicularis	prickly rose	N
F-4_2.2013	F-4	RUBUIDA	0.5	4	Rubus idaeus	red raspberry	N
F-4_2.2013	F-4	SCHEARU	15	6	Schedonorus arundinaceus	tall fescue	E
F-4_2.2013	F-4	SHEPCAN	1	4	Shepherdia canadensis	soopolallie	N
F-4_2.2013	F-4	SYMPALB	0.7	4	Symphoricarpos albus	common snowberry	N
F-4_2.2013	F-4	VICIAME	0.5	7	Vicia americana	American vetch	N
F-4_2.2013	F-4	FESTRUB	3	6	Festuca rubra	red fescue	E
F-4_2.2013	F-4	FESTRUB	4	6	Festuca rubra	red fescue	E
F-4_2.2013	F-4	SALIX	1	2	Salix sp.	willow	N
G-1_1.2015	G-1	ACHIMIL	3	7	Achillea millefolium	yarrow	N
G-1_1.2015	G-1	AGROSCA	0.5	6	Agrostis scabra	hair bentgrass	N
G-1_1.2015	G-1	BROMINE	5	6	Bromus inermis	smooth brome	E
G-1_1.2015	G-1	CASTMIN	1	7	Castilleja miniata	scarlet paintbrush	N
G-1_1.2015	G-1	CERAPUR	2	9	Ceratodon purpureus	fire-moss	N
G-1_1.2015	G-1	EPILANG	0.5	7	Epilobium angustifolium	fireweed	N
G-1_1.2015	G-1	EQUIARV	15	5	Equisetum arvense	common horsetail	N
G-1_1.2015	G-1	FRAGVIR	1	7	Fragaria virginiana	wild strawberry	N
G-1_1.2015	G-1	LEUCVUL	1	7	Leucanthemum vulgare	oxeye daisy	E
G-1_1.2015	G-1	PICEGLA	0.1	1	Picea glauca	hybrid white spruce	N
G-1_1.2015	G-1	POA INT	2	6	Poa interior	interior bluegrass	N
G-1_1.2015	G-1	POPUBAL	10	2	Populus balsamifera	balsam poplar	N
G-1_1.2015	G-1	PSEUMEN	0.1	1	Pseudotsuga menziesii	Douglas-fir	N
G-1_1.2015	G-1	ROSAACI	1	4	Rosa acicularis	prickly rose	N
G-1_1.2015	G-1	RUBUIDA	0.1	4	Rubus idaeus	red raspberry	N
G-1_1.2015	G-1	SALIBEB	8	2	Salix bebbiana	Bebb's willow	N
G-1_1.2015	G-1	SALIPYR	5	2	Salix pyrifolia	balsam willow	N
G-1_1.2015	G-1	SCHEARU	2	6	Schedonorus arundinaceus	tall fescue	E
G-1_1.2015	G-1	SHEPCAN	0.1	4	Shepherdia canadensis	soopolallie	N
G-1_1.2015	G-1	SYMPFOL	0.01	7	Symphyotrichum foliaceum	leafy aster	N
G-1_1.2015	G-1	TARAOFF	0.1	7	Taraxacum officinale	common dandelion	E
G-1_1.2015	G-1	TRIFHYB	5	7	Trifolium hybridum	alsike clover	E
G-1_1.2015	G-1	TYPHLAT	0.01	6	Typha latifolia	common cattail	N
G-2_1.2013	G-2	BROMINE	4	6	Bromus inermis	smooth brome	E
G-2_1.2013	G-2	CERAPUR	30	9	Ceratodon purpureus	fire-moss	N
G-2_1.2013	G-2	DACTGLO	3	6	Dactylis glomerata	orchard-grass	E
G-2_1.2013	G-2	MEDISAT	0.1	7	Medicago sativa	alfalfa	E
G-2_1.2013	G-2	POA COM	4	6	Poa compressa	Canada bluegrass	E
G-2_1.2013	G-2	PSEUMEN	3	1	Pseudotsuga menziesii	Douglas-fir	N
G-2_1.2013	G-2	FESTRUB	5	6	Festuca rubra	red fescue	E
G-2_2.2014	G-2	BROMINE	2	6	Bromus inermis	smooth brome	E
G-2_2.2014	G-2	CERAPUR	6	9	Ceratodon purpureus	fire-moss	N
G-2_2.2014	G-2	DACTGLO	0.5	6	Dactylis glomerata	orchard-grass	E
G-2_2.2014	G-2	ELYMGLA	0.25	6	Elymus glaucus	blue wildrye	N
G-2_2.2014	G-2	FESTTRA	0.25	6	Festuca trachyphylla	hard fescue	E
G-2_2.2014	G-2	POA COM	0.25	6	Poa compressa	Canada bluegrass	E
G-2_2.2014	G-2	PSEUMEN	0.4	1	Pseudotsuga menziesii	Douglas-fir	N
G-2_2.2014	G-2	TRIFHYB	0.25	7	Trifolium hybridum	alsike clover	E
G-2_2.2014	G-2	FESTRUB	4	6	Festuca rubra	red fescue	E
G-2_3.2013	G-2	AGROCRI	0.2	6	Agropyron cristatum	crested wheatgrass	E
G-2_3.2013	G-2	BROMINE	1	6	Bromus inermis	smooth brome	E
G-2_3.2013	G-2	CERAPUR	12	9	Ceratodon purpureus	fire-moss	N
G-2_3.2013	G-2	POA COM	2	6	Poa compressa	Canada bluegrass	E

Site_plot_year	Site	Sp_Code	PCV	Life form	Scientific name	Common name	Origin
G-2_3.2013	G-2	PSEUMEN	1	1	Pseudotsuga menziesii	Douglas-fir	N
G-2_3.2013	G-2	FESTRUB	6	6	Festuca rubra	red fescue	E
G-2_4.2014	G-2	BROMINE	7	6	Bromus inermis	smooth brome	E
G-2_4.2014	G-2	CERAPUR	35	9	Ceratodon purpureus	fire-moss	N
G-2_4.2014	G-2	DACTGLO	1	6	Dactylis glomerata	orchard-grass	E
G-2_4.2014	G-2	FESTTRA	15	6	Festuca trachyphylla	hard fescue	E
G-2_4.2014	G-2	LICHINA	0.25	11	Lichinaceae	lichin sp.	N
G-2_4.2014	G-2	POA COM	1	6	Poa compressa	Canada bluegrass	E
G-2_4.2014	G-2	PSEUMEN	2	1	Pseudotsuga menziesii	Douglas-fir	N
G-2_4.2014	G-2	FESTRUB	5	6	Festuca rubra	red fescue	E
G-2_5.2013	G-2	BROMINE	12	6	Bromus inermis	smooth brome	E
G-2_5.2013	G-2	CERAPUR	65	9	Ceratodon purpureus	fire-moss	N
G-2_5.2013	G-2	PHLEPRA	3	6	Phleum pratense	common timothy	E
G-2_5.2013	G-2	POA COM	2	6	Poa compressa	Canada bluegrass	E
G-2_5.2013	G-2	PSEUMEN	5	1	Pseudotsuga menziesii	Douglas-fir	N
G-2_5.2013	G-2	TRIFPRA	0.5	7	Trifolium pratense	red clover	E
G-2_5.2013	G-2	FESTRUB	20	6	Festuca rubra	red fescue	E
R-1_1.2013	R-1	ACHIMIL	0.5	7	Achillea millefolium	yarrow	N
R-1_1.2013	R-1	AGROCRI	2	6	Agropyron cristatum	crested wheatgrass	E
R-1_1.2013	R-1	ALNUVIR	2	4	Alnus viridis	green alder	N
R-1_1.2013	R-1	BROMINE	0.8	6	Bromus inermis	smooth brome	E
R-1_1.2013	R-1	CERAPUR	15	9	Ceratodon purpureus	fire-moss	N
R-1_1.2013	R-1	ELYMTRA	2	6	Elymus trachycaulus	slender wheatgrass	N
R-1_1.2013	R-1	EPILANG	0.2	7	Epilobium angustifolium	fireweed	N
R-1_1.2013	R-1	FESTTRA	4	6	Festuca trachyphylla	hard fescue	E
R-1_1.2013	R-1	MEDISAT	0.1	7	Medicago sativa	alfalfa	E
R-1_1.2013	R-1	PICEENG	0.2	1	Picea engelmannii	Engelmann spruce	N
R-1_1.2013	R-1	POPUBAL	1	2	Populus balsamifera	balsam poplar	N
R-1_1.2013	R-1	RUBUIDA	0.1	4	Rubus idaeus	red raspberry	N
R-1_1.2013	R-1	SCHEARU	25	6	Schedonorus arundinaceus	tall fescue	E
R-1_1.2013	R-1	SHEPCAN	0.6	4	Shepherdia canadensis	soopolallie	N
R-1_1.2013	R-1	TARAOFF	0.1	7	Taraxacum officinale	common dandelion	E
R-1_1.2013	R-1	FESTRUB	10	6	Festuca rubra	red fescue	E
R-1_1.2013	R-1	SALIX	0.2	2	Salix sp.	willow	N
R-2_1.2013	R-2	ACHIMIL	0.1	7	Achillea millefolium	yarrow	N
R-2_1.2013	R-2	BRACHYT	5	9	Brachythecium sp.	ragged-moss	N
R-2_1.2013	R-2	BROMINE	3	6	Bromus inermis	smooth brome	E
R-2_1.2013	R-2	CERAPUR	2	9	Ceratodon purpureus	fire-moss	N
R-2_1.2013	R-2	DACTGLO	20	6	Dactylis glomerata	orchard-grass	E
R-2_1.2013	R-2	MEDISAT	30	7	Medicago sativa	alfalfa	E
R-2_1.2013	R-2	PHLEPRA	0.1	6	Phleum pratense	common timothy	E
R-2_1.2013	R-2	ROSAACI	0.2	4	Rosa acicularis	prickly rose	N
R-2_1.2013	R-2	TARAOFF	0.01	7	Taraxacum officinale	common dandelion	E
R-2_1.2013	R-2	FESTRUB	16	6	Festuca rubra	red fescue	E
R-2_2.2013	R-2	ACHIMIL	1	7	Achillea millefolium	yarrow	N
R-2_2.2013	R-2	BROMINE	12	6	Bromus inermis	smooth brome	E
R-2_2.2013	R-2	BRYUM	0.01	9	Bryum sp.	thread-moss	N
R-2_2.2013	R-2	CERAPUR	12	9	Ceratodon purpureus	fire-moss	N
R-2_2.2013	R-2	FESTTRA	16	6	Festuca trachyphylla	hard fescue	E
R-2_2.2013	R-2	MEDISAT	8	7	Medicago sativa	alfalfa	E
R-2_2.2013	R-2	POA PRA	4	6	Poa pratensis	Kentucky bluegrass	N
R-2_2.2013	R-2	ROSAACI	0.03	4	Rosa acicularis	prickly rose	N
R-2_2.2013	R-2	SCHEARU	20	6	Schedonorus arundinaceus	tall fescue	E
R-2_2.2013	R-2	SHEPCAN	0.5	4	Shepherdia canadensis	soopolallie	N
R-2_2.2013	R-2	TARAOFF	0.2	7	Taraxacum officinale	common dandelion	E
R-2_2.2013	R-2	TANAVUL	0.1	7	Tanacetum vulgare	common tansy	E
REF-1_1.2013	REF-1	CAREPET	0.01	6	Carex petasata	pasture sedge	N
REF-1_1.2013	REF-1	ARCTUVA	20	12	Arctostaphylos uva-ursi	kinnikinnick	N

Site_plot_year	Site	Sp_Code	PCV	Life form	Scientific name	Common name	Origin
REF-1_1.2013	REF-1	CERAPUR	5	9	Ceratodon purpureus	fire-moss	N
REF-1_1.2013	REF-1	CORNCAN	2	7	Cornus canadensis	bunchberry	N
REF-1_1.2013	REF-1	EPILANG	0.8	7	Epilobium angustifolium	fireweed	N
REF-1_1.2013	REF-1	GEOCLIV	2	7	Geocaulon lividum	false toad-flax	N
REF-1_1.2013	REF-1	LINNBOR	3	12	Linnaea borealis	twinflower	N
REF-1_1.2013	REF-1	ORYZASP	3	6	Oryzopsis asperifolia	rough-leaved ricegrass	N
REF-1_1.2013	REF-1	PICEENG	1	1	Picea engelmannii	Engelmann spruce	N
REF-1_1.2013	REF-1	PINUCON	1	1	Pinus contorta	lodgepole pine	N
REF-1_1.2013	REF-1	PLEUSCH	0.8	9	Pleurozium schreberi	red-stemmed feathermoss	N
REF-1_1.2013	REF-1	POA PRA	0.7	6	Poa pratensis	Kentucky bluegrass	N
REF-1_1.2013	REF-1	POLYJUN	3	9	Polytrichum juniperinum	juniper haircap moss	N
REF-1_1.2013	REF-1	ROSAACI	0.1	4	Rosa acicularis	prickly rose	N
REF-1_1.2013	REF-1	SPIRBET	0.5	4	Spiraea betulifolia	birch-leaved spirea	N
REF-1_1.2013	REF-1	FESTRUB	0.01	6	Festuca rubra	red fescue	E
REF-1_1.2013	REF-1	LYCOPOD	0.2	4	Lycopodium sp.	clubmoss	N
REF-1_1.2013	REF-1	PEDICUL	0.2	7	Pedicularis sp.	lousewort	N
REF-1_1.2013	REF-1	SALIX	3	2	Salix sp.	willow	N
REF-1_1.2013	REF-1	VACCMYT	0.01	12	Vaccinium myrtillus	low bilberry	N
REF-10_1.2014	REF-10	AGROSCA	0.25	6	Agrostis scabra	hair bentgrass	N
REF-10_1.2014	REF-10	ARNICOR	1	7	Arnica cordifolia	heart-leaved arnica	N
REF-10_1.2014	REF-10	CORNCAN	2	7	Cornus canadensis	bunchberry	N
REF-10_1.2014	REF-10	DIPHALP	2	5	Diphasiastrum alpinum	alpine club-moss	N
REF-10_1.2014	REF-10	EPILANG	6	7	Epilobium angustifolium	fireweed	N
REF-10_1.2014	REF-10	HUPEOCC	1	5	Huperzia occidentalis	western fir clubmoss	N
REF-10_1.2014	REF-10	LINNBOR	2	12	Linnaea borealis	twinflower	N
REF-10_1.2014	REF-10	ORYZASP	1	6	Oryzopsis asperifolia	rough-leaved ricegrass	N
REF-10_1.2014	REF-10	ROSAACI	3	4	Rosa acicularis	prickly rose	N
REF-10_1.2014	REF-10	RUBUIDA	0.25	4	Rubus idaeus	red raspberry	N
REF-10_1.2014	REF-10	SHEPCAN	2	4	Shepherdia canadensis	soopolallie	N
REF-10_1.2014	REF-10	SPIRBET	2	4	Spiraea betulifolia	birch-leaved spirea	N
REF-10_1.2014	REF-10	TRISSPI	1	6	Trisetum spicatum	spike trisetum	N
REF-10_1.2014	REF-10	VACCMEM	3	4	Vaccinium membranaceum	black huckleberry	N
REF-10_1.2014	REF-10	FESTRUB	15	6	Festuca rubra	red fescue	E
REF-11_1.2014	REF-11	ABIELAS	4	1	Abies lasiocarpa	subalpine fir	N
REF-11_1.2014	REF-11	ABIELAS	2	1	Abies lasiocarpa	subalpine fir	N
REF-11_1.2014	REF-11	ALNUVIR	11	4	Alnus viridis	green alder	N
REF-11_1.2014	REF-11	ARNICOR	1	7	Arnica cordifolia	heart-leaved arnica	N
REF-11_1.2014	REF-11	CINNLAT	4	6	Cinna latifolia	nodding wood-reed	N
REF-11_1.2014	REF-11	CORNCAN	2	7	Cornus canadensis	bunchberry	N
REF-11_1.2014	REF-11	EPILANG	0.25	7	Epilobium angustifolium	fireweed	N
REF-11_1.2014	REF-11	LONIUTA	0.025	4	Lonicera utahensis	Utah honeysuckle	N
REF-11_1.2014	REF-11	PICEENE	2	1	Picea engelmannii x glauca	hybrid hybrid white spruce	N
REF-11_1.2014	REF-11	PICEENE	0.5	1	Picea engelmannii x glauca	hybrid hybrid white spruce	N
REF-11_1.2014	REF-11	PINUCON	10	1	Pinus contorta	lodgepole pine	N
REF-11_1.2014	REF-11	POPUTRI	2	2	Populus trichocarpa	black cottonwood	N
REF-11_1.2014	REF-11	RIBELAC	0.5	4	Ribes lacustre	black gooseberry	N
REF-11_1.2014	REF-11	ROSAACI	8	4	Rosa acicularis	prickly rose	N
REF-11_1.2014	REF-11	SPIRBET	2	4	Spiraea betulifolia	birch-leaved spirea	N
REF-11_1.2014	REF-11	VACCMEM	3	4	Vaccinium membranaceum	black huckleberry	N
REF-11_1.2014	REF-11	VACCSCO	1	12	Vaccinium scoparium	grouseberry	N
REF-11_1.2014	REF-11	FESTRUB	2	6	Festuca rubra	red fescue	E
REF-12_1.2014	REF-12	ABIELAS	10	1	Abies lasiocarpa	subalpine fir	N
REF-12_1.2014	REF-12	ABIELAS	7	1	Abies lasiocarpa	subalpine fir	N
REF-12_1.2014	REF-12	ACTARUB	1	7	Actaea rubra	baneberry	N
REF-12_1.2014	REF-12	AMELALN	0.25	4	Amelanchier alnifolia	saskatoon	N
REF-12_1.2014	REF-12	ARNICOR	2	7	Arnica cordifolia	heart-leaved arnica	N
REF-12_1.2014	REF-12	CINNLAT	5	6	Cinna latifolia	nodding wood-reed	N
REF-12_1.2014	REF-12	CLINUNI	1	7	Clintonia uniflora	queen's cup	N

Site_plot_year	Site	Sp_Code	PCV	Life form	Scientific name	Common name	Origin
REF-12_1.2014	REF-12	EPILANG	1	7	Epilobium angustifolium	fireweed	N
REF-12_1.2014	REF-12	GALITRD	0.5	7	Galium trifidum	small bedstraw	N
REF-12_1.2014	REF-12	GEOCLIV	1	7	Geocaulon lividum	false toad-flax	N
REF-12_1.2014	REF-12	MAIARAC	2	7	Maianthemum racemosum	false Solomon's-seal	N
REF-12_1.2014	REF-12	PICEENE	15	1	Picea engelmannii x glauca	hybrid hybrid white spruce	N
REF-12_1.2014	REF-12	PINUCON	4	1	Pinus contorta	lodgepole pine	N
REF-12_1.2014	REF-12	PLEUSCH	15	9	Pleurozium schreberi	red-stemmed feathermoss	N
REF-12_1.2014	REF-12	POPUTRE	12	2	Populus tremuloides	trembling aspen	N
REF-12_1.2014	REF-12	ROSAACI	3	4	Rosa acicularis	prickly rose	N
REF-12_1.2014	REF-12	SYMPCIL	3	7	Symphyotrichum ciliatum	rayless alkali aster	N
REF-12_1.2014	REF-12	THALDAS	0.5	7	Thalictrum dasycarpum	purple meadowrue	N
REF-12_1.2014	REF-12	VICIAME	5	7	Vicia americana	American vetch	N
REF-12_1.2014	REF-12	SALIX	0.25	4	Salix sp.	willow	N
REF-13_1.2015	REF-13	ARCTUVA	6	12	Arctostaphylos uva-ursi	kinnikinnick	N
REF-13_1.2015	REF-13	BRACSAL	6	9	Brachythecium salebrosum	golden ragged-moss	N
REF-13_1.2015	REF-13	CALACAN	0.1	6	Calamagrostis canadensis	bluejoint reedgrass	N
REF-13_1.2015	REF-13	CORNCAN	0.1	7	Cornus canadensis	bunchberry	N
REF-13_1.2015	REF-13	CREPTEC	0.01	7	Crepis tectorum	annual hawksbeard	E
REF-13_1.2015	REF-13	EPILANG	2	7	Epilobium angustifolium	fireweed	N
REF-13_1.2015	REF-13	LINNBOR	2	12	Linnaea borealis	twinflower	N
REF-13_1.2015	REF-13	PETAFRI	0.05	7	Petasites frigidus	sweet coltsfoot	N
REF-13_1.2015	REF-13	PICEGLA	0.5	1	Picea glauca	hybrid white spruce	N
REF-13_1.2015	REF-13	PINUCON	15	1	Pinus contorta	lodgepole pine	N
REF-13_1.2015	REF-13	POLYCOM	2	7	Polytrichum commune	common haircap moss	N
REF-13_1.2015	REF-13	POPUTRE	0.01	2	Populus tremuloides	trembling aspen	N
REF-13_1.2015	REF-13	ROSAACI	6	4	Rosa acicularis	prickly rose	N
REF-13_1.2015	REF-13	SPIRBET	3	4	Spiraea betulifolia	birch-leaved spirea	N
REF-13_1.2015	REF-13	SPIRPYR	1	4	Spiraea pyramidata	pyramid spirea	N
REF-13_1.2015	REF-13	TARAOFF	0.1	7	Taraxacum officinale	common dandelion	E
REF-13_1.2015	REF-13	VACCMEM	0.1	4	Vaccinium membranaceum	black huckleberry	N
REF-13_1.2015	REF-13	VACCSCO	3	12	Vaccinium scoparium	grouseberry	N
REF-13_1.2015	REF-13	VACCULI	0.5	4	Vaccinium uliginosum	bog blueberry	N
REF-13_1.2015	REF-13	FESTRUB	0.1	6	Festuca rubra	red fescue	E
REF-14_1.2015	REF-14	ACHIMIL	1	7	Achillea millefolium	yarrow	N
REF-14_1.2015	REF-14	ALNUVIR	3	4	Alnus viridis	green alder	N
REF-14_1.2015	REF-14	ARNICOR	2	7	Arnica cordifolia	heart-leaved arnica	N
REF-14_1.2015	REF-14	BRACSAL	5	9	Brachythecium salebrosum	golden ragged-moss	N
REF-14_1.2015	REF-14	CALAPUR	0.01	6	Calamagrostis purpurascens	purple reedgrass	N
REF-14_1.2015	REF-14	CERAPUR	6	9	Ceratodon purpureus	fire-moss	N
REF-14_1.2015	REF-14	CREPTEC	1	7	Crepis tectorum	annual hawksbeard	E
REF-14_1.2015	REF-14	EPILANG	4	7	Epilobium angustifolium	fireweed	N
REF-14_1.2015	REF-14	EURYCON	0.5	7	Eurybia conspicua	showy aster	N
REF-14_1.2015	REF-14	FRAGVIR	0.1	7	Fragaria virginiana	wild strawberry	N
REF-14_1.2015	REF-14	GALIBOR	1	7	Galium boreale	northern bedstraw	N
REF-14_1.2015	REF-14	LINNBOR	2	12	Linnaea borealis	twinflower	N
REF-14_1.2015	REF-14	LONIINV	2	4	Lonicera involucrata	black twinberry	N
REF-14_1.2015	REF-14	PELTCAN	0.5	11	Peltigera canina	dog pelt	N
REF-14_1.2015	REF-14	PICEGLA	5	1	Picea glauca	hybrid white spruce	N
REF-14_1.2015	REF-14	PINUCON	30	1	Pinus contorta	lodgepole pine	N
REF-14_1.2015	REF-14	POLYCOM	1	7	Polytrichum commune	common haircap moss	N
REF-14_1.2015	REF-14	ROSAACI	15	4	Rosa acicularis	prickly rose	N
REF-14_1.2015	REF-14	SALIPYR	0.5	2	Salix pyrifolia	balsam willow	N
REF-14_1.2015	REF-14	SCHIPUR	0.5	6	Schizachne purpurascens	false melic	N
REF-14_1.2015	REF-14	SPIRBET	20	4	Spiraea betulifolia	birch-leaved spirea	N
REF-14_1.2015	REF-14	SYMPFOL	0.1	7	Symphyotrichum foliaceum	leafy aster	N
REF-14_1.2015	REF-14	TSUGHET	0.1	6	Tsuga heterophylla	western hemlock	N
REF-14_1.2015	REF-14	VACCSCO	10	12	Vaccinium scoparium	grouseberry	N
REF-14_1.2015	REF-14	HIER SP	0.01	6	Hieracium sp.	hawkweed	N

Site_plot_year	Site	Sp_Code	PCV	Life form	Scientific name	Common name	Origin
REF-15_1.2015	REF-15	CHAMCAL	0.1	9	Chamaedaphne calyculata	leatherleaf	N
REF-15_1.2015	REF-15	DICRANUM	5	6	Dicranum sp.	heron's-bill moss	N
REF-15_1.2015	REF-15	ALNUVIR	3	4	Alnus viridis	green alder	N
REF-15_1.2015	REF-15	ARCTUVA	4	12	Arctostaphylos uva-ursi	kinnikinnick	N
REF-15_1.2015	REF-15	ARNICOR	1	7	Arnica cordifolia	heart-leaved arnica	N
REF-15_1.2015	REF-15	BETUPAP	0.5	2	Betula papyrifera	paper birch	N
REF-15_1.2015	REF-15	CALAPUR	0.1	6	Calamagrostis purpurascens	purple reedgrass	N
REF-15_1.2015	REF-15	CLADCOR	0.1	6	Cladonia cornuta	common bighorn	N
REF-15_1.2015	REF-15	CLADPYX	0.1	11	Cladonia pyxidata	pebbled pixie-cup	N
REF-15_1.2015	REF-15	EPILANG	2	7	Epilobium angustifolium	fireweed	N
REF-15_1.2015	REF-15	EURYCON	0.5	7	Eurybia conspicua	showy aster	N
REF-15_1.2015	REF-15	FRAGVIR	0.1	7	Fragaria virginiana	wild strawberry	N
REF-15_1.2015	REF-15	GEOCLIV	1	7	Geocaulon lividum	false toad-flax	N
REF-15_1.2015	REF-15	LATHOCH	0.5	7	Lathyrus ochroleucus	creamy peavine	N
REF-15_1.2015	REF-15	LEYMINN	0.5	7	Leymus innovatus	fuzzy-spiked wildrye	N
REF-15_1.2015	REF-15	LINNBOR	8	12	Linnaea borealis	twinflower	N
REF-15_1.2015	REF-15	LONIINV	0.1	4	Lonicera involucrata	black twinberry	N
REF-15_1.2015	REF-15	MAIACAN	0.1	7	Maianthemum canadense	wild lily-of-the-valley	N
REF-15_1.2015	REF-15	MELALIN	0.1	7	Melampyrum lineare	cow-wheat	N
REF-15_1.2015	REF-15	ORTHSEC	2	7	Orthilia secunda	one-sided wintergreen	N
REF-15_1.2015	REF-15	PICEGLA	10	1	Picea glauca	hybrid white spruce	N
REF-15_1.2015	REF-15	PINUCON	30	1	Pinus contorta	lodgepole pine	N
REF-15_1.2015	REF-15	PLEUSCH	15	9	Pleurozium schreberi	red-stemmed feathermoss	N
REF-15_1.2015	REF-15	PSEUMEN	0.3	1	Pseudotsuga menziesii	Douglas-fir	N
REF-15_1.2015	REF-15	RIBELAC	0.5	4	Ribes lacustre	black gooseberry	N
REF-15_1.2015	REF-15	RUBUPUB	0.5	4	Rubus pubescens	dwarf red raspberry	N
REF-15_1.2015	REF-15	SIBBPRO	0.01	4	Sibbaldia procumbens	sibbaldia	N
REF-15_1.2015	REF-15	STREAMP	1	6	Streptopus amplexifolius	clasping twistedstalk	N
REF-15_1.2015	REF-15	HIERALI	3	7	Hieracium albiflorum	white hawkweed	N
REF-15_1.2015	REF-15	PELTAPH	0.1	11	Peltigera aphthosa	freckle pelt	N
REF-2_1.2013	REF-2	ACHIMIL	0.05	7	Achillea millefolium	yarrow	N
REF-2_1.2013	REF-2	ANAPMAR	2	7	Anaphalis margaritacea	pearly everlasting	N
REF-2_1.2013	REF-2	ARCTUVA	1	12	Arctostaphylos uva-ursi	kinnikinnick	N
REF-2_1.2013	REF-2	CALACAN	0.2	6	Calamagrostis canadensis	bluejoint reedgrass	N
REF-2_1.2013	REF-2	CORNCAN	2	7	Cornus canadensis	bunchberry	N
REF-2_1.2013	REF-2	EPILANG	3	7	Epilobium angustifolium	fireweed	N
REF-2_1.2013	REF-2	HIERACI	0.6	7	Hieracium sp.	hawkweed	N
REF-2_1.2013	REF-2	LINNBOR	3	12	Linnaea borealis	twinflower	N
REF-2_1.2013	REF-2	ORYZASP	4	6	Oryzopsis asperifolia	rough-leaved ricegrass	N
REF-2_1.2013	REF-2	PELTAPH	1	11	Peltigera aphthosa	freckle pelt	N
REF-2_1.2013	REF-2	PICEENG	0.7	1	Picea engelmannii	Engelmann spruce	N
REF-2_1.2013	REF-2	PINUCON	20	1	Pinus contorta	lodgepole pine	N
REF-2_1.2013	REF-2	PLEUSCH	0.2	9	Pleurozium schreberi	red-stemmed feathermoss	N
REF-2_1.2013	REF-2	POLYJUN	4	9	Polytrichum juniperinum	juniper haircap moss	N
REF-2_1.2013	REF-2	POPUBAL	0.2	2	Populus balsamifera	balsam poplar	N
REF-2_1.2013	REF-2	POPUTRE	0.5	2	Populus tremuloides	trembling aspen	N
REF-2_1.2013	REF-2	RIBELAC	0.4	4	Ribes lacustre	black gooseberry	N
REF-2_1.2013	REF-2	ROSAACI	0.2	4	Rosa acicularis	prickly rose	N
REF-2_1.2013	REF-2	RUBUIDA	1	4	Rubus idaeus	red raspberry	N
REF-2_1.2013	REF-2	SHEPCAN	8	4	Shepherdia canadensis	soopolallie	N
REF-2_1.2013	REF-2	SPIRBET	4	4	Spiraea betulifolia	birch-leaved spirea	N
REF-2_1.2013	REF-2	TARAOFF	0.3	7	Taraxacum officinale	common dandelion	E
REF-2_1.2013	REF-2	VACCINI	0.5	3	Vaccinium sp.	blueberry, huckleberry	N
REF-2_1.2013	REF-2	VACCINI	4	3	Vaccinium sp.	blueberry, huckleberry	N
REF-2_1.2013	REF-2	FESTRUB	2	6	Festuca rubra	red fescue	E
REF-2_1.2013	REF-2	LYCOPOA	0.05	4	Lycopodiaceae	club-moss	N
REF-2_1.2013	REF-2	RHODGRO	1	3	Rhododendron groenlandicum	Labrador tea	N
REF-2_1.2013	REF-2	SALIX	3	2	Salix sp.	willow	N

Site_plot_year	Site	Sp_Code	PCV	Life form	Scientific name	Common name	Origin
REF-2_1.2013	REF-2	VACCMYT	0.01	12	Vaccinium myrtillus	low bilberry	N
REF-2_2.2014	REF-2	ANEMCAN	0.100000001	7	Anemone canadensis	Canada anemone	N
REF-2_2.2014	REF-2	AGROSCA	1	6	Agrostis scabra	hair bentgrass	N
REF-2_2.2014	REF-2	ARCTUVA	2	12	Arctostaphylos uva-ursi	kinnikinnick	N
REF-2_2.2014	REF-2	BETUPAP	0.100000001	2	Betula papyrifera	paper birch	N
REF-2_2.2014	REF-2	CALACAN	3	6	Calamagrostis canadensis	bluejoint reedgrass	N
REF-2_2.2014	REF-2	CAREX	5	6	Carex sp.	sedge	N
REF-2_2.2014	REF-2	CERAPUR	5	9	Ceratodon purpureus	fire-moss	N
REF-2_2.2014	REF-2	CINNLAT	3	6	Cinna latifolia	nodding wood-reed	N
REF-2_2.2014	REF-2	CORNCAN	3	7	Cornus canadensis	bunchberry	N
REF-2_2.2014	REF-2	EPILANG	8	7	Epilobium angustifolium	fireweed	N
REF-2_2.2014	REF-2	FRAGVIR	2	7	Fragaria virginiana	wild strawberry	N
REF-2_2.2014	REF-2	GALITRF	0.100000001	7	Galium triflorum	sweet-scented bedstraw	N
REF-2_2.2014	REF-2	HIERALI	2	7	Hieracium albiflorum	white hawkweed	N
REF-2_2.2014	REF-2	LINNBOR	4	12	Linnaea borealis	twinflower	N
REF-2_2.2014	REF-2	ORYZASP	2	6	Oryzopsis asperifolia	rough-leaved ricegrass	N
REF-2_2.2014	REF-2	PINUCON	3	1	Pinus contorta	lodgepole pine	N
REF-2_2.2014	REF-2	ROSAACI	4	4	Rosa acicularis	prickly rose	N
REF-2_2.2014	REF-2	SPIRBET	5	4	Spiraea betulifolia	birch-leaved spirea	N
REF-2_2.2014	REF-2	TARAOFF	1	7	Taraxacum officinale	common dandelion	E
REF-2_2.2014	REF-2	TRISSPI	3	6	Trisetum spicatum	spike trisetum	N
REF-2_2.2014	REF-2	VACCMEM	2	4	Vaccinium membranaceum	black huckleberry	N
REF-2_2.2014	REF-2	VACCULI	2	4	Vaccinium uliginosum	bog blueberry	N
REF-2_2.2014	REF-2	SALIX	6	4	Salix sp.	willow	N
REF-3_1.2013	REF-3	ACHIMIL	0.2	7	Achillea millefolium	yarrow	N
REF-3_1.2013	REF-3	ARCTUVA	0.8	12	Arctostaphylos uva-ursi	kinnikinnick	N
REF-3_1.2013	REF-3	ASTER	6	7	Aster sp.	aster	N
REF-3_1.2013	REF-3	CALAPUR	0.8	6	Calamagrostis purpurascens	purple reedgrass	N
REF-3_1.2013	REF-3	EPILANG	7	7	Epilobium angustifolium	fireweed	N
REF-3_1.2013	REF-3	FESTRUB	6	6	Festuca rubra	red fescue	E
REF-3_1.2013	REF-3	FRAGVIR	3	7	Fragaria virginiana	wild strawberry	N
REF-3_1.2013	REF-3	GALIBOR	0.2	7	Galium boreale	northern bedstraw	N
REF-3_1.2013	REF-3	LEUCVUL	0.1	7	Leucanthemum vulgare	oxeye daisy	E
REF-3_1.2013	REF-3	LINNBOR	0.6	12	Linnaea borealis	twinflower	N
REF-3_1.2013	REF-3	MAIARAC	0.03	7	Maianthemum racemosum	false Solomon's-seal	N
REF-3_1.2013	REF-3	PETAFRI	7	7	Petasites frigidus	sweet coltsfoot	N
REF-3_1.2013	REF-3	PICEENE	3	1	Picea engelmannii x glauca	hybrid hybrid white spruce	N
REF-3_1.2013	REF-3	PINUCON	4	1	Pinus contorta	lodgepole pine	N
REF-3_1.2013	REF-3	PLEUSCH	0.01	9	Pleurozium schreberi	red-stemmed feathermoss	N
REF-3_1.2013	REF-3	POLYJUN	1	9	Polytrichum juniperinum	juniper haircap moss	N
REF-3_1.2013	REF-3	ROSAACI	10	4	Rosa acicularis	prickly rose	N
REF-3_1.2013	REF-3	SPIRBET	0.1	4	Spiraea betulifolia	birch-leaved spirea	N
REF-3_1.2013	REF-3	VACCINI	3	3	Vaccinium sp.	blueberry, huckleberry	N
REF-3_1.2013	REF-3	SALIX	1	2	Salix sp.	willow	N
REF-3_1.2013	REF-3	SPIRDOU	6	4	Spiraea douglasii	hardhack	N
REF-3_1.2013	REF-3	VIBUOPU	0.4	4	Viburnum opulus	American bush-cranberry	N
REF-4_1.2014	REF-4	ABIELAS	8	1	Abies lasiocarpa	subalpine fir	N
REF-4_1.2014	REF-4	ACHIMIL	1.5	7	Achillea millefolium	yarrow	N
REF-4_1.2014	REF-4	ALNUVIR	8	4	Alnus viridis	green alder	N
REF-4_1.2014	REF-4	ARCTUVA	4	12	Arctostaphylos uva-ursi	kinnikinnick	N
REF-4_1.2014	REF-4	ARNICOR	1	7	Arnica cordifolia	heart-leaved arnica	N
REF-4_1.2014	REF-4	BROMCIL	1	6	Bromus ciliatus	fringed brome	N
REF-4_1.2014	REF-4	BRYACEA	2	9	Bryaceae	bryaceae	N
REF-4_1.2014	REF-4	CLINUNI	1	7	Clintonia uniflora	queen's cup	N
REF-4_1.2014	REF-4	CORNCAN	5	7	Cornus canadensis	bunchberry	N
REF-4_1.2014	REF-4	DACTGLO	0.5	6	Dactylis glomerata	orchard-grass	E
REF-4_1.2014	REF-4	EPILANG	1	7	Epilobium angustifolium	fireweed	N
REF-4_1.2014	REF-4	EQUIARV	0.5	5	Equisetum arvense	common horsetail	N

Site_plot_year	Site	Sp_Code	PCV	Life form	Scientific name	Common name	Origin
REF-4_1.2014	REF-4	EURYCON	0.100000001	7	Eurybia conspicua	showy aster	N
REF-4_1.2014	REF-4	HIERALI	0.5	7	Hieracium albiflorum	white hawkweed	N
REF-4_1.2014	REF-4	LONIINV	0.5	4	Lonicera involucrata	black twinberry	N
REF-4_1.2014	REF-4	MAIARAC	1	7	Maianthemum racemosum	false Solomon's-seal	N
REF-4_1.2014	REF-4	PETAFRI	2	7	Petasites frigidus	sweet coltsfoot	N
REF-4_1.2014	REF-4	PICEENE	4	1	Picea engelmannii x glauca	hybrid hybrid white spruce	N
REF-4_1.2014	REF-4	POPUTRI	2	2	Populus trichocarpa	black cottonwood	N
REF-4_1.2014	REF-4	PSEUMEN	8	1	Pseudotsuga menziesii	Douglas-fir	N
REF-4_1.2014	REF-4	PYROASA	0.5	7	Pyrola asarifolia	pink wintergreen	N
REF-4_1.2014	REF-4	PYROCHL	0.200000003	7	Pyrola chlorantha	green wintergreen	N
REF-4_1.2014	REF-4	RIBEOXY	1	4	Ribes oxyacanthoides	northern gooseberry	N
REF-4_1.2014	REF-4	ROSAACI	0.5	4	Rosa acicularis	prickly rose	N
REF-4_1.2014	REF-4	RUBUPAR	5	4	Rubus parviflorus	thimbleberry	N
REF-4_1.2014	REF-4	SORBSCO	0.25	4	Sorbus scopulina	western mountain-ash	N
REF-4_1.2014	REF-4	SPIRBET	1	4	Spiraea betulifolia	birch-leaved spirea	N
REF-4_1.2014	REF-4	VACCCAE	3	12	Vaccinium caespitosum	dwarf blueberry	N
REF-4_1.2014	REF-4	VACCMEM	0.5	4	Vaccinium membranaceum	black huckleberry	N
REF-4_1.2014	REF-4	SALIX	0.5	4	Salix sp.	willow	N
REF-4_1.2014	REF-4	STIPA	0.100000001	6	Stipa sp.	stipa	N
REF-5_1.2014	REF-5	ABIELAS	7	1	Abies lasiocarpa	subalpine fir	N
REF-5_1.2014	REF-5	ABIELAS	2	1	Abies lasiocarpa	subalpine fir	N
REF-5_1.2014	REF-5	ALNUVIR	3	4	Alnus viridis	green alder	N
REF-5_1.2014	REF-5	AMELALN	2	4	Amelanchier alnifolia	saskatoon	N
REF-5_1.2014	REF-5	CASTMIN	0.3	7	Castilleja miniata	scarlet paintbrush	N
REF-5_1.2014	REF-5	CLINUNI	3	7	Clintonia uniflora	queen's cup	N
REF-5_1.2014	REF-5	CORNCAN	6	7	Cornus canadensis	bunchberry	N
REF-5_1.2014	REF-5	EPILANG	0.5	7	Epilobium angustifolium	fireweed	N
REF-5_1.2014	REF-5	MAIARAC	0.5	7	Maianthemum racemosum	false Solomon's-seal	N
REF-5_1.2014	REF-5	ORTHSEC	2	7	Orthilia secunda	one-sided wintergreen	N
REF-5_1.2014	REF-5	PICEENE	3	1	Picea engelmannii x glauca	hybrid hybrid white spruce	N
REF-5_1.2014	REF-5	PSEUMEN	5	1	Pseudotsuga menziesii	Douglas-fir	N
REF-5_1.2014	REF-5	PSEUMEN	1	1	Pseudotsuga menziesii	Douglas-fir	N
REF-5_1.2014	REF-5	RIBEOXY	2	4	Ribes oxyacanthoides	northern gooseberry	N
REF-5_1.2014	REF-5	RUBUPAR	2	4	Rubus parviflorus	thimbleberry	N
REF-5_1.2014	REF-5	SORBSCO	2	4	Sorbus scopulina	western mountain-ash	N
REF-5_1.2014	REF-5	SPIRBET	10	4	Spiraea betulifolia	birch-leaved spirea	N
REF-5_1.2014	REF-5	SYMPCIL	2	7	Symphyotrichum ciliatum	rayless alkali aster	N
REF-5_1.2014	REF-5	THALDAS	0.25	7	Thalictrum dasycarpum	purple meadowrue	N
REF-5_1.2014	REF-5	VACCMEM	8	4	Vaccinium membranaceum	black huckleberry	N
REF-5_1.2014	REF-5	VIBUEDU	1	4	Viburnum edule	highbush-cranberry	N
REF-6_1.2014	REF-6	ABIELAS	35	1	Abies lasiocarpa	subalpine fir	N
REF-6_1.2014	REF-6	ABIELAS	3	1	Abies lasiocarpa	subalpine fir	N
REF-6_1.2014	REF-6	AGROSCA	1	6	Agrostis scabra	hair bentgrass	N
REF-6_1.2014	REF-6	ALNUVIR	0.5	4	Alnus viridis	green alder	N
REF-6_1.2014	REF-6	ARNICOR	0.25	7	Arnica cordifolia	heart-leaved arnica	N
REF-6_1.2014	REF-6	BRYACEA	10	9	Bryaceae	bryaceae	N
REF-6_1.2014	REF-6	CORNCAN	0.25	7	Cornus canadensis	bunchberry	N
REF-6_1.2014	REF-6	GAULHIS	0.25	12	Gaultheria hispidula	creeping-snowberry	N
REF-6_1.2014	REF-6	GOODOBL	0.5	7	Goodyera oblongifolia	rattlesnake-plantain	N
REF-6_1.2014	REF-6	LINNBOR	0.75	12	Linnaea borealis	twinflower	N
REF-6_1.2014	REF-6	MAIACAN	0.2	7	Maianthemum canadense	wild lily-of-the-valley	N
REF-6_1.2014	REF-6	MAIARAC	0.25	7	Maianthemum racemosum	false Solomon's-seal	N
REF-6_1.2014	REF-6	ORTHSEC	1	7	Orthilia secunda	one-sided wintergreen	N
REF-6_1.2014	REF-6	PELTCAN	0.75	11	Peltigera canina	dog pelt	N
REF-6_1.2014	REF-6	PLEUSCH	6	9	Pleurozium schreberi	red-stemmed feathermoss	N
REF-6_1.2014	REF-6	PTILCRI	10	9	Ptilium crista-castrensis	knight's plume	N
REF-6_1.2014	REF-6	PYROASA	1	7	Pyrola asarifolia	pink wintergreen	N
REF-6_1.2014	REF-6	SORBSCO	0.5	4	Sorbus scopulina	western mountain-ash	N

Site_plot_year	Site	Sp_Code	PCV	Life form	Scientific name	Common name	Origin
REF-6_1.2014	REF-6	SPIRBET	2	4	Spiraea betulifolia	birch-leaved spirea	N
REF-6_1.2014	REF-6	SYMPCIL	0.1	7	Symphyotrichum ciliatum	rayless alkali aster	N
REF-6_1.2014	REF-6	THALDAS	0.25	7	Thalictrum dasycarpum	purple meadowrue	N
REF-6_1.2014	REF-6	VACCCAE	0.5	12	Vaccinium caespitosum	dwarf blueberry	N
REF-6_1.2014	REF-6	VACCMEM	0.25	4	Vaccinium membranaceum	black huckleberry	N
REF-6_1.2014	REF-6	VIOLREN	0.2	7	Viola renifolia	kidney-leaved violet	N
REF-6_1.2014	REF-6	SALIX	3	4	Salix sp.	willow	N
REF-7_1.2014	REF-7	ALNUVIR	2	4	Alnus viridis	green alder	N
REF-7_1.2014	REF-7	AMELALN	10	4	Amelanchier alnifolia	saskatoon	N
REF-7_1.2014	REF-7	EPILANG	2	7	Epilobium angustifolium	fireweed	N
REF-7_1.2014	REF-7	GALITRF	1	7	Galium triflorum	sweet-scented bedstraw	N
REF-7_1.2014	REF-7	MAIARAC	1	7	Maianthemum racemosum	false Solomon's-seal	N
REF-7_1.2014	REF-7	POPUTRE	20	2	Populus tremuloides	trembling aspen	N
REF-7_1.2014	REF-7	ROSAACI	15	4	Rosa acicularis	prickly rose	N
REF-7_1.2014	REF-7	SORBSCO	4	4	Sorbus scopulina	western mountain-ash	N
REF-7_1.2014	REF-7	SPIRBET	17	4	Spiraea betulifolia	birch-leaved spirea	N
REF-7_1.2014	REF-7	SYMPALB	12	4	Symphoricarpos albus	common snowberry	N
REF-7_1.2014	REF-7	SYMPCIL	7	7	Symphyotrichum ciliatum	rayless alkali aster	N
REF-7_1.2014	REF-7	THALDAS	5	7	Thalictrum dasycarpum	purple meadowrue	N
REF-7_1.2014	REF-7	VICIAME	20	7	Vicia americana	American vetch	N
REF-7_1.2014	REF-7	POA	6	6	Poa sp.	bluegrass	N
REF-8_1.2014	REF-8	ACHIMIL	1	7	Achillea millefolium	yarrow	N
REF-8_1.2014	REF-8	ALNUVIR	2	4	Alnus viridis	green alder	N
REF-8_1.2014	REF-8	ARCTUVA	2	12	Arctostaphylos uva-ursi	kinnikinnick	N
REF-8_1.2014	REF-8	ARNICOR	1	7	Arnica cordifolia	heart-leaved arnica	N
REF-8_1.2014	REF-8	CASTMIN	0.5	7	Castilleja miniata	scarlet paintbrush	N
REF-8_1.2014	REF-8	CLADMIT	1	11	Cladina mitis	lesser green reindeer	N
REF-8_1.2014	REF-8	CLADRAN	1	11	Cladina rangiferina	grey reindeer	N
REF-8_1.2014	REF-8	CORNCAN	2	7	Cornus canadensis	bunchberry	N
REF-8_1.2014	REF-8	EPILANG	0.25	7	Epilobium angustifolium	fireweed	N
REF-8_1.2014	REF-8	FRAGVIR	0.5	7	Fragaria virginiana	wild strawberry	N
REF-8_1.2014	REF-8	GEOCLIV	0.100000001	7	Geocaulon lividum	false toad-flax	N
REF-8_1.2014	REF-8	HIERACI	0.100000001	7	Hieracium sp.	hawkweed	N
REF-8_1.2014	REF-8	LEUCVUL	0.100000001	7	Leucanthemum vulgare	oxeye daisy	E
REF-8_1.2014	REF-8	LICHINA	3	11	Lichinaceae	lichin sp.	N
REF-8_1.2014	REF-8	LINNBOR	2	12	Linnaea borealis	twinflower	N
REF-8_1.2014	REF-8	LONIINV	3	4	Lonicera involucrata	black twinberry	N
REF-8_1.2014	REF-8	ORYZASP	4	6	Oryzopsis asperifolia	rough-leaved ricegrass	N
REF-8_1.2014	REF-8	PELTCAN	1	11	Peltigera canina	dog pelt	N
REF-8_1.2014	REF-8	PICEENE	3	1	Picea engelmannii x glauca	hybrid hybrid white spruce	N
REF-8_1.2014	REF-8	PINUCON	15	1	Pinus contorta	lodgepole pine	N
REF-8_1.2014	REF-8	PLEUSCH	7	9	Pleurozium schreberi	red-stemmed feathermoss	N
REF-8_1.2014	REF-8	ROSAACI	3	4	Rosa acicularis	prickly rose	N
REF-8_1.2014	REF-8	SHEPCAN	8	4	Shepherdia canadensis	soopolallie	N
REF-8_1.2014	REF-8	SORBSCO	1	4	Sorbus scopulina	western mountain-ash	N
REF-8_1.2014	REF-8	SPIRBET	2	4	Spiraea betulifolia	birch-leaved spirea	N
REF-8_1.2014	REF-8	SYMPCIL	2	7	Symphyotrichum ciliatum	rayless alkali aster	N
REF-8_1.2014	REF-8	VACCMEM	2	4	Vaccinium membranaceum	black huckleberry	N
REF-8_1.2014	REF-8	VACCSCO	1	12	Vaccinium scoparium	grouseberry	N
REF-9_1.2014	REF-9	FESTRUB	14	6	Festuca rubra	red fescue	E
REF-9_1.2014	REF-9	ALNUVIR	2	4	Alnus viridis	green alder	N
REF-9_1.2014	REF-9	AMELALN	4	4	Amelanchier alnifolia	saskatoon	N
REF-9_1.2014	REF-9	ARCTUVA	20	12	Arctostaphylos uva-ursi	kinnikinnick	N
REF-9_1.2014	REF-9	BETUPAP	1	2	Betula papyrifera	paper birch	N
REF-9_1.2014	REF-9	CHIMUMB	1	12	Chimaphila umbellata	prince's pine	N
REF-9_1.2014	REF-9	CORNCAN	2	7	Cornus canadensis	bunchberry	N
REF-9_1.2014	REF-9	DIPHALP	2	5	Diphasiastrum alpinum	alpine club-moss	N
REF-9_1.2014	REF-9	EPILANG	2	7	Epilobium angustifolium	fireweed	N

Site_plot_year	Site	Sp_Code	PCV	Life form	Scientific name	Common name	Origin
REF-9_1.2014	REF-9	HIERALI	2	7	Hieracium albiflorum	white hawkweed	N
REF-9_1.2014	REF-9	MONEUNI	1	7	Moneses uniflora	single delight	N
REF-9_1.2014	REF-9	ORYZASP	1	6	Oryzopsis asperifolia	rough-leaved ricegrass	N
REF-9_1.2014	REF-9	PICEENE	0.25	1	Picea engelmannii x glauca	hybrid hybrid white spruce	N
REF-9_1.2014	REF-9	PINUCON	1	1	Pinus contorta	lodgepole pine	N
REF-9_1.2014	REF-9	POPUTRE	2	2	Populus tremuloides	trembling aspen	N
REF-9_1.2014	REF-9	ROSAACI	6	4	Rosa acicularis	prickly rose	N
REF-9_1.2014	REF-9	SALIBEB	0.5	2	Salix bebbiana	Bebb's willow	N
REF-9_1.2014	REF-9	SAMBRAC	0.5	4	Sambucus racemosa	elderberry	N
REF-9_1.2014	REF-9	SHEPCAN	4	4	Shepherdia canadensis	soopolallie	N
REF-9_1.2014	REF-9	SPIRBET	4	4	Spiraea betulifolia	birch-leaved spirea	N
REF-9_1.2014	REF-9	VACCMEM	7	4	Vaccinium membranaceum	black huckleberry	N
REF-9_1.2014	REF-9	VIBUEDU	0.25	4	Viburnum edule	highbush-cranberry	N
REF-9_1.2014	REF-9	SALIX	0.5	4	Salix sp.	willow	N
S-1_1.2015	S-1	ANTEPAR	0.5	7	Antennaria parvifolia	Nuttall's pussytoes	N
S-1_1.2015	S-1	ACHIMIL	1	7	Achillea millefolium	yarrow	N
S-1_1.2015	S-1	ANEMMUL	1	7	Anemone multifida	cut-leaved anemone	N
S-1_1.2015	S-1	BRACSAL	10	9	Brachythecium salebrosum	golden ragged-moss	N
S-1_1.2015	S-1	EQUIARV	25	5	Equisetum arvense	common horsetail	N
S-1_1.2015	S-1	FESTOCC	3	6	Festuca occidentalis	western fescue	N
S-1_1.2015	S-1	HIERAUR	0.1	7	Hieracium aurantiacum	orange-red king devil	E
S-1_1.2015	S-1	HIERGRA	0.01	7	Hieracium gracile	slender hawkweed	N
S-1_1.2015	S-1	HIERUMB	0.1	7	Hieracium umbellatum	narrow-leaved hawkweed	E
S-1_1.2015	S-1	PELTCAN	8	11	Peltigera canina	dog pelt	N
S-1_1.2015	S-1	PICEGLA	1	1	Picea glauca	hybrid white spruce	N
S-1_1.2015	S-1	PINUCON	20	1	Pinus contorta	lodgepole pine	N
S-1_1.2015	S-1	POA PRA	1	6	Poa pratensis	Kentucky bluegrass	N
S-1_2.2015	S-1	BRACHYH	3	2	Brachytheciaceae	ragged-moss	N
S-1_2.2015	S-1	DICRANUM	0.1	6	Dicranum sp.	heron's-bill moss	N
S-1_2.2015	S-1	ACHIMIL	0.1	7	Achillea millefolium	yarrow	N
S-1_2.2015	S-1	ANTEMIC	0.5	7	Antennaria microphylla	white pussytoes	N
S-1_2.2015	S-1	ANTENEG	2	7	Antennaria neglecta	field pussytoes	N
S-1_2.2015	S-1	CALAPUR	0.01	6	Calamagrostis purpurascens	purple reedgrass	N
S-1_2.2015	S-1	CLADPYX	0.5	11	Cladonia pyxidata	pebbled pixie-cup	N
S-1_2.2015	S-1	EPILANG	0.1	7	Epilobium angustifolium	fireweed	N
S-1_2.2015	S-1	EQUIARV	0.1	5	Equisetum arvense	common horsetail	N
S-1_2.2015	S-1	FESTOCC	20	6	Festuca occidentalis	western fescue	N
S-1_2.2015	S-1	JUNICOM	0.5	3	Juniperus communis	common juniper	N
S-1_2.2015	S-1	LONIINV	0.5	4	Lonicera involucrata	black twinberry	N
S-1_2.2015	S-1	PELTCAN	3	11	Peltigera canina	dog pelt	N
S-1_2.2015	S-1	PICEGLA	0.1	1	Picea glauca	hybrid white spruce	N
S-1_2.2015	S-1	PINUCON	25	1	Pinus contorta	lodgepole pine	N
S-1_2.2015	S-1	POPUBAL	0.1	2	Populus balsamifera	balsam poplar	N
S-1_2.2015	S-1	SYMPFOL	0.5	7	Symphyotrichum foliaceum	leafy aster	N
S-1_2.2015	S-1	PELTAPH	1	11	Peltigera aphthosa	freckle pelt	N
S-1_2.2015	S-1	TORTRUA	0.5	6	Tortula ruralis	sidewalk moss	N
S-1_3.2015	S-1	ANTEPAR	1	7	Antennaria parvifolia	Nuttall's pussytoes	N
S-1_3.2015	S-1	BRACHYT	12	2	Brachythecium sp.	ragged-moss	N
S-1_3.2015	S-1	ACHIMIL	0.5	7	Achillea millefolium	yarrow	N
S-1_3.2015	S-1	ANTENEG	0.5	7	Antennaria neglecta	field pussytoes	N
S-1_3.2015	S-1	CALAPUR	0.01	6	Calamagrostis purpurascens	purple reedgrass	N
S-1_3.2015	S-1	CLADPYX	0.5	11	Cladonia pyxidata	pebbled pixie-cup	N
S-1_3.2015	S-1	EPILANG	0.1	7	Epilobium angustifolium	fireweed	N
S-1_3.2015	S-1	EQUIARV	0.1	5	Equisetum arvense	common horsetail	N
S-1_3.2015	S-1	FESTOCC	5	6	Festuca occidentalis	western fescue	N
S-1_3.2015	S-1	LONIINV	1	4	Lonicera involucrata	black twinberry	N
S-1_3.2015	S-1	PELTCAN	1	11	Peltigera canina	dog pelt	N
S-1_3.2015	S-1	PINUCON	20	1	Pinus contorta	lodgepole pine	N

Site_plot_year	Site	Sp_Code	PCV	Life form	Scientific name	Common name	Origin
S-1_3.2015	S-1	POLYJUN	0.5	9	Polytrichum juniperinum	juniper haircap moss	N
S-1_3.2015	S-1	SYMPFOL	0.5	7	Symphyotrichum foliaceum	leafy aster	N
S-1_3.2015	S-1	PELTAPH	1	11	Peltigera aphthosa	freckle pelt	N
S-1_4.2015	S-1	CERAPUR	10	9	Ceratodon purpureus	fire-moss	N
S-1_4.2015	S-1	FESTRUB	8	6	Festuca rubra	red fescue	E
S-1_4.2015	S-1	ACHIMIL	0.5	7	Achillea millefolium	yarrow	N
S-1_4.2015	S-1	ANTENEG	0.1	7	Antennaria neglecta	field pussytoes	N
S-1_4.2015	S-1	ARCTUVA	0.1	12	Arctostaphylos uva-ursi	kinnikinnick	N
S-1_4.2015	S-1	CLADCOR	0.01	6	Cladonia cornuta	common bighorn	N
S-1_4.2015	S-1	CLADPYX	0.1	11	Cladonia pyxidata	pebbled pixie-cup	N
S-1_4.2015	S-1	ELYMTRA	0.1	6	Elymus trachycaulus	slender wheatgrass	N
S-1_4.2015	S-1	FESTOCC	4	6	Festuca occidentalis	western fescue	N
S-1_4.2015	S-1	PELTCAN	1	11	Peltigera canina	dog pelt	N
S-1_4.2015	S-1	PINUCON	12	1	Pinus contorta	lodgepole pine	N
S-1_4.2015	S-1	POPUBAL	0.1	2	Populus balsamifera	balsam poplar	N
S-1_4.2015	S-1	HIERACI	0.01	6	Hieracium sp.	hawkweed	N
S-1_4.2015	S-1	SALIX	1	4	Salix sp.	willow	N
S-2_1.2014	S-2	FESTRUB	15	6	Festuca rubra	red fescue	E
S-2_1.2014	S-2	ACHIMIL	1.5	7	Achillea millefolium	yarrow	N
S-2_1.2014	S-2	BROMCIL	3	6	Bromus ciliatus	fringed brome	N
S-2_1.2014	S-2	BROMINE	7	6	Bromus inermis	smooth brome	E
S-2_1.2014	S-2	DACTGLO	1	6	Dactylis glomerata	orchard-grass	E
S-2_1.2014	S-2	ELYMGLA	1	6	Elymus glaucus	blue wildrye	N
S-2_1.2014	S-2	FRAGVIR	5	7	Fragaria virginiana	wild strawberry	N
S-2_1.2014	S-2	LATHNEV	0.5	7	Lathyrus nevadensis	purple peavine	N
S-2_1.2014	S-2	LONIINV	0.25	4	Lonicera involucrata	black twinberry	N
S-2_1.2014	S-2	PENSTEM	2	7	Penstemon sp.	penstemon	N
S-2_1.2014	S-2	PHLEPRA	0.5	6	Phleum pratense	common timothy	E
S-2_1.2014	S-2	POA COM	1	6	Poa compressa	Canada bluegrass	E
S-2_1.2014	S-2	ROSAACI	1	4	Rosa acicularis	prickly rose	N
S-2_1.2014	S-2	RUBUPAR	2	4	Rubus parviflorus	thimbleberry	N
S-2_1.2014	S-2	SYMPALB	3	4	Symphoricarpos albus	common snowberry	N
S-2_1.2014	S-2	TARAOFF	1	7	Taraxacum officinale	common dandelion	E
S-2_1.2014	S-2	THININT	2	6	Thinopyrum intermedium	intermediate wheatgrass	E
S-2_1.2014	S-2	VIBUEDU	1	4	Viburnum edule	highbush-cranberry	N
S-2_1.2014	S-2	VICIAME	1	7	Vicia americana	American vetch	N
S-2_2.2013	S-2	ACHIMIL	3	7	Achillea millefolium	yarrow	N
S-2_2.2013	S-2	ARCTUVA	6	12	Arctostaphylos uva-ursi	kinnikinnick	N
S-2_2.2013	S-2	BROMINE	8	6	Bromus inermis	smooth brome	E
S-2_2.2013	S-2	CERAPUR	35	9	Ceratodon purpureus	fire-moss	N
S-2_2.2013	S-2	EPILANG	0.03	7	Epilobium angustifolium	fireweed	N
S-2_2.2013	S-2	FESTTRA	4	6	Festuca trachyphylla	hard fescue	E
S-2_2.2013	S-2	MELIALB	0.1	7	Melilotus alba	white sweet-clover	E
S-2_2.2013	S-2	PSEUMEN	2	1	Pseudotsuga menziesii	Douglas-fir	N
S-2_2.2013	S-2	SCHEARU	4	6	Schedonorus arundinaceus	tall fescue	E
S-2_2.2013	S-2	TARAOFF	0.1	7	Taraxacum officinale	common dandelion	E
S-2_2.2013	S-2	TRIFREP	1	7	Trifolium repens	white clover	E
S-2_2.2013	S-2	VICIAME	0.5	7	Vicia americana	American vetch	N
S-2_3.2014	S-2	FESTRUB	5	6	Festuca rubra	red fescue	E
S-2_3.2014	S-2	ACHIMIL	0.25	7	Achillea millefolium	yarrow	N
S-2_3.2014	S-2	AGROCRI	1	6	Agropyron cristatum	crested wheatgrass	E
S-2_3.2014	S-2	ALLICER	0.5	7	Allium cernuum	nodding onion	N
S-2_3.2014	S-2	ANTERAC	0.100000001	7	Antennaria racemosa	racemose pussytoes	N
S-2_3.2014	S-2	BROMCIL	0.25	6	Bromus ciliatus	fringed brome	N
S-2_3.2014	S-2	BROMINE	0.5	6	Bromus inermis	smooth brome	E
S-2_3.2014	S-2	CAREX	0.25	6	Carex sp.	sedge	N
S-2_3.2014	S-2	CERAPUR	4	9	Ceratodon purpureus	fire-moss	N
S-2_3.2014	S-2	ELYMTRA	1	6	Elymus trachycaulus	slender wheatgrass	N

Site_plot_year	Site	Sp_Code	PCV	Life form	Scientific name	Common name	Origin
S-2_3.2014	S-2	FESTTRA	2	6	Festuca trachyphylla	hard fescue	E
S-2_3.2014	S-2	HESPCOM	0.25	6	Hesperostipa comata	needle-and-thread grass	N
S-2_3.2014	S-2	PHLEPRA	1	6	Phleum pratense	common timothy	E
S-2_3.2014	S-2	POA COM	3	6	Poa compressa	Canada bluegrass	E
S-2_3.2014	S-2	PSEUMEN	0.5	1	Pseudotsuga menziesii	Douglas-fir	N
S-2_3.2014	S-2	RUBUPAR	1	4	Rubus parviflorus	thimbleberry	N
S-2_3.2014	S-2	SYMPALB	2	4	Symphoricarpos albus	common snowberry	N
S-2_3.2014	S-2	TARAOFF	2	7	Taraxacum officinale	common dandelion	E
S-2_3.2014	S-2	TRIFHYB	1	7	Trifolium hybridum	alsike clover	E
S-2_3.2014	S-2	VICIAME	0.25	7	Vicia americana	American vetch	N
S-2_3.2014	S-2	STIPA	0.25	6	Stipa sp.	stipa	N
S-2_4.2013	S-2	FESTRUB	4	6	Festuca rubra	red fescue	E
S-2_4.2013	S-2	BROMINE	3	6	Bromus inermis	smooth brome	E
S-2_4.2013	S-2	FESTTRA	4	6	Festuca trachyphylla	hard fescue	E
S-2_4.2013	S-2	PHLEPRA	0.05	6	Phleum pratense	common timothy	E
S-2_4.2013	S-2	POA PRA	0.5	6	Poa pratensis	Kentucky bluegrass	N
S-2_4.2013	S-2	ROSAACI	0.1	4	Rosa acicularis	prickly rose	N
S-2_4.2013	S-2	SCHEARU	12	6	Schedonorus arundinaceus	tall fescue	E
S-2_4.2013	S-2	TARAOFF	0.1	7	Taraxacum officinale	common dandelion	E
S-2_5.2014	S-2	FESTRUB	6	6	Festuca rubra	red fescue	E
S-2_5.2014	S-2	ACHIMIL	0.200000003	7	Achillea millefolium	yarrow	N
S-2_5.2014	S-2	ALNUVIR	0.25	4	Alnus viridis	green alder	N
S-2_5.2014	S-2	BROMINE	3	6	Bromus inermis	smooth brome	E
S-2_5.2014	S-2	CERAPUR	20	9	Ceratodon purpureus	fire-moss	N
S-2_5.2014	S-2	DACTGLO	1	6	Dactylis glomerata	orchard-grass	E
S-2_5.2014	S-2	EPILANG	0.5	7	Epilobium angustifolium	fireweed	N
S-2_5.2014	S-2	FESTTRA	2	6	Festuca trachyphylla	hard fescue	E
S-2_5.2014	S-2	FRAGVIR	0.100000001	7	Fragaria virginiana	wild strawberry	N
S-2_5.2014	S-2	HIERGRA	0.100000001	7	Hieracium gracile	slender hawkweed	N
S-2_5.2014	S-2	POA COM	2	6	Poa compressa	Canada bluegrass	E
S-2_5.2014	S-2	PSEUMEN	1	1	Pseudotsuga menziesii	Douglas-fir	N
S-2_5.2014	S-2	RUBUIDA	0.25	4	Rubus idaeus	red raspberry	N
S-2_5.2014	S-2	TARAOFF	0.200000003	7	Taraxacum officinale	common dandelion	E
S-2_5.2014	S-2	TRIFHYB	0.5	7	Trifolium hybridum	alsike clover	E
S-2_5.2014	S-2	TRIFREP	0.100000001	7	Trifolium repens	white clover	E
S-2_6.2013	S-2	ACHIMIL	0.5	7	Achillea millefolium	yarrow	N
S-2_6.2013	S-2	BROMINE	2	6	Bromus inermis	smooth brome	E
S-2_6.2013	S-2	CERAPUR	3	9	Ceratodon purpureus	fire-moss	N
S-2_6.2013	S-2	FESTTRA	5	6	Festuca trachyphylla	hard fescue	E
S-2_6.2013	S-2	HIERACI	1	7	Hieracium sp.	hawkweed	N
S-2_6.2013	S-2	PHLEPRA	0.1	6	Phleum pratense	common timothy	E
S-2_6.2013	S-2	POA PRA	0.5	6	Poa pratensis	Kentucky bluegrass	N
S-2_6.2013	S-2	POPUBAL	0.05	2	Populus balsamifera	balsam poplar	N
S-2_6.2013	S-2	PSEUMEN	0.8	1	Pseudotsuga menziesii	Douglas-fir	N
S-2_6.2013	S-2	SCHEARU	1	6	Schedonorus arundinaceus	tall fescue	E
S-2_6.2013	S-2	TARAOFF	0.3	7	Taraxacum officinale	common dandelion	E
S-2_6.2013	S-2	VICIAME	0.7	7	Vicia americana	American vetch	N
S-3_1.2015	S-3	FESTRUB	8	6	Festuca rubra	red fescue	E
S-3_1.2015	S-3	AGROCRI	0.1	6	Agropyron cristatum	crested wheatgrass	E
S-3_1.2015	S-3	ALNUVIR	1	4	Alnus viridis	green alder	N
S-3_1.2015	S-3	BOECRET	0.5	2	Boechera retrofracta	dangling suncress	N
S-3_1.2015	S-3	BROMINE	2	6	Bromus inermis	smooth brome	E
S-3_1.2015	S-3	CERAPUR	5	9	Ceratodon purpureus	fire-moss	N
S-3_1.2015	S-3	ELYMTRA	0.1	6	Elymus trachycaulus	slender wheatgrass	N
S-3_1.2015	S-3	MEDISAT	0.5	7	Medicago sativa	alfalfa	E
S-3_1.2015	S-3	POA COM	2	6	Poa compressa	Canada bluegrass	E
S-3_1.2015	S-3	PSEUMEN	4	1	Pseudotsuga menziesii	Douglas-fir	N
S-3_2.2015	S-3	FESTRUB	20	6	Festuca rubra	red fescue	E

Site_plot_year	Site	Sp_Code	PCV	Life form	Scientific name	Common name	Origin
S-3_2.2015	S-3	ACHIMIL	0.5	7	Achillea millefolium	yarrow	N
S-3_2.2015	S-3	BOECRET	0.5	2	Boechera retrofracta	dangling suncress	N
S-3_2.2015	S-3	BROMINE	2	6	Bromus inermis	smooth brome	E
S-3_2.2015	S-3	ELYMTRA	0.5	6	Elymus trachycaulus	slender wheatgrass	N
S-3_2.2015	S-3	EPILANG	0.5	7	Epilobium angustifolium	fireweed	N
S-3_2.2015	S-3	EURYCON	0.1	7	Eurybia conspicua	showy aster	N
S-3_2.2015	S-3	PINUCON	15	1	Pinus contorta	lodgepole pine	N
S-3_2.2015	S-3	PSEUMEN	2	1	Pseudotsuga menziesii	Douglas-fir	N
S-4_1.2013	S-4	FESTRUB	35	6	Festuca rubra	red fescue	E
S-4_1.2013	S-4	ACHIMIL	1	7	Achillea millefolium	yarrow	N
S-4_1.2013	S-4	AGROCRI	3	6	Agropyron cristatum	crested wheatgrass	E
S-4_1.2013	S-4	ARABHOL	0.1	7	Arabis holboellii	Holboell's rockcress	N
S-4_1.2013	S-4	BRACHYT	3	9	Brachythecium sp.	ragged-moss	N
S-4_1.2013	S-4	CASTMIN	0.1	7	Castilleja miniata	scarlet paintbrush	N
S-4_1.2013	S-4	CERAPUR	10	9	Ceratodon purpureus	fire-moss	N
S-4_1.2013	S-4	DACTGLO	3	6	Dactylis glomerata	orchard-grass	E
S-4_1.2013	S-4	ELYMTRA	5	6	Elymus trachycaulus	slender wheatgrass	N
S-4_1.2013	S-4	EPILANG	0.2	7	Epilobium angustifolium	fireweed	N
S-4_1.2013	S-4	FESTIDA	0.2	6	Festuca idahoensis	Idaho fescue	N
S-4_1.2013	S-4	MEDISAT	12	7	Medicago sativa	alfalfa	E
S-4_1.2013	S-4	PHLEPRA	1	6	Phleum pratense	common timothy	E
S-4_1.2013	S-4	POPUBAL	2	2	Populus balsamifera	balsam poplar	N
S-4_1.2013	S-4	TARAOFF	0.3	7	Taraxacum officinale	common dandelion	E
S-4_1.2013	S-4	LICHINA	35	11	Lichinaceae	lichin sp.	N
S-4_1.2013	S-4	POLYTRI	2	9	Polytrichum sp.	haircap moss	N
S-4_2.2013	S-4	FESTRUB	15	6	Festuca rubra	red fescue	E
S-4_2.2013	S-4	ACHIMIL	0.7	7	Achillea millefolium	yarrow	N
S-4_2.2013	S-4	CALAPUR	0.5	6	Calamagrostis purpurascens	purple reedgrass	N
S-4_2.2013	S-4	CASTMIN	0.3	7	Castilleja miniata	scarlet paintbrush	N
S-4_2.2013	S-4	FESTIDA	2	6	Festuca idahoensis	Idaho fescue	N
S-4_2.2013	S-4	FRAGVIR	3	7	Fragaria virginiana	wild strawberry	N
S-4_2.2013	S-4	MEDISAT	7	7	Medicago sativa	alfalfa	E
S-4_2.2013	S-4	PINUCON	4	1	Pinus contorta	lodgepole pine	N
S-4_2.2013	S-4	POPUBAL	11	2	Populus balsamifera	balsam poplar	N
S-4_2.2013	S-4	SCHEARU	2	6	Schedonorus arundinaceus	tall fescue	E
S-4_2.2013	S-4	TARAOFF	0.1	7	Taraxacum officinale	common dandelion	E
S-4_2.2013	S-4	LICHINA	30	11	Lichinaceae	lichin sp.	N
S-5_1.2015	S-5	FESTRUB	5	6	Festuca rubra	red fescue	E
S-5_1.2015	S-5	ACHIMIL	2	7	Achillea millefolium	yarrow	N
S-5_1.2015	S-5	AGROSCA	0.1	6	Agrostis scabra	hair bentgrass	N
S-5_1.2015	S-5	BROMINE	10	6	Bromus inermis	smooth brome	E
S-5_1.2015	S-5	CERAPUR	5	9	Ceratodon purpureus	fire-moss	N
S-5_1.2015	S-5	EPILANG	8	7	Epilobium angustifolium	fireweed	N
S-5_1.2015	S-5	FESTTRA	15	6	Festuca trachyphylla	hard fescue	E
S-5_1.2015	S-5	FRAGVIR	1	7	Fragaria virginiana	wild strawberry	N
S-5_1.2015	S-5	MEDISAT	1	7	Medicago sativa	alfalfa	E
S-5_1.2015	S-5	PELTCAN	0.1	11	Peltigera canina	dog pelt	N
S-5_1.2015	S-5	PSEUMEN	20	1	Pseudotsuga menziesii	Douglas-fir	N
S-5_1.2015	S-5	ROSAACI	0.1	4	Rosa acicularis	prickly rose	N
S-5_1.2015	S-5	SYMPALB	2	4	Symphoricarpos albus	common snowberry	N
S-5_1.2015	S-5	TARAOFF	0.1	7	Taraxacum officinale	common dandelion	E
S-5_1.2015	S-5	HIERACI	0.1	6	Hieracium sp.	hawkweed	N
S-5_2.2015	S-5	BROMINE	12	6	Bromus inermis	smooth brome	E
S-5_2.2015	S-5	CERAPUR	15	9	Ceratodon purpureus	fire-moss	N
S-5_2.2015	S-5	MEDISAT	3	7	Medicago sativa	alfalfa	E
S-5_2.2015	S-5	MELIALB	0.5	7	Melilotus alba	white sweet-clover	E
S-5_2.2015	S-5	PELTCAN	0.5	11	Peltigera canina	dog pelt	N
S-5_3.2015	S-5	FESTRUB	3	6	Festuca rubra	red fescue	E

Site_plot_year	Site	Sp_Code	PCV	Life form	Scientific name	Common name	Origin
S-5_3.2015	S-5	BROMINE	1	6	Bromus inermis	smooth brome	E
S-5_3.2015	S-5	DACTGLO	0.1	6	Dactylis glomerata	orchard-grass	E
S-5_3.2015	S-5	FESTTRA	0.01	6	Festuca trachyphylla	hard fescue	E
S-5_3.2015	S-5	PHLEPRA	0.5	6	Phleum pratense	common timothy	E
S-5_3.2015	S-5	PSEUMEN	0.05	1	Pseudotsuga menziesii	Douglas-fir	N
S-5_4.2015	S-5	FESTRUB	5	6	Festuca rubra	red fescue	E
S-5_4.2015	S-5	BROMCIL	0.1	6	Bromus ciliatus	fringed brome	N
S-5_4.2015	S-5	BROMINE	2	6	Bromus inermis	smooth brome	E
S-5_4.2015	S-5	CERAPUR	45	9	Ceratodon purpureus	fire-moss	N
S-5_4.2015	S-5	POA COM	0.1	6	Poa compressa	Canada bluegrass	E
S-5_4.2015	S-5	PSEUMEN	0.01	1	Pseudotsuga menziesii	Douglas-fir	N
S-6_1.2013	S-6	CREPNAN	0.01	7	Crepis nana	dwarf hawksbeard	N
S-6_1.2013	S-6	ACHIMIL	0.2	7	Achillea millefolium	yarrow	N
S-6_1.2013	S-6	BETUPAP	2	2	Betula papyrifera	paper birch	N
S-6_1.2013	S-6	BROMINE	5	6	Bromus inermis	smooth brome	E
S-6_1.2013	S-6	CERAPUR	1	9	Ceratodon purpureus	fire-moss	N
S-6_1.2013	S-6	CREPTEC	0.1	7	Crepis tectorum	annual hawksbeard	E
S-6_1.2013	S-6	DACTGLO	1	6	Dactylis glomerata	orchard-grass	E
S-6_1.2013	S-6	ELYMTRA	0.4	6	Elymus trachycaulus	slender wheatgrass	N
S-6_1.2013	S-6	EPILANG	3	7	Epilobium angustifolium	fireweed	N
S-6_1.2013	S-6	HIERACI	0.4	7	Hieracium sp.	hawkweed	N
S-6_1.2013	S-6	PETAFRI	0.1	7	Petasites frigidus	sweet coltsfoot	N
S-6_1.2013	S-6	PINUCON	4	1	Pinus contorta	lodgepole pine	N
S-6_1.2013	S-6	POA PRA	0.1	6	Poa pratensis	Kentucky bluegrass	N
S-6_1.2013	S-6	RIBELAC	0.2	4	Ribes lacustre	black gooseberry	N
S-6_1.2013	S-6	ROSAACI	2	4	Rosa acicularis	prickly rose	N
S-6_1.2013	S-6	RUBUIDA	4	4	Rubus idaeus	red raspberry	N
S-6_1.2013	S-6	RUBUPAR	0.7	4	Rubus parviflorus	thimbleberry	N
S-6_1.2013	S-6	SPIRBET	2	4	Spiraea betulifolia	birch-leaved spirea	N
S-6_1.2013	S-6	TARAOFF	2	7	Taraxacum officinale	common dandelion	E
S-6_1.2013	S-6	LICHINA	4	11	Lichinaceae	lichin sp.	N
S-6_1.2013	S-6	MAIASTE	0.01	7	Maianthemum stellatum	star-flowered false Solomon's-seal	N
S-6_2.2013	S-6	ACHIMIL	0.5	7	Achillea millefolium	yarrow	N
S-6_2.2013	S-6	BROMINE	25	6	Bromus inermis	smooth brome	E
S-6_2.2013	S-6	EPILANG	7	7	Epilobium angustifolium	fireweed	N
S-6_2.2013	S-6	PETAFRI	0.1	7	Petasites frigidus	sweet coltsfoot	N
S-6_2.2013	S-6	POA PRA	2	6	Poa pratensis	Kentucky bluegrass	N
S-6_2.2013	S-6	RIBELAC	0.4	4	Ribes lacustre	black gooseberry	N
S-6_2.2013	S-6	ROSAACI	1	4	Rosa acicularis	prickly rose	N
S-6_2.2013	S-6	RUBUPAR	0.8	4	Rubus parviflorus	thimbleberry	N
S-6_2.2013	S-6	SPIRAEA	0.7	4	Spiraea sp.	spirea	N
S-1w_w.2015	S-1w	BROMINE	2	6	Bromus inermis	smooth brome	E
S-1w_w.2015	S-1w	CALACAN	10	6	Calamagrostis canadensis	bluejoint reedgrass	N
S-1w_w.2015	S-1w	EPILANG	3	7	Epilobium angustifolium	fireweed	N
S-1w_w.2015	S-1w	EQUIARV	90	5	Equisetum arvense	common horsetail	N
S-1w_w.2015	S-1w	FESTOCC	3	6	Festuca occidentalis	western fescue	N
S-1w_w.2015	S-1w	SALIBEB	2	2	Salix bebbiana	Bebb's willow	N
S-1w_w.2015	S-1w	SALIPET	4	2	Salix petiolaris	meadow willow	N
T-1_1.2014	T-1	FESTRUB	4	6	Festuca rubra	red fescue	E
T-1_1.2014	T-1	ACHIMIL	2	7	Achillea millefolium	yarrow	N
T-1_1.2014	T-1	AGROCRI	2	6	Agropyron cristatum	crested wheatgrass	E
T-1_1.2014	T-1	AGROGIG	7	6	Agrostis gigantea	redtop	E
T-1_1.2014	T-1	AGROSCA	5	6	Agrostis scabra	hair bentgrass	N
T-1_1.2014	T-1	ALOPPRA	2	6	Alopecurus pratensis	meadow-foxtail	E
T-1_1.2014	T-1	ANTEROS	0.25	7	Antennaria rosea	rosy pussytoes	N
T-1_1.2014	T-1	ARCTUVA	1	12	Arctostaphylos uva-ursi	kinnikinnick	N
T-1_1.2014	T-1	ARNICOR	1	7	Arnica cordifolia	heart-leaved arnica	N
T-1_1.2014	T-1	BROMCIL	1	6	Bromus ciliatus	fringed brome	N

Site_plot_year	Site	Sp_Code	PCV	Life form	Scientific name	Common name	Origin
T-1_1.2014	T-1	BROMINE	3	6	Bromus inermis	smooth brome	E
T-1_1.2014	T-1	CALACAN	1	6	Calamagrostis canadensis	bluejoint reedgrass	N
T-1_1.2014	T-1	CASTMIN	1	7	Castilleja miniata	scarlet paintbrush	N
T-1_1.2014	T-1	CREPTEC	3	7	Crepis tectorum	annual hawksbeard	E
T-1_1.2014	T-1	ELYMGLA	2	6	Elymus glaucus	blue wildrye	N
T-1_1.2014	T-1	ELYMTRA	3	6	Elymus trachycaulus	slender wheatgrass	N
T-1_1.2014	T-1	EPILANG	6	7	Epilobium angustifolium	fireweed	N
T-1_1.2014	T-1	EQUISCI	2	5	Equisetum scirpoides	dwarf scouring-rush	N
T-1_1.2014	T-1	FRAGVIR	2	7	Fragaria virginiana	wild strawberry	N
T-1_1.2014	T-1	HIERALI	0.25	7	Hieracium albiflorum	white hawkweed	N
T-1_1.2014	T-1	HORDJUB	1	6	Hordeum jubatum	foxtail barley	N
T-1_1.2014	T-1	PINUCON	0.100000001	1	Pinus contorta	lodgepole pine	N
T-1_1.2014	T-1	POA COM	1	6	Poa compressa	Canada bluegrass	E
T-1_1.2014	T-1	POA PRA	8	6	Poa pratensis	Kentucky bluegrass	N
T-1_1.2014	T-1	POTEVIL	1	7	Potentilla villosa	villous cinquefoil	N
T-1_1.2014	T-1	RIBEOXY	1	4	Ribes oxyacanthoides	northern gooseberry	N
T-1_1.2014	T-1	RUBUIDA	4	4	Rubus idaeus	red raspberry	N
T-1_1.2014	T-1	RUBUPAR	3	4	Rubus parviflorus	thimbleberry	N
T-1_1.2014	T-1	TARAOFF	2	7	Taraxacum officinale	common dandelion	E
T-1_1.2014	T-1	THALVEN	1	7	Thalictrum venulosum	veiny meadowrue	N
T-1_1.2014	T-1	TRIFHYB	2	7	Trifolium hybridum	alsike clover	E
T-1_2.2014	T-1	FESTRUB	4	6	Festuca rubra	red fescue	E
T-1_2.2014	T-1	ACHIMIL	5	7	Achillea millefolium	yarrow	N
T-1_2.2014	T-1	AGROSCA	7	6	Agrostis scabra	hair bentgrass	N
T-1_2.2014	T-1	ALNURUB	1	2	Alnus rubra	red alder	N
T-1_2.2014	T-1	AMELALN	0.5	4	Amelanchier alnifolia	saskatoon	N
T-1_2.2014	T-1	ARCTUVA	0.5	12	Arctostaphylos uva-ursi	kinnikinnick	N
T-1_2.2014	T-1	BROMINE	5	6	Bromus inermis	smooth brome	E
T-1_2.2014	T-1	CAREROS	1	6	Carex rossii	Ross' sedge	N
T-1_2.2014	T-1	DANTINT	2	6	Danthonia intermedia	timber oatgrass	N
T-1_2.2014	T-1	EPILANG	5	7	Epilobium angustifolium	fireweed	N
T-1_2.2014	T-1	FESTTRA	1	6	Festuca trachyphylla	hard fescue	E
T-1_2.2014	T-1	HIERUMB	1	7	Hieracium umbellatum	narrow-leaved hawkweed	E
T-1_2.2014	T-1	LINNBOR	0.5	12	Linnaea borealis	twinflower	N
T-1_2.2014	T-1	POA ALP	1	6	Poa alpina	alpine bluegrass	N
T-1_2.2014	T-1	POA COM	3	6	Poa compressa	Canada bluegrass	E
T-1_2.2014	T-1	RIBEOXY	1	4	Ribes oxyacanthoides	northern gooseberry	N
T-1_2.2014	T-1	RUBUIDA	3	4	Rubus idaeus	red raspberry	N
T-1_2.2014	T-1	RUBUPAR	2	4	Rubus parviflorus	thimbleberry	N
T-1_2.2014	T-1	SPIRBET	4	4	Spiraea betulifolia	birch-leaved spirea	N
T-1_2.2014	T-1	TARAOFF	1	7	Taraxacum officinale	common dandelion	E
T-1_2.2014	T-1	THININT	2	6	Thinopyrum intermedium	intermediate wheatgrass	E
T-1_2.2014	T-1	VACCINI	0.25	7	Vaccinium sp.	blueberry, huckleberry	N
T-1_3.2014	T-1	FESTRUB	7	6	Festuca rubra	red fescue	E
T-1_3.2014	T-1	ACHIMIL	1	7	Achillea millefolium	yarrow	N
T-1_3.2014	T-1	ALNURUB	1	2	Alnus rubra	red alder	N
T-1_3.2014	T-1	AMELALN	1	4	Amelanchier alnifolia	saskatoon	N
T-1_3.2014	T-1	ARCTUVA	0.5	12	Arctostaphylos uva-ursi	kinnikinnick	N
T-1_3.2014	T-1	BROMINE	10	6	Bromus inermis	smooth brome	E
T-1_3.2014	T-1	BROMTEC	10	6	Bromus tectorum	cheatgrass	E
T-1_3.2014	T-1	CAREROS	2	6	Carex rossii	Ross' sedge	N
T-1_3.2014	T-1	CASTMIN	1.5	7	Castilleja miniata	scarlet paintbrush	N
T-1_3.2014	T-1	ELYMTRA	2	6	Elymus trachycaulus	slender wheatgrass	N
T-1_3.2014	T-1	EPILANG	6	7	Epilobium angustifolium	fireweed	N
T-1_3.2014	T-1	FESTTRA	2	6	Festuca trachyphylla	hard fescue	E
T-1_3.2014	T-1	HIERACI	0.25	7	Hieracium sp.	hawkweed	N
T-1_3.2014	T-1	LEYMINN	2	7	Leymus innovatus	fuzzy-spiked wildrye	N
T-1_3.2014	T-1	MAIARAC	0.25	7	Maianthemum racemosum	false Solomon's-seal	N

Site_plot_year	Site	Sp_Code	PCV	Life form	Scientific name	Common name	Origin
T-1_3.2014	T-1	POA COM	2	6	Poa compressa	Canada bluegrass	E
T-1_3.2014	T-1	POPUTRE	0.5	2	Populus tremuloides	trembling aspen	N
T-1_3.2014	T-1	ROSAACI	3	4	Rosa acicularis	prickly rose	N
T-1_3.2014	T-1	SPIRBET	5	4	Spiraea betulifolia	birch-leaved spirea	N
T-1_3.2014	T-1	THININT	1	6	Thinopyrum intermedium	intermediate wheatgrass	E
T-1_3.2014	T-1	SALIX	0.25	4	Salix sp.	willow	N
T-2_1.2013	T-2	CAREPET	0.01	6	Carex petasata	pasture sedge	N
T-2_1.2013	T-2	FESTRUB	6	6	Festuca rubra	red fescue	E
T-2_1.2013	T-2	GENTIAN	0.1	7	Gentiana sp.	gentian	N
T-2_1.2013	T-2	ACHIMIL	0.01	7	Achillea millefolium	yarrow	N
T-2_1.2013	T-2	AGROSCA	0.1	6	Agrostis scabra	hair bentgrass	N
T-2_1.2013	T-2	ARABHOL	4	7	Arabis holboellii	Holboell's rockcress	N
T-2_1.2013	T-2	BROMINE	5	6	Bromus inermis	smooth brome	E
T-2_1.2013	T-2	CHENALB	1	7	Chenopodium album	lamb's-quarters	E
T-2_1.2013	T-2	ELYMTRA	0.1	6	Elymus trachycaulus	slender wheatgrass	N
T-2_1.2013	T-2	FRAGVIR	0.2	7	Fragaria virginiana	wild strawberry	N
T-2_1.2013	T-2	LEUCVUL	0.5	7	Leucanthemum vulgare	oxeye daisy	E
T-2_1.2013	T-2	MATRDIS	0.05	7	Matricaria discoidea	pineapple weed	N
T-2_1.2013	T-2	MELIALB	3	7	Melilotus alba	white sweet-clover	E
T-2_1.2013	T-2	POA PRA	1	6	Poa pratensis	Kentucky bluegrass	N
T-2_1.2013	T-2	POPUBAL	0.3	2	Populus balsamifera	balsam poplar	N
T-2_1.2013	T-2	POPUTRE	0.1	2	Populus tremuloides	trembling aspen	N
T-2_1.2013	T-2	PSEUMEN	0.4	1	Pseudotsuga menziesii	Douglas-fir	N
T-2_1.2013	T-2	RUBUIDA	0.3	4	Rubus idaeus	red raspberry	N
T-2_1.2013	T-2	TARAOFF	0.5	7	Taraxacum officinale	common dandelion	E
T-2_1.2013	T-2	TRIFHYB	5	7	Trifolium hybridum	alsike clover	E
T-2_1.2013	T-2	URTIDIO	0.05	7	Urtica dioica	stinging nettle	N
T-2_1.2013	T-2	VICIAME	0.2	7	Vicia americana	American vetch	N
T-2_1.2013	T-2	POTEGRA	0.1	7	Potentilla gracilis	graceful cinquefoil	N
T-2_1.2013	T-2	POTEREC	4	7	Potentilla recta	sulphur cinquefoil	E
T-2_2.2014	T-2	FESTRUB	2	6	Festuca rubra	red fescue	E
T-2_2.2014	T-2	ACHIMIL	0.5	7	Achillea millefolium	yarrow	N
T-2_2.2014	T-2	AGROGIG	5	6	Agrostis gigantea	redtop	E
T-2_2.2014	T-2	BROMINE	2	6	Bromus inermis	smooth brome	E
T-2_2.2014	T-2	CALACAN	0.5	6	Calamagrostis canadensis	bluejoint reedgrass	N
T-2_2.2014	T-2	CAREROS	0.25	6	Carex rossii	Ross' sedge	N
T-2_2.2014	T-2	CERAPUR	4	9	Ceratodon purpureus	fire-moss	N
T-2_2.2014	T-2	DACTGLO	0.5	6	Dactylis glomerata	orchard-grass	E
T-2_2.2014	T-2	ELYMREP	0.5	6	Elymus repens	quackgrass	E
T-2_2.2014	T-2	EPILANG	1.5	7	Epilobium angustifolium	fireweed	N
T-2_2.2014	T-2	FESTTRA	1.5	6	Festuca trachyphylla	hard fescue	E
T-2_2.2014	T-2	HIERACI	0.25	7	Hieracium sp.	hawkweed	N
T-2_2.2014	T-2	HORDJUB	0.25	6	Hordeum jubatum	foxtail barley	N
T-2_2.2014	T-2	LEUCVUL	7	7	Leucanthemum vulgare	oxeye daisy	E
T-2_2.2014	T-2	MELIALB	1	7	Melilotus alba	white sweet-clover	E
T-2_2.2014	T-2	PHLEPRA	0.25	6	Phleum pratense	common timothy	E
T-2_2.2014	T-2	POA PRA	1	6	Poa pratensis	Kentucky bluegrass	N
T-2_2.2014	T-2	POLYGOA	0.25	7	Polygonaceae	knotweed	N
T-2_2.2014	T-2	POPUTRI	0.5	2	Populus trichocarpa	black cottonwood	N
T-2_2.2014	T-2	POTEVIL	4	7	Potentilla villosa	villous cinquefoil	N
T-2_2.2014	T-2	PSEUMEN	0.5	1	Pseudotsuga menziesii	Douglas-fir	N
T-2_2.2014	T-2	RUBUIDA	2	4	Rubus idaeus	red raspberry	N
T-2_2.2014	T-2	TRIFHYB	5	7	Trifolium hybridum	alsike clover	E
T-2_2.2014	T-2	TRIFPRA	2	7	Trifolium pratense	red clover	E
T-2_2.2014	T-2	VICIAME	1	7	Vicia americana	American vetch	N
T-2_3.2013	T-2	CAREPET	0.01	6	Carex petasata	pasture sedge	N
T-2_3.2013	T-2	CREPNAN	0.01	7	Crepis nana	dwarf hawksbeard	N
T-2_3.2013	T-2	ACHIMIL	0.4	7	Achillea millefolium	yarrow	N

Site_plot_year	Site	Sp_Code	PCV	Life form	Scientific name	Common name	Origin
T-2_3.2013	T-2	AGROSCA	4	6	Agrostis scabra	hair bentgrass	N
T-2_3.2013	T-2	ARABHOL	0.3	7	Arabis holboellii	Holboell's rockcress	N
T-2_3.2013	T-2	ASTER	0.2	7	Aster sp.	aster	N
T-2_3.2013	T-2	ASTER	0.05	7	Aster sp.	aster	N
T-2_3.2013	T-2	CALAPUR	0.05	6	Calamagrostis purpurascens	purple reedgrass	N
T-2_3.2013	T-2	CAREMED	0.01	6	Carex media	Scandinavian sedge	N
T-2_3.2013	T-2	CHENALB	0.01	7	Chenopodium album	lamb's-quarters	E
T-2_3.2013	T-2	CREPTEC	0.03	7	Crepis tectorum	annual hawksbeard	E
T-2_3.2013	T-2	ELYMTRA	0.5	6	Elymus trachycaulus	slender wheatgrass	N
T-2_3.2013	T-2	EPILANG	0.3	7	Epilobium angustifolium	fireweed	N
T-2_3.2013	T-2	EQUIARV	5	5	Equisetum arvense	common horsetail	N
T-2_3.2013	T-2	GALITRF	1	7	Galium triflorum	sweet-scented bedstraw	N
T-2_3.2013	T-2	LEUCVUL	4	7	Leucanthemum vulgare	oxeye daisy	E
T-2_3.2013	T-2	MATRDIS	0.5	7	Matricaria discoidea	pineapple weed	N
T-2_3.2013	T-2	MELIALB	3	7	Melilotus alba	white sweet-clover	E
T-2_3.2013	T-2	POA PAL	4	6	Poa palustris	fowl bluegrass	N
T-2_3.2013	T-2	POA PRA	0.5	6	Poa pratensis	Kentucky bluegrass	N
T-2_3.2013	T-2	POLEPUL	0.01	7	Polemonium pulcherrimum	showy Jacob's-ladder	N
T-2_3.2013	T-2	POPUBAL	3	2	Populus balsamifera	balsam poplar	N
T-2_3.2013	T-2	RIBELAC	0.1	4	Ribes lacustre	black gooseberry	N
T-2_3.2013	T-2	ROSAACI	0.01	4	Rosa acicularis	prickly rose	N
T-2_3.2013	T-2	RUBUIDA	0.2	4	Rubus idaeus	red raspberry	N
T-2_3.2013	T-2	RUBUPAR	0.2	4	Rubus parviflorus	thimbleberry	N
T-2_3.2013	T-2	TARAOFF	0.2	7	Taraxacum officinale	common dandelion	E
T-2_3.2013	T-2	TRIFHYB	10	7	Trifolium hybridum	alsike clover	E
T-2_3.2013	T-2	TRIFPRA	1	7	Trifolium pratense	red clover	E
T-2_3.2013	T-2	VICIAME	1	7	Vicia americana	American vetch	N
T-2_3.2013	T-2	POTEREC	0.3	7	Potentilla recta	sulphur cinquefoil	E
T-2_3.2013	T-2	SALIX	0.05	2	Salix sp.	willow	N
T-2_3.2013	T-2	TANAVUL	0.3	7	Tanacetum vulgare	common tansy	E
T-2_4.2014	T-2	FESTRUB	5	6	Festuca rubra	red fescue	E
T-2_4.2014	T-2	ACHIMIL	3	7	Achillea millefolium	yarrow	N
T-2_4.2014	T-2	AGROCRI	0.5	6	Agropyron cristatum	crested wheatgrass	E
T-2_4.2014	T-2	AGROGIG	5	6	Agrostis gigantea	redtop	E
T-2_4.2014	T-2	BROMINE	1	6	Bromus inermis	smooth brome	E
T-2_4.2014	T-2	CALACAN	1	6	Calamagrostis canadensis	bluejoint reedgrass	N
T-2_4.2014	T-2	DACTGLO	0.25	6	Dactylis glomerata	orchard-grass	E
T-2_4.2014	T-2	ELYMGLA	0.5	6	Elymus glaucus	blue wildrye	N
T-2_4.2014	T-2	ELYMTRA	1	6	Elymus trachycaulus	slender wheatgrass	N
T-2_4.2014	T-2	EPILANG	0.5	7	Epilobium angustifolium	fireweed	N
T-2_4.2014	T-2	EQUISCI	2	5	Equisetum scirpoides	dwarf scouring-rush	N
T-2_4.2014	T-2	FESTTRA	2	6	Festuca trachyphylla	hard fescue	E
T-2_4.2014	T-2	LOLIPER	0.25	6	Lolium perenne	perennial ryegrass	E
T-2_4.2014	T-2	MATRDIS	0.5	7	Matricaria discoidea	pineapple weed	N
T-2_4.2014	T-2	MEDISAT	0.25	7	Medicago sativa	alfalfa	E
T-2_4.2014	T-2	MELIALB	0.200000003	7	Melilotus alba	white sweet-clover	E
T-2_4.2014	T-2	POA COM	3	6	Poa compressa	Canada bluegrass	E
T-2_4.2014	T-2	POPUTRI	0.5	2	Populus trichocarpa	black cottonwood	N
T-2_4.2014	T-2	POTEVIL	3	7	Potentilla villosa	villous cinquefoil	N
T-2_4.2014	T-2	PSEUMEN	0.5	1	Pseudotsuga menziesii	Douglas-fir	N
T-2_4.2014	T-2	ROSAACI	0.25	4	Rosa acicularis	prickly rose	N
T-2_4.2014	T-2	RUBUIDA	4	4	Rubus idaeus	red raspberry	N
T-2_4.2014	T-2	SENECIO	0.5	7	Senecio sp.	groundsel, butterweed	N
T-2_4.2014	T-2	SORBSCO	0.5	4	Sorbus scopulina	western mountain-ash	N
T-2_4.2014	T-2	TRIFHYB	3	7	Trifolium hybridum	alsike clover	E
T-2_4.2014	T-2	STIPA	0.5	6	Stipa sp.	stipa	N
T-2_5.2013	T-2	CAREPET	0.5	6	Carex petasata	pasture sedge	N
T-2_5.2013	T-2	FESTRUB	3	6	Festuca rubra	red fescue	E

Site_plot_year	Site	Sp_Code	PCV	Life form	Scientific name	Common name	Origin
T-2_5.2013	T-2	AGROSCA	0.5	6	Agrostis scabra	hair bentgrass	N
T-2_5.2013	T-2	ARABHOL	0.1	7	Arabis holboellii	Holboell's rockcress	N
T-2_5.2013	T-2	BROMINE	5	6	Bromus inermis	smooth brome	E
T-2_5.2013	T-2	CAREMED	0.1	6	Carex media	Scandinavian sedge	N
T-2_5.2013	T-2	CHENALB	0.1	7	Chenopodium album	lamb's-quarters	E
T-2_5.2013	T-2	CREPTEC	0.2	7	Crepis tectorum	annual hawksbeard	E
T-2_5.2013	T-2	EPILANG	0.5	7	Epilobium angustifolium	fireweed	N
T-2_5.2013	T-2	EQUIARV	0.1	5	Equisetum arvense	common horsetail	N
T-2_5.2013	T-2	HORDJUB	0.05	6	Hordeum jubatum	foxtail barley	N
T-2_5.2013	T-2	LEUCVUL	1	7	Leucanthemum vulgare	oxeye daisy	E
T-2_5.2013	T-2	MATRDIS	0.5	7	Matricaria discoidea	pineapple weed	N
T-2_5.2013	T-2	MELIALB	1	7	Melilotus alba	white sweet-clover	E
T-2_5.2013	T-2	PHLEPRA	2	6	Phleum pratense	common timothy	E
T-2_5.2013	T-2	POA PAL	2	6	Poa palustris	fowl bluegrass	N
T-2_5.2013	T-2	POA PRA	0.5	6	Poa pratensis	Kentucky bluegrass	N
T-2_5.2013	T-2	POLEPUL	0.5	7	Polemonium pulcherrimum	showy Jacob's-ladder	N
T-2_5.2013	T-2	RUBUIDA	3	4	Rubus idaeus	red raspberry	N
T-2_5.2013	T-2	SOLICAN	1	7	Solidago canadensis	Canada goldenrod	N
T-2_5.2013	T-2	STACPAL	0.5	7	Stachys palustris	swamp hedge-nettle	N
T-2_5.2013	T-2	TARAOFF	0.2	7	Taraxacum officinale	common dandelion	E
T-2_5.2013	T-2	TRIFHYB	7	7	Trifolium hybridum	alsike clover	E
T-2_5.2013	T-2	VICIAME	0.1	7	Vicia americana	American vetch	N
T-2_5.2013	T-2	POTEREC	4	7	Potentilla recta	sulphur cinquefoil	E
T-2_5.2013	T-2	VIOLA	0.01	7	Viola sp.	violet	N
T-3_5.2013	T-3	FESTRUB	0.5	6	Festuca rubra	red fescue	E
T-3_5.2015	T-3	FESTRUB	0.5	6	Festuca rubra	red fescue	E
T-3_5.2013	T-3	SCROPHU	0.1	6	Scrophularia sp.	figwort	N
T-3_5.2015	T-3	SCROPHU	0.5	6	Scrophularia sp.	figwort	N
T-3_5.2013	T-3	ACHIMIL	3	7	Achillea millefolium	yarrow	N
T-3_5.2013	T-3	AGROCRI	0.3	6	Agropyron cristatum	crested wheatgrass	E
T-3_5.2013	T-3	AGROSCA	1	6	Agrostis scabra	hair bentgrass	N
T-3_5.2013	T-3	BROMINE	0.1	6	Bromus inermis	smooth brome	E
T-3_5.2013	T-3	CAREMED	0.2	6	Carex media	Scandinavian sedge	N
T-3_5.2013	T-3	CERAARV	0.1	7	Cerastium arvense	field chickweed	N
T-3_5.2013	T-3	CREPTEC	2	7	Crepis tectorum	annual hawksbeard	E
T-3_5.2013	T-3	ELYMTRA	1	6	Elymus trachycaulus	slender wheatgrass	N
T-3_5.2013	T-3	EPILANG	0.2	7	Epilobium angustifolium	fireweed	N
T-3_5.2013	T-3	EQUISCI	0.05	5	Equisetum scirpoides	dwarf scouring-rush	N
T-3_5.2013	T-3	EURYCON	0.5	7	Eurybia conspicua	showy aster	N
T-3_5.2013	T-3	HORDJUB	0.01	6	Hordeum jubatum	foxtail barley	N
T-3_5.2013	T-3	LEUCVUL	2	7	Leucanthemum vulgare	oxeye daisy	E
T-3_5.2013	T-3	MAIARAC	0.02	7	Maianthemum racemosum	false Solomon's-seal	N
T-3_5.2013	T-3	MATRDIS	0.05	7	Matricaria discoidea	pineapple weed	N
T-3_5.2013	T-3	MELIALB	0.01	7	Melilotus alba	white sweet-clover	E
T-3_5.2013	T-3	PHLEPRA	0.4	6	Phleum pratense	common timothy	E
T-3_5.2013	T-3	PINUCON	0.03	1	Pinus contorta	lodgepole pine	N
T-3_5.2013	T-3	POA PRA	2	6	Poa pratensis	Kentucky bluegrass	N
T-3_5.2013	T-3	POPUBAL	0.2	2	Populus balsamifera	balsam poplar	N
T-3_5.2013	T-3	PSEUMEN	1	1	Pseudotsuga menziesii	Douglas-fir	N
T-3_5.2013	T-3	RIBELAC	0.02	4	Ribes lacustre	black gooseberry	N
T-3_5.2013	T-3	RUBUIDA	0.05	4	Rubus idaeus	red raspberry	N
T-3_5.2013	T-3	RUBUPAR	0.1	4	Rubus parviflorus	thimbleberry	N
T-3_5.2013	T-3	SYMPALB	0.1	4	Symphoricarpos albus	common snowberry	N
T-3_5.2013	T-3	TARAOFF	0.5	7	Taraxacum officinale	common dandelion	E
T-3_5.2013	T-3	THALOCC	0.05	7	Thalictrum occidentale	western meadowrue	N
T-3_5.2013	T-3	THALVEN	0.05	7	Thalictrum venulosum	veiny meadowrue	N
T-3_5.2013	T-3	TRIFHYB	1	7	Trifolium hybridum	alsike clover	E
T-3_5.2013	T-3	VICIAME	0.05	7	Vicia americana	American vetch	N

Site_plot_year	Site	Sp_Code	PCV	Life form	Scientific name	Common name	Origin
T-3_5.2015	T-3	ACHIMIL	1	7	Achillea millefolium	yarrow	N
T-3_5.2015	T-3	AGROSTO	0.5	6	Agrostis stolonifera	creeping bentgrass	E
T-3_5.2015	T-3	AMELALN	0.1	4	Amelanchier alnifolia	saskatoon	N
T-3_5.2015	T-3	ARCTUVA	0.5	12	Arctostaphylos uva-ursi	kinnikinnick	N
T-3_5.2015	T-3	BOECRET	0.1	2	Boechera retrofracta	dangling suncress	N
T-3_5.2015	T-3	BROMTEC	0.1	6	Bromus tectorum	cheatgrass	E
T-3_5.2015	T-3	CARECOI	0.1	7	Carex concinna	low northern sedge	N
T-3_5.2015	T-3	CERAPUR	2	9	Ceratodon purpureus	fire-moss	N
T-3_5.2015	T-3	ELYMGLA	2	6	Elymus glaucus	blue wildrye	N
T-3_5.2015	T-3	EPILANG	1	7	Epilobium angustifolium	fireweed	N
T-3_5.2015	T-3	EURYCON	0.1	7	Eurybia conspicua	showy aster	N
T-3_5.2015	T-3	LEUCVUL	5	7	Leucanthemum vulgare	oxeye daisy	E
T-3_5.2015	T-3	PHLEPRA	0.1	6	Phleum pratense	common timothy	E
T-3_5.2015	T-3	POA COM	7	6	Poa compressa	Canada bluegrass	E
T-3_5.2015	T-3	POPUBAL	0.1	2	Populus balsamifera	balsam poplar	N
T-3_5.2015	T-3	PSEUMEN	1	1	Pseudotsuga menziesii	Douglas-fir	N
T-3_5.2015	T-3	ROSAACI	1	4	Rosa acicularis	prickly rose	N
T-3_5.2015	T-3	RUBUIDA	0.5	4	Rubus idaeus	red raspberry	N
T-3_5.2015	T-3	SENEERE	0.1	7	Senecio eremophilus	dryland ragwort	N
T-3_5.2015	T-3	SYMPALB	0.1	4	Symphoricarpos albus	common snowberry	N
T-3_5.2015	T-3	TARAOFF	0.5	7	Taraxacum officinale	common dandelion	E
T-3_5.2015	T-3	THININT	3	6	Thinopyrum intermedium	intermediate wheatgrass	E
T-3_5.2015	T-3	TRIFHYB	1	7	Trifolium hybridum	alsike clover	E
T-3_5.2013	T-3	VIOLA	0.03	7	Viola sp.	violet	N
T-3_10.2013	T-3	FESTRUB	0.1	6	Festuca rubra	red fescue	E
T-3_10.2015	T-3	FESTRUB	1	6	Festuca rubra	red fescue	E
T-3_10.2015	T-3	SCROPHU	0.1	6	Scrophularia sp.	figwort	N
T-3_10.2013	T-3	FRAGVES	0.01	7	Fragaria vesca	wood strawberry	N
T-3_10.2013	T-3	ACHIMIL	0.2	7	Achillea millefolium	yarrow	N
T-3_10.2013	T-3	AGROCRI	1	6	Agropyron cristatum	crested wheatgrass	E
T-3_10.2013	T-3	ALOPPRA	0.01	6	Alopecurus pratensis	meadow-foxtail	E
T-3_10.2013	T-3	BETUPAP	0.01	2	Betula papyrifera	paper birch	N
T-3_10.2013	T-3	BROMINE	0.02	6	Bromus inermis	smooth brome	E
T-3_10.2013	T-3	CAPSBUR	0.01	7	Capsella bursa-pastoris	shepherd's purse	E
T-3_10.2013	T-3	CASTMIN	0.2	7	Castilleja miniata	scarlet paintbrush	N
T-3_10.2013	T-3	CREPTEC	2	7	Crepis tectorum	annual hawksbeard	E
T-3_10.2013	T-3	ELYMTRA	1	6	Elymus trachycaulus	slender wheatgrass	N
T-3_10.2013	T-3	EPILANG	0.5	7	Epilobium angustifolium	fireweed	N
T-3_10.2013	T-3	HIERAUR	0.01	7	Hieracium aurantiacum	orange-red king devil	E
T-3_10.2013	T-3	HORDJUB	0.01	6	Hordeum jubatum	foxtail barley	N
T-3_10.2013	T-3	MATRDIS	0.01	7	Matricaria discoidea	pineapple weed	N
T-3_10.2013	T-3	PASCSMI	0.01	6	Pascopyrum smithii	western wheatgrass	N
T-3_10.2013	T-3	PHLEPRA	0.1	6	Phleum pratense	common timothy	E
T-3_10.2013	T-3	PICEENE	0.01	1	Picea engelmannii x glauca	hybrid hybrid white spruce	N
T-3_10.2013	T-3	POA PRA	4	6	Poa pratensis	Kentucky bluegrass	N
T-3_10.2013	T-3	POPUBAL	0.01	2	Populus balsamifera	balsam poplar	N
T-3_10.2013	T-3	PSEUMEN	0.3	1	Pseudotsuga menziesii	Douglas-fir	N
T-3_10.2013	T-3	RIBELAC	0.1	4	Ribes lacustre	black gooseberry	N
T-3_10.2013	T-3	RUBUIDA	0.3	4	Rubus idaeus	red raspberry	N
T-3_10.2013	T-3	RUBUPAR	0.01	4	Rubus parviflorus	thimbleberry	N
T-3_10.2013	T-3	SCUTGAL	0.5	7	Scutellaria galericulata	marsh skullcap	N
T-3_10.2013	T-3	SYMPLAE	0.01	7	Symphyotrichum laeve	smooth aster	N
T-3_10.2013	T-3	TARAOFF	0.05	7	Taraxacum officinale	common dandelion	E
T-3_10.2013	T-3	TRIFHYB	0.5	7	Trifolium hybridum	alsike clover	E
T-3_10.2015	T-3	ACHIMIL	0.5	7	Achillea millefolium	yarrow	N
T-3_10.2015	T-3	AGROCRI	2	6	Agropyron cristatum	crested wheatgrass	E
T-3_10.2015	T-3	AGROSTO	0.5	6	Agrostis stolonifera	creeping bentgrass	E
T-3_10.2015	T-3	ALNUVIR	0.1	4	Alnus viridis	green alder	N

Site_plot_year	Site	Sp_Code	PCV	Life form	Scientific name	Common name	Origin
T-3_10.2015	T-3	BETUPAP	0.5	2	Betula papyrifera	paper birch	N
T-3_10.2015	T-3	CALAPUR	1	6	Calamagrostis purpurascens	purple reedgrass	N
T-3_10.2015	T-3	CARECOI	0.1	7	Carex concinna	low northern sedge	N
T-3_10.2015	T-3	EPILANG	0.5	7	Epilobium angustifolium	fireweed	N
T-3_10.2015	T-3	HORDJUB	0.5	6	Hordeum jubatum	foxtail barley	N
T-3_10.2015	T-3	POA COM	5	6	Poa compressa	Canada bluegrass	E
T-3_10.2015	T-3	POPUBAL	0.1	2	Populus balsamifera	balsam poplar	N
T-3_10.2015	T-3	RIBELAC	0.5	4	Ribes lacustre	black gooseberry	N
T-3_10.2015	T-3	RUBUIDA	1	4	Rubus idaeus	red raspberry	N
T-3_10.2015	T-3	SALIBEB	0.1	2	Salix bebbiana	Bebb's willow	N
T-3_10.2015	T-3	SALIPYR	0.5	2	Salix pyrifolia	balsam willow	N
T-3_10.2015	T-3	SYMPLAE	0.1	7	Symphyotrichum laeve	smooth aster	N
T-3_10.2015	T-3	TARAOFF	0.1	7	Taraxacum officinale	common dandelion	E
T-3_10.2015	T-3	THININT	2	6	Thinopyrum intermedium	intermediate wheatgrass	E
T-3_10.2013	T-3	SALIX	0.01	4	Salix sp.	willow	N
T-3_15.2013	T-3	FESTRUB	3	6	Festuca rubra	red fescue	E
T-3_15.2015	T-3	FESTRUB	2	6	Festuca rubra	red fescue	E
T-3_15.2015	T-3	SCROPHU	0.01	6	Scrophularia sp.	figwort	N
T-3_15.2015	T-3	POTEREC	0.1	7	Potentilla recta	sulphur cinquefoil	E
T-3_15.2013	T-3	AGROCRI	0.2	6	Agropyron cristatum	crested wheatgrass	E
T-3_15.2013	T-3	AGROSCA	2	6	Agrostis scabra	hair bentgrass	N
T-3_15.2013	T-3	EPILANG	2	7	Epilobium angustifolium	fireweed	N
T-3_15.2013	T-3	FRAGVIR	0.05	7	Fragaria virginiana	wild strawberry	N
T-3_15.2013	T-3	POPUBAL	0.1	2	Populus balsamifera	balsam poplar	N
T-3_15.2013	T-3	PSEUMEN	0.5	1	Pseudotsuga menziesii	Douglas-fir	N
T-3_15.2013	T-3	RIBELAC	1	4	Ribes lacustre	black gooseberry	N
T-3_15.2013	T-3	RUBUIDA	4	4	Rubus idaeus	red raspberry	N
T-3_15.2013	T-3	RUBUPAR	0.2	4	Rubus parviflorus	thimbleberry	N
T-3_15.2015	T-3	AGROCRI	1	6	Agropyron cristatum	crested wheatgrass	E
T-3_15.2015	T-3	AGROSCA	0.5	6	Agrostis scabra	hair bentgrass	N
T-3_15.2015	T-3	AGROSTO	1	6	Agrostis stolonifera	creeping bentgrass	E
T-3_15.2015	T-3	BOECRET	0.01	2	Boechera retrofracta	dangling suncress	N
T-3_15.2015	T-3	BROMINE	0.5	6	Bromus inermis	smooth brome	E
T-3_15.2015	T-3	CARECOI	0.1	7	Carex concinna	low northern sedge	N
T-3_15.2015	T-3	CREPTEC	4	7	Crepis tectorum	annual hawksbeard	E
T-3_15.2015	T-3	ELYMTRA	1	6	Elymus trachycaulus	slender wheatgrass	N
T-3_15.2015	T-3	EPILANG	3	7	Epilobium angustifolium	fireweed	N
T-3_15.2015	T-3	EQUISCI	0.2	5	Equisetum scirpoides	dwarf scouring-rush	N
T-3_15.2015	T-3	FRAGVIR	0.5	7	Fragaria virginiana	wild strawberry	N
T-3_15.2015	T-3	LEUCVUL	0.1	7	Leucanthemum vulgare	oxeye daisy	E
T-3_15.2015	T-3	MELIALB	0.1	7	Melilotus alba	white sweet-clover	E
T-3_15.2015	T-3	MELIOFF	2	7	Melilotus officinalis	yellow sweet-clover	E
T-3_15.2015	T-3	POA COM	1	6	Poa compressa	Canada bluegrass	E
T-3_15.2015	T-3	POA INT	1	6	Poa interior	interior bluegrass	N
T-3_15.2015	T-3	POA PRA	1	6	Poa pratensis	Kentucky bluegrass	N
T-3_15.2015	T-3	POPUBAL	0.1	2	Populus balsamifera	balsam poplar	N
T-3_15.2015	T-3	PSEUMEN	0.5	1	Pseudotsuga menziesii	Douglas-fir	N
T-3_15.2015	T-3	RIBELAC	1	4	Ribes lacustre	black gooseberry	N
T-3_15.2015	T-3	ROSAACI	2	4	Rosa acicularis	prickly rose	N
T-3_15.2015	T-3	RUBUIDA	10	4	Rubus idaeus	red raspberry	N
T-3_15.2015	T-3	RUBUPAR	0.5	4	Rubus parviflorus	thimbleberry	N
T-3_15.2015	T-3	SCUTGAL	0.2	7	Scutellaria galericulata	marsh skullcap	N
T-3_15.2015	T-3	SYMPLAE	0.1	7	Symphyotrichum laeve	smooth aster	N
T-3_15.2015	T-3	TARAOFF	0.05	7	Taraxacum officinale	common dandelion	E
T-3_15.2015	T-3	THALVEN	0.01	7	Thalictrum venulosum	veiny meadowrue	N
T-3_15.2015	T-3	THININT	3	6	Thinopyrum intermedium	intermediate wheatgrass	E
T-3_15.2015	T-3	TRIFHYB	3	7	Trifolium hybridum	alsike clover	E
T-3_15.2015	T-3	VICIAME	1	7	Vicia americana	American vetch	N

Site_plot_year	Site	Sp_Code	PCV	Life form	Scientific name	Common name	Origin
T-3_15.2013	T-3	SALIX	0.7	4	Salix sp.	willow	N
T-3_15.2015	T-3	SALIX	0.5	4	Salix sp.	willow	N
T-3_16.2015	T-3	FESTRUB	1	6	Festuca rubra	red fescue	E
T-3_16.2015	T-3	ACHIMIL	0.5	7	Achillea millefolium	yarrow	N
T-3_16.2015	T-3	AGROCRI	0.5	6	Agropyron cristatum	crested wheatgrass	E
T-3_16.2015	T-3	AGROSCA	0.1	6	Agrostis scabra	hair bentgrass	N
T-3_16.2015	T-3	AGROSTO	1	6	Agrostis stolonifera	creeping bentgrass	E
T-3_16.2015	T-3	BOECRET	0.01	2	Boechera retrofracta	dangling suncress	N
T-3_16.2015	T-3	BROMTEC	0.5	6	Bromus tectorum	cheatgrass	E
T-3_16.2015	T-3	CREPTEC	0.1	7	Crepis tectorum	annual hawksbeard	E
T-3_16.2015	T-3	ELYMTRA	5	6	Elymus trachycaulus	slender wheatgrass	N
T-3_16.2015	T-3	EPILANG	0.5	7	Epilobium angustifolium	fireweed	N
T-3_16.2015	T-3	HIERUMB	0.01	7	Hieracium umbellatum	narrow-leaved hawkweed	E
T-3_16.2015	T-3	HORDJUB	0.1	6	Hordeum jubatum	foxtail barley	N
T-3_16.2015	T-3	MELIALB	0.1	7	Melilotus alba	white sweet-clover	E
T-3_16.2015	T-3	PHLEPRA	1	6	Phleum pratense	common timothy	E
T-3_16.2015	T-3	POA COM	1	6	Poa compressa	Canada bluegrass	E
T-3_16.2015	T-3	POA INT	0.5	6	Poa interior	interior bluegrass	N
T-3_16.2015	T-3	RUBUIDA	0.5	4	Rubus idaeus	red raspberry	N
T-3_16.2015	T-3	RUBUPAR	0.1	4	Rubus parviflorus	thimbleberry	N
T-3_16.2015	T-3	SYMPLAE	0.5	7	Symphyotrichum laeve	smooth aster	N
T-3_16.2015	T-3	TRIFHYB	3	7	Trifolium hybridum	alsike clover	E
T-3_17.2015	T-3	CAREX	0.5	6	Carex sp.	sedge	N
T-3_17.2015	T-3	FESTRUB	2	6	Festuca rubra	red fescue	E
T-3_17.2015	T-3	SCROPHU	0.1	6	Scrophularia sp.	figwort	N
T-3_17.2015	T-3	POTEREC	0.1	7	Potentilla recta	sulphur cinquefoil	E
T-3_17.2015	T-3	ACHIMIL	1	7	Achillea millefolium	yarrow	N
T-3_17.2015	T-3	AGROCRI	0.5	6	Agropyron cristatum	crested wheatgrass	E
T-3_17.2015	T-3	AGROSCA	0.1	6	Agrostis scabra	hair bentgrass	N
T-3_17.2015	T-3	AGROSTO	2	6	Agrostis stolonifera	creeping bentgrass	E
T-3_17.2015	T-3	ARCTUVA	0.1	12	Arctostaphylos uva-ursi	kinnikinnick	N
T-3_17.2015	T-3	BOECRET	0.1	2	Boechera retrofracta	dangling suncress	N
T-3_17.2015	T-3	BROMINE	0.5	6	Bromus inermis	smooth brome	E
T-3_17.2015	T-3	CERAPUR	4	9	Ceratodon purpureus	fire-moss	N
T-3_17.2015	T-3	ELYMTRA	1	6	Elymus trachycaulus	slender wheatgrass	N
T-3_17.2015	T-3	EPILANG	1	7	Epilobium angustifolium	fireweed	N
T-3_17.2015	T-3	FRAGVIR	0.5	7	Fragaria virginiana	wild strawberry	N
T-3_17.2015	T-3	LEUCVUL	3	7	Leucanthemum vulgare	oxeye daisy	E
T-3_17.2015	T-3	POA COM	5	6	Poa compressa	Canada bluegrass	E
T-3_17.2015	T-3	POA INT	0.1	6	Poa interior	interior bluegrass	N
T-3_17.2015	T-3	POLEPUL	0.1	7	Polemonium pulcherrimum	showy Jacob's-ladder	N
T-3_17.2015	T-3	POPUBAL	0.5	2	Populus balsamifera	balsam poplar	N
T-3_17.2015	T-3	PSEUMEN	4	1	Pseudotsuga menziesii	Douglas-fir	N
T-3_17.2015	T-3	RIBELAC	0.5	4	Ribes lacustre	black gooseberry	N
T-3_17.2015	T-3	RUBUIDA	2	4	Rubus idaeus	red raspberry	N
T-3_17.2015	T-3	RUBUPAR	1	4	Rubus parviflorus	thimbleberry	N
T-3_17.2015	T-3	SYMPLAE	0.1	7	Symphyotrichum laeve	smooth aster	N
T-3_17.2015	T-3	TARAOFF	0.1	7	Taraxacum officinale	common dandelion	E
T-3_17.2015	T-3	TRIFHYB	3	7	Trifolium hybridum	alsike clover	E
T-3_18.2015	T-3	FESTRUB	1	6	Festuca rubra	red fescue	E
T-3_18.2015	T-3	ACTARUB	0.1	7	Actaea rubra	baneberry	N
T-3_18.2015	T-3	BROMINE	3	6	Bromus inermis	smooth brome	E
T-3_18.2015	T-3	CALAPUR	1	6	Calamagrostis purpurascens	purple reedgrass	N
T-3_18.2015	T-3	CARECOI	0.1	7	Carex concinna	low northern sedge	N
T-3_18.2015	T-3	ELYMGLA	5	6	Elymus glaucus	blue wildrye	N
T-3_18.2015	T-3	ELYMTRA	2	6	Elymus trachycaulus	slender wheatgrass	N
T-3_18.2015	T-3	EPILANG	6	7	Epilobium angustifolium	fireweed	N
T-3_18.2015	T-3	EURYCON	0.1	7	Eurybia conspicua	showy aster	N

Site_plot_year	Site	Sp_Code	PCV	Life form	Scientific name	Common name	Origin
T-3_18.2015	T-3	FESTOCC	0.1	6	Festuca occidentalis	western fescue	N
T-3_18.2015	T-3	FRAGVIR	4	7	Fragaria virginiana	wild strawberry	N
T-3_18.2015	T-3	LEUCVUL	1	7	Leucanthemum vulgare	oxeye daisy	E
T-3_18.2015	T-3	PINUCON	0.1	1	Pinus contorta	lodgepole pine	N
T-3_18.2015	T-3	POA COM	2	6	Poa compressa	Canada bluegrass	E
T-3_18.2015	T-3	PSEUMEN	5	1	Pseudotsuga menziesii	Douglas-fir	N
T-3_18.2015	T-3	ROSAACI	4	4	Rosa acicularis	prickly rose	N
T-3_18.2015	T-3	SPIRBET	20	4	Spiraea betulifolia	birch-leaved spirea	N
T-3_18.2015	T-3	SYMPFOL	2	7	Symphyotrichum foliaceum	leafy aster	N
T-3_18.2015	T-3	TARAOFF	2	7	Taraxacum officinale	common dandelion	E
T-3_18.2015	T-3	TRIFHYB	1	7	Trifolium hybridum	alsike clover	E
T-3_19.2015	T-3	CAREX	2	7	Carex sp.	sedge	N
T-3_19.2015	T-3	FESTRUB	1	6	Festuca rubra	red fescue	E
T-3_19.2015	T-3	AGROCRI	2	6	Agropyron cristatum	crested wheatgrass	E
T-3_19.2015	T-3	AGROSTO	1	6	Agrostis stolonifera	creeping bentgrass	E
T-3_19.2015	T-3	BETUPAP	2	2	Betula papyrifera	paper birch	N
T-3_19.2015	T-3	BOECRET	0.1	2	Boechera retrofracta	dangling suncress	N
T-3_19.2015	T-3	BROMINE	6	6	Bromus inermis	smooth brome	E
T-3_19.2015	T-3	CALAPUR	1	6	Calamagrostis purpurascens	purple reedgrass	N
T-3_19.2015	T-3	CREPTEC	0.1	7	Crepis tectorum	annual hawksbeard	E
T-3_19.2015	T-3	FESTTRA	2	6	Festuca trachyphylla	hard fescue	E
T-3_19.2015	T-3	LONIINV	0.1	4	Lonicera involucrata	black twinberry	N
T-3_19.2015	T-3	LUZUPAR	0.01	4	Luzula parviflora	small-flowered wood-rush	N
T-3_19.2015	T-3	MEDISAT	1	7	Medicago sativa	alfalfa	E
T-3_19.2015	T-3	PINUCON	1	1	Pinus contorta	lodgepole pine	N
T-3_19.2015	T-3	POA COM	0.1	6	Poa compressa	Canada bluegrass	E
T-3_19.2015	T-3	POA INT	3	6	Poa interior	interior bluegrass	N
T-3_19.2015	T-3	POPUBAL	0.5	2	Populus balsamifera	balsam poplar	N
T-3_19.2015	T-3	PSEUMEN	8	1	Pseudotsuga menziesii	Douglas-fir	N
T-3_19.2015	T-3	RIBELAC	1	4	Ribes lacustre	black gooseberry	N
T-3_19.2015	T-3	RUBUIDA	15	4	Rubus idaeus	red raspberry	N
T-3_20.2015	T-3	FESTRUB	2	6	Festuca rubra	red fescue	E
T-3_20.2015	T-3	POTEREC	1	7	Potentilla recta	sulphur cinquefoil	E
T-3_20.2015	T-3	ACHIMIL	0.1	7	Achillea millefolium	yarrow	N
T-3_20.2015	T-3	AGROSTO	2	6	Agrostis stolonifera	creeping bentgrass	E
T-3_20.2015	T-3	FESTTRA	2	6	Festuca trachyphylla	hard fescue	E
T-3_20.2015	T-3	HORDJUB	0.01	6	Hordeum jubatum	foxtail barley	N
T-3_20.2015	T-3	LEUCVUL	15	7	Leucanthemum vulgare	oxeye daisy	E
T-3_20.2015	T-3	MEDISAT	1	7	Medicago sativa	alfalfa	E
T-3_20.2015	T-3	MELIALB	0.1	7	Melilotus alba	white sweet-clover	E
T-3_20.2015	T-3	PHLEPRA	0.5	6	Phleum pratense	common timothy	E
T-3_20.2015	T-3	SYMPLAE	0.1	7	Symphyotrichum laeve	smooth aster	N
T-3_20.2015	T-3	THININT	1	6	Thinopyrum intermedium	intermediate wheatgrass	E
T-3_21.2015	T-3	CAREX	0.1	7	Carex sp.	sedge	N
T-3_21.2015	T-3	CREPNAN	0.01	7	Crepis nana	dwarf hawksbeard	N
T-3_21.2015	T-3	POTEREC	1	7	Potentilla recta	sulphur cinquefoil	E
T-3_21.2015	T-3	ACHIMIL	0.1	7	Achillea millefolium	yarrow	N
T-3_21.2015	T-3	AGROSCA	0.1	6	Agrostis scabra	hair bentgrass	N
T-3_21.2015	T-3	AGROSTO	5	6	Agrostis stolonifera	creeping bentgrass	E
T-3_21.2015	T-3	ALNUVIR	0.5	4	Alnus viridis	green alder	N
T-3_21.2015	T-3	ARCTUVA	0.5	12	Arctostaphylos uva-ursi	kinnikinnick	N
T-3_21.2015	T-3	BETUPAP	0.1	2	Betula papyrifera	paper birch	N
T-3_21.2015	T-3	CAREMED	0.1	6	Carex media	Scandinavian sedge	N
T-3_21.2015	T-3	CREPTEC	0.01	7	Crepis tectorum	annual hawksbeard	E
T-3_21.2015	T-3	EPILANG	0.5	7	Epilobium angustifolium	fireweed	N
T-3_21.2015	T-3	HIERGRA	0.1	7	Hieracium gracile	slender hawkweed	N
T-3_21.2015	T-3	HIERUMB	0.01	7	Hieracium umbellatum	narrow-leaved hawkweed	E
T-3_21.2015	T-3	LEUCVUL	2	7	Leucanthemum vulgare	oxeye daisy	E

Site_plot_year	Site	Sp_Code	PCV	Life form	Scientific name	Common name	Origin
T-3_21.2015	T-3	PHLEPRA	0.5	6	Phleum pratense	common timothy	E
T-3_21.2015	T-3	POA INT	1	6	Poa interior	interior bluegrass	N
T-3_21.2015	T-3	POPUBAL	0.1	2	Populus balsamifera	balsam poplar	N
T-3_21.2015	T-3	PSEUMEN	4	1	Pseudotsuga menziesii	Douglas-fir	N
T-3_21.2015	T-3	RIBELAC	0.1	4	Ribes lacustre	black gooseberry	N
T-3_21.2015	T-3	RUBUIDA	1	4	Rubus idaeus	red raspberry	N
T-3_21.2015	T-3	SALIPYR	0.1	2	Salix pyrifolia	balsam willow	N
T-3_21.2015	T-3	TARAOFF	0.5	7	Taraxacum officinale	common dandelion	E
T-3_21.2015	T-3	TRIFHYB	1	7	Trifolium hybridum	alsike clover	E
T-3_22.2015	T-3	CREPNAN	0.01	7	Crepis nana	dwarf hawksbeard	N
T-3_22.2015	T-3	FESTRUB	2	6	Festuca rubra	red fescue	E
T-3_22.2015	T-3	SCROPHU	0.1	6	Scrophularia sp.	figwort	N
T-3_22.2015	T-3	ACHIMIL	0.1	7	Achillea millefolium	yarrow	N
T-3_22.2015	T-3	AGROCRI	1	6	Agropyron cristatum	crested wheatgrass	E
T-3_22.2015	T-3	ARCTUVA	0.1	12	Arctostaphylos uva-ursi	kinnikinnick	N
T-3_22.2015	T-3	BOECRET	0.1	2	Boechera retrofracta	dangling suncress	N
T-3_22.2015	T-3	BROMINE	0.5	6	Bromus inermis	smooth brome	E
T-3_22.2015	T-3	CALAPUR	1	6	Calamagrostis purpurascens	purple reedgrass	N
T-3_22.2015	T-3	CARECOI	0.1	7	Carex concinna	low northern sedge	N
T-3_22.2015	T-3	ELYMGLA	0.5	6	Elymus glaucus	blue wildrye	N
T-3_22.2015	T-3	ELYMREP	0.01	6	Elymus repens	quackgrass	E
T-3_22.2015	T-3	ELYMTRA	2	6	Elymus trachycaulus	slender wheatgrass	N
T-3_22.2015	T-3	EPILANG	0.5	7	Epilobium angustifolium	fireweed	N
T-3_22.2015	T-3	EURYCON	0.5	7	Eurybia conspicua	showy aster	N
T-3_22.2015	T-3	FRAGVIR	0.5	7	Fragaria virginiana	wild strawberry	N
T-3_22.2015	T-3	PHLEPRA	0.1	6	Phleum pratense	common timothy	E
T-3_22.2015	T-3	POA INT	6	6	Poa interior	interior bluegrass	N
T-3_22.2015	T-3	PSEUMEN	2	1	Pseudotsuga menziesii	Douglas-fir	N
T-3_22.2015	T-3	RIBELAC	0.1	4	Ribes lacustre	black gooseberry	N
T-3_22.2015	T-3	SPIRBET	0.1	4	Spiraea betulifolia	birch-leaved spirea	N
T-3_22.2015	T-3	SYMPFOL	0.1	7	Symphyotrichum foliaceum	leafy aster	N
T-3_23.2015	T-3	SCROPHU	1	6	Scrophularia sp.	figwort	N
T-3_23.2015	T-3	ACHIMIL	1	7	Achillea millefolium	yarrow	N
T-3_23.2015	T-3	AGROSTO	5	6	Agrostis stolonifera	creeping bentgrass	E
T-3_23.2015	T-3	AMELALN	0.1	4	Amelanchier alnifolia	saskatoon	N
T-3_23.2015	T-3	BOECRET	0.5	2	Boechera retrofracta	dangling suncress	N
T-3_23.2015	T-3	BROMINE	5	6	Bromus inermis	smooth brome	E
T-3_23.2015	T-3	ELYMTRA	2	6	Elymus trachycaulus	slender wheatgrass	N
T-3_23.2015	T-3	EPILANG	1	7	Epilobium angustifolium	fireweed	N
T-3_23.2015	T-3	LEPIDEN	0.1	7	Lepidium densiflorum	prairie pepper-grass	N
T-3_23.2015	T-3	LEUCVUL	5	7	Leucanthemum vulgare	oxeye daisy	E
T-3_23.2015	T-3	POA INT	2	6	Poa interior	interior bluegrass	N
T-3_23.2015	T-3	POPUTRE	0.5	2	Populus tremuloides	trembling aspen	N
T-3_23.2015	T-3	PSEUMEN	2	1	Pseudotsuga menziesii	Douglas-fir	N
T-3_23.2015	T-3	RUBUIDA	5	4	Rubus idaeus	red raspberry	N
T-3_23.2015	T-3	SYMPFOL	0.5	7	Symphyotrichum foliaceum	leafy aster	N
T-3_23.2015	T-3	TARAOFF	1	7	Taraxacum officinale	common dandelion	E
T-3_24.2015	T-3	CAREX	0.5	7	Carex sp.	sedge	N
T-3_24.2015	T-3	FESTRUB	1	6	Festuca rubra	red fescue	E
T-3_24.2015	T-3	AGROCRI	1	6	Agropyron cristatum	crested wheatgrass	E
T-3_24.2015	T-3	AGROSCA	1	6	Agrostis scabra	hair bentgrass	N
T-3_24.2015	T-3	BETUPAP	1	2	Betula papyrifera	paper birch	N
T-3_24.2015	T-3	CARECOI	0.1	7	Carex concinna	low northern sedge	N
T-3_24.2015	T-3	ELYMTRA	1	6	Elymus trachycaulus	slender wheatgrass	N
T-3_24.2015	T-3	EPILANG	2	7	Epilobium angustifolium	fireweed	N
T-3_24.2015	T-3	EURYCON	0.1	7	Eurybia conspicua	showy aster	N
T-3_24.2015	T-3	FRAGVIR	0.5	7	Fragaria virginiana	wild strawberry	N
T-3_24.2015	T-3	PHLEPRA	1	6	Phleum pratense	common timothy	E

Site_plot_year	Site	Sp_Code	PCV	Life form	Scientific name	Common name	Origin
T-3_24.2015	T-3	PINUCON	0.1	1	Pinus contorta	lodgepole pine	N
T-3_24.2015	T-3	POA INT	8	6	Poa interior	interior bluegrass	N
T-3_24.2015	T-3	POLEPUL	0.1	7	Polemonium pulcherrimum	showy Jacob's-ladder	N
T-3_24.2015	T-3	PSEUMEN	2	1	Pseudotsuga menziesii	Douglas-fir	N
T-3_24.2015	T-3	RIBELAC	1	4	Ribes lacustre	black gooseberry	N
T-3_24.2015	T-3	ROSAACI	4	4	Rosa acicularis	prickly rose	N
T-3_24.2015	T-3	RUBUIDA	2	4	Rubus idaeus	red raspberry	N
T-3_24.2015	T-3	TRIFHYB	0.1	7	Trifolium hybridum	alsike clover	E
T-3_25.2015	T-3	SCROPHU	1	6	Scrophularia sp.	figwort	N
T-3_25.2015	T-3	ACHIMIL	2	7	Achillea millefolium	yarrow	N
T-3_25.2015	T-3	AGROCRI	0.1	6	Agropyron cristatum	crested wheatgrass	E
T-3_25.2015	T-3	AGROSTO	0.5	6	Agrostis stolonifera	creeping bentgrass	E
T-3_25.2015	T-3	AMELALN	1	4	Amelanchier alnifolia	saskatoon	N
T-3_25.2015	T-3	ARCTUVA	0.1	12	Arctostaphylos uva-ursi	kinnikinnick	N
T-3_25.2015	T-3	BETUPAP	0.1	2	Betula papyrifera	paper birch	N
T-3_25.2015	T-3	BOECRET	1	2	Boechera retrofracta	dangling suncress	N
T-3_25.2015	T-3	CAREMED	1	6	Carex media	Scandinavian sedge	N
T-3_25.2015	T-3	EPILANG	3	7	Epilobium angustifolium	fireweed	N
T-3_25.2015	T-3	EURYCON	1	7	Eurybia conspicua	showy aster	N
T-3_25.2015	T-3	FESTTRA	3	6	Festuca trachyphylla	hard fescue	E
T-3_25.2015	T-3	FRAGVIR	0.5	7	Fragaria virginiana	wild strawberry	N
T-3_25.2015	T-3	LEUCVUL	0.1	7	Leucanthemum vulgare	oxeye daisy	E
T-3_25.2015	T-3	PHLEPRA	0.5	6	Phleum pratense	common timothy	E
T-3_25.2015	T-3	PINUCON	1	1	Pinus contorta	lodgepole pine	N
T-3_25.2015	T-3	POA INT	2	6	Poa interior	interior bluegrass	N
T-3_25.2015	T-3	POPUBAL	0.1	2	Populus balsamifera	balsam poplar	N
T-3_25.2015	T-3	PSEUMEN	4	1	Pseudotsuga menziesii	Douglas-fir	N
T-3_25.2015	T-3	ROSAACI	8	4	Rosa acicularis	prickly rose	N
T-3_25.2015	T-3	RUBUIDA	0.1	4	Rubus idaeus	red raspberry	N
T-3_25.2015	T-3	SENEERE	0.1	7	Senecio eremophilus	dryland ragwort	N
T-3_25.2015	T-3	TARAOFF	1	7	Taraxacum officinale	common dandelion	E
T-3_25.2015	T-3	THININT	1	6	Thinopyrum intermedium	intermediate wheatgrass	E
T-3_25.2015	T-3	TRIFHYB	3	7	Trifolium hybridum	alsike clover	E
T-3_26.2015	T-3	CAREX	0.01	7	Carex sp.	sedge	N
T-3_26.2015	T-3	FESTRUB	4	6	Festuca rubra	red fescue	E
T-3_26.2015	T-3	SALIX	0.1	4	Salix sp.	willow	N
T-3_26.2015	T-3	AGROCRI	0.1	6	Agropyron cristatum	crested wheatgrass	E
T-3_26.2015	T-3	AGROSTO	0.1	6	Agrostis stolonifera	creeping bentgrass	E
T-3_26.2015	T-3	CERAPUR	0.5	9	Ceratodon purpureus	fire-moss	N
T-3_26.2015	T-3	DACTGLO	8	6	Dactylis glomerata	orchard-grass	E
T-3_26.2015	T-3	ELYMTRA	1	6	Elymus trachycaulus	slender wheatgrass	N
T-3_26.2015	T-3	EPILANG	0.5	7	Epilobium angustifolium	fireweed	N
T-3_26.2015	T-3	MEDISAT	0.1	7	Medicago sativa	alfalfa	E
T-3_26.2015	T-3	PHLEPRA	1	6	Phleum pratense	common timothy	E
T-3_26.2015	T-3	POA INT	4	6	Poa interior	interior bluegrass	N
T-3_26.2015	T-3	PSEUMEN	0.5	1	Pseudotsuga menziesii	Douglas-fir	N
T-3_26.2015	T-3	RIBELAC	0.1	4	Ribes lacustre	black gooseberry	N
T-3_26.2015	T-3	ROSAACI	0.5	4	Rosa acicularis	prickly rose	N
T-3_26.2015	T-3	RUBUIDA	0.1	4	Rubus idaeus	red raspberry	N
T-3_26.2015	T-3	SPIRBET	0.5	4	Spiraea betulifolia	birch-leaved spirea	N

APPENDIX G – FOREST DATA

Year	Site	PSP	Tag#	Species code	Common name	DBH _cm	Ht_m	SI?	SI_age	SI_age_method	SI_GY PSY
2015	F-1	F-1_1	7	Fd	douglas fir	1.5	2.22				
2015	F-1	F-1_1	8	Fd	douglas fir	1.1	1.91				
2015	F-1	F-1_1	10	Fd	douglas fir	2.1	2.54				
2015	F-1	F-1_1	14	Fd	douglas fir	1.8	2.16				
2015	F-1	F-1_1	18	Fd	douglas fir	1.5	1.77				
2015	F-1	F-1_1	26	Fd	douglas fir	NA	1.29				
2015	F-1	F-1_1	188	Fd	douglas fir	NA	0.57				
2015	F-1	F-1_2	1	Pl	lodgepole pine	8	3.83				
2015	F-1	F-1_2	2	Pl	lodgepole pine	4.5	3.33				
2015	F-1	F-1_2	3	Pl	lodgepole pine	0.5	1.35				
2015	F-1	F-1_2	4	Pl	lodgepole pine	NA	1.16				
2015	F-1	F-1_2	5	Pl	lodgepole pine	NA	0.85				
2015	F-1	F-1_3	6	Fd	douglas fir	NA	0.36				
2015	F-2	F-2_1	148	Fd	douglas fir	NA	0.42				
2015	F-2	F-2_1	149	Fd	douglas fir	NA	0.45				
2015	F-2	F-2_1	150	Fd	douglas fir	NA	0.44				
2015	F-2	F-2_1	151	Fd	douglas fir	NA	0.34				
2015	F-2	F-2_1	152	Fd	douglas fir	NA	0.42				
2015	F-2	F-2_1	153	Fd	douglas fir	NA	0.5				
2015	F-2	F-2_1	154	Fd	douglas fir	NA	0.87				
2015	F-2	F-2_1	155	Fd	douglas fir	NA	0.61				
2015	F-2	F-2_1	156	Fd	douglas fir	NA	0.66				
2015	F-2	F-2_1	157	Fd	douglas fir	NA	0.52				
2015	F-2	F-2_2	158	Fd	douglas fir	NA	0.24				
2015	F-2	F-2_2	159	Fd	douglas fir	NA	0.47				
2015	F-2	F-2_2	160	Fd	douglas fir	NA	0.2				
2015	F-2	F-2_2	161	Fd	douglas fir	NA	0.46				
2015	F-2	F-2_2	162	Fd	douglas fir	NA	0.24				
2015	F-2	F-2_2	163	Fd	douglas fir	NA	0.24				
2015	F-2	F-2_2	164	Fd	douglas fir	NA	0.89				
2015	F-2	F-2_2	165	Fd	douglas fir	NA	0.24				
2015	F-2	F-2_2	166	Fd	douglas fir	NA	0.29				
2015	F-2	F-2_2	167	Fd	douglas fir	NA	0.45				
2015	F-2	F-2_2	168	Fd	douglas fir	NA	0.85				
2015	F-2	F-2_2	169	Fd	douglas fir	NA	0.39				
2015	F-2	F-2_2	170	Fd	douglas fir	NA	0.47				
2015	F-2	F-2_2	171	Fd	douglas fir	NA	0.34				
2015	F-2	F-2_2	172	Fd	douglas fir	NA	0.3				
2015	F-2	F-2_2	173	Fd	douglas fir	NA	0.48				
2015	F-2	F-2_3	174	Fd	douglas fir	0.5	1.77				
2015	F-2	F-2_3	175	Fd	douglas fir	NA	0.64				
2015	F-2	F-2_3	176	Fd	douglas fir	1.7	2.03				
2015	F-2	F-2_3	177	Fd	douglas fir	NA	0.46				
2015	F-2	F-2_3	178	Fd	douglas fir	NA	0.53				
2015	F-2	F-2_3	179	Fd	douglas fir	NA	0.4				
2015	F-2	F-2_3	180	Fd	douglas fir	NA	0.79				
2015	F-2	F-2_3	181	Fd	douglas fir	0.5	1.44				
2015	F-2	F-2_3	182	Fd	douglas fir	0.5	1.76				
2015	F-2	F-2_3	183	Fd	douglas fir	NA	1.24				
2015	F-2	F-2_3	184	Fd	douglas fir	NA	0.48				
2015	F-2	F-2_3	185	Fd	douglas fir	NA	1.15				
2015	F-2	F-2_3	186	Fd	douglas fir	0.5	1.31				
2015	F-2	F-2_3	187	Fd	douglas fir	1.6	2.02				
2015	F-3	F-3_1	191	Fd	douglas fir	0.5	1.4				

Year	Site	PSP	Tag#	Species code	Common name	DBH _cm	Ht_m	SI?	SI_age	SI_age_method	SI_GYPSY
2015	F-3	F-3_1	192	Fd	douglas fir	NA	0.4				
2015	F-3	F-3_1	193	Fd	douglas fir	NA	0.31				
2015	F-3	F-3_1	194	Fd	douglas fir	NA	0.5				
2015	F-3	F-3_1	195	Fd	douglas fir	NA	0.36				
2015	G-1	G-1_1	229	Pb	balsam poplar	0.5	2.03				
2015	G-1	G-1_1	230	Pb	balsam poplar	1.5	2.47				
2015	G-1	G-1_1	231	Pb	balsam poplar	1.8	2.27				
2015	G-1	G-1_1	232	Pb	balsam poplar	0.5	1.92				
2015	G-1	G-1_1	389	Pb	balsam poplar	1.2	2.15				
2015	G-1	G-1_1	390	Pb	balsam poplar	0.5	1.46				
2015	G-1	G-1_1	391	Pl	lodgepole pine	0.5	1.49				
2015	G-1	G-1_1	392	Bp	paper birch	2.5	4.37				
2015	G-1	G-1_1	393	Pb	balsam poplar	14.6	8.89	Y	23	cored_BH	14.7814
2015	G-1	G-1_1	394	Bp	paper birch	2.1	3.09				
2015	G-1	G-1_1	395	Sxw	hybrid hybrid white spruce	NA	0.87				
2015	G-1	G-1_1	396	Pb	balsam poplar	1.4	2.41				
2015	G-1	G-1_1	397	Pb	balsam poplar	1.1	2.12				
2015	G-1	G-1_1	398	Sxw	hybrid hybrid white spruce	NA	0.51				
2015	G-1	G-1_1	399	Pb	balsam poplar	0.5	1.44				
2015	G-1	G-1_1	400	Pb	balsam poplar	0.5	2.06				
2015	REF-13	REF-13_1	301	Pl	lodgepole pine	NA	0.34				
2015	REF-13	REF-13_1	302	Pl	lodgepole pine	NA	0.57				
2015	REF-13	REF-13_1	303	Pl	lodgepole pine	NA	0.67				
2015	REF-13	REF-13_1	304	Pl	lodgepole pine	NA	0.49				
2015	REF-13	REF-13_1	305	Pl	lodgepole pine	NA	0.34				
2015	REF-13	REF-13_1	306	Pl	lodgepole pine	NA	0.36				
2015	REF-13	REF-13_1	307	Pl	lodgepole pine	NA	0.35				
2015	REF-13	REF-13_1	308	Pl	lodgepole pine	NA	0.31				
2015	REF-13	REF-13_1	309	Pl	lodgepole pine	NA	0.34				
2015	REF-13	REF-13_1	310	Pl	lodgepole pine	NA	0.41				
2015	REF-13	REF-13_1	311	Pl	lodgepole pine	NA	0.37				
2015	REF-13	REF-13_1	312	Pl	lodgepole pine	NA	0.33				
2015	REF-13	REF-13_1	313	Pl	lodgepole pine	NA	0.48				
2015	REF-13	REF-13_1	314	Pl	lodgepole pine	NA	0.34				
2015	REF-13	REF-13_1	315	Pl	lodgepole pine	NA	0.38				
2015	REF-13	REF-13_1	316	Pl	lodgepole pine	NA	0.63				
2015	REF-13	REF-13_1	317	Pl	lodgepole pine	NA	0.3				
2015	REF-13	REF-13_1	318	Pl	lodgepole pine	NA	0.37				
2015	REF-13	REF-13_1	319	Pl	lodgepole pine	NA	0.33				
2015	REF-13	REF-13_1	320	Pl	lodgepole pine	NA	0.43				
2015	REF-13	REF-13_1	321	Pl	lodgepole pine	NA	0.7				
2015	REF-13	REF-13_1	322	Pl	lodgepole pine	NA	0.42				
2015	REF-13	REF-13_1	323	Pl	lodgepole pine	NA	0.99				
2015	REF-13	REF-13_1	324	Pl	lodgepole pine	NA	0.37				
2015	REF-13	REF-13_1	325	Pl	lodgepole pine	NA	0.3				
2015	REF-13	REF-13_1	326	Pl	lodgepole pine	NA	0.35				
2015	REF-13	REF-13_1	327	Pl	lodgepole pine	NA	0.33				
2015	REF-13	REF-13_1	328	Pl	lodgepole pine	NA	0.37				
2015	REF-13	REF-13_1	329	Pl	lodgepole pine	NA	0.44				
2015	REF-13	REF-13_1	330	Pl	lodgepole pine	NA	0.45				
2015	REF-13	REF-13_1	331	Pl	lodgepole pine	NA	0.45				
2015	REF-13	REF-13_1	332	Pl	lodgepole pine	NA	0.42				
2015	REF-13	REF-13_1	333	Pl	lodgepole pine	NA	0.43				
2015	REF-13	REF-13_1	334	Pl	lodgepole pine	NA	0.32				

Year	Site	PSP	Tag#	Species code	Common name	DBH _cm	Ht_m	SI?	SI_age	SI_age_method	SI_GYPSY
2015	REF-13	REF-13_1	335	Pl	lodgepole pine	NA	0.42				
2015	REF-13	REF-13_1	336	Pl	lodgepole pine	NA	0.36				
2015	REF-13	REF-13_1	337	Pl	lodgepole pine	NA	0.33				
2015	REF-13	REF-13_1	338	Pl	lodgepole pine	NA	0.3				
2015	REF-13	REF-13_1	339	Pl	lodgepole pine	NA	0.33				
2015	REF-13	REF-13_1	340	Pl	lodgepole pine	NA	0.47				
2015	REF-13	REF-13_1	341	Pl	lodgepole pine	NA	0.33				
2015	REF-13	REF-13_1	342	Pl	lodgepole pine	NA	0.3				
2015	REF-13	REF-13_1	343	Pl	lodgepole pine	NA	0.65				
2015	REF-13	REF-13_1	344	Pl	lodgepole pine	NA	1.15				
2015	REF-13	REF-13_1	345	Pl	lodgepole pine	NA	0.41				
2015	REF-13	REF-13_1	346	Sxw	hybrid hybrid white spruce	NA	0.67				
2015	REF-13	REF-13_1	347	Pl	lodgepole pine	NA	1.13				
2015	REF-13	REF-13_1	348	Sxw	hybrid hybrid white spruce	NA	0.69				
2015	REF-13	REF-13_1	349	Pl	lodgepole pine	NA	0.39				
2015	REF-13	REF-13_1	350	Pl	lodgepole pine	NA	0.411				
2015	REF-13	REF-13_1	351	Pl	lodgepole pine	NA	0.78				
2015	REF-13	REF-13_1	352	Pl	lodgepole pine	NA	0.66				
2015	REF-13	REF-13_1	353	Pl	lodgepole pine	NA	0.34				
2015	REF-13	REF-13_1	354	Pl	lodgepole pine	NA	0.38				
2015	REF-13	REF-13_1	355	Pl	lodgepole pine	NA	0.47				
2015	REF-13	REF-13_1	356	Pl	lodgepole pine	NA	0.55				
2015	REF-13	REF-13_1	357	Pl	lodgepole pine	NA	0.46				
2015	REF-13	REF-13_1	358	Pl	lodgepole pine	NA	0.41				
2015	REF-13	REF-13_1	359	Pl	lodgepole pine	NA	0.5				
2015	REF-13	REF-13_1	360	Pl	lodgepole pine	NA	0.53				
2015	REF-13	REF-13_1	361	Pl	lodgepole pine	NA	0.65				
2015	REF-13	REF-13_1	362	Pl	lodgepole pine	NA	0.9				
2015	REF-13	REF-13_1	363	Pl	lodgepole pine	NA	0.35				
2015	REF-13	REF-13_1	364	Pl	lodgepole pine	NA	0.37				
2015	REF-13	REF-13_1	365	Pl	lodgepole pine	NA	0.35				
2015	REF-13	REF-13_1	366	Pl	lodgepole pine	NA	0.48				
2015	REF-13	REF-13_1	367	Pl	lodgepole pine	NA	0.31				
2015	REF-13	REF-13_1	368	Pl	lodgepole pine	NA	0.56				
2015	REF-13	REF-13_1	369	Pl	lodgepole pine	NA	0.34				
2015	REF-13	REF-13_1	370	Pl	lodgepole pine	NA	0.41				
2015	REF-13	REF-13_1	371	Pl	lodgepole pine	NA	0.39				
2015	REF-13	REF-13_1	372	Pl	lodgepole pine	NA	0.48				
2015	REF-13	REF-13_1	373	Pl	lodgepole pine	NA	0.46				
2015	REF-13	REF-13_1	374	Pl	lodgepole pine	NA	0.48				
2015	REF-13	REF-13_1	375	Pl	lodgepole pine	NA	0.3				
2015	REF-13	REF-13_1	376	Pl	lodgepole pine	NA	0.31				
2015	REF-13	REF-13_1	377	Pl	lodgepole pine	NA	1.18				
2015	REF-13	REF-13_1	378	Pl	lodgepole pine	NA	0.37				
2015	REF-13	REF-13_1	379	Pl	lodgepole pine	NA	0.36				
2015	REF-13	REF-13_1	380	Pl	lodgepole pine	NA	0.48				
2015	REF-13	REF-13_1	381	Pl	lodgepole pine	NA	0.31				
2015	REF-13	REF-13_1	382	Pl	lodgepole pine	NA	0.31				
2015	REF-13	REF-13_1	383	Pl	lodgepole pine	NA	0.41				
2015	REF-13	REF-13_1	384	Pl	lodgepole pine	NA	0.3				
2015	REF-13	REF-13_1	385	Pl	lodgepole pine	NA	0.38				
2015	REF-14	REF-14_1	30	Pl	lodgepole pine	1.7	2.77				
2015	REF-14	REF-14_1	31	Sxw	hybrid hybrid white spruce	NA	0.68				

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2015	REF-14	REF-14_1	32	Pl	lodgepole pine	3.3	3.5				
2015	REF-14	REF-14_1	33	Pl	lodgepole pine	3.5	3.15				
2015	REF-14	REF-14_1	34	Pl	lodgepole pine	5.5	4.04				
2015	REF-14	REF-14_1	35	Pl	lodgepole pine	2.4	2.83				
2015	REF-14	REF-14_1	36	Pl	lodgepole pine	3.9	3.85				
2015	REF-14	REF-14_1	37	Pl	lodgepole pine	2.3	2.71				
2015	REF-14	REF-14_1	38	Pl	lodgepole pine	NA	1.01				
2015	REF-14	REF-14_1	39	Pl	lodgepole pine	NA	0.34				
2015	REF-14	REF-14_1	40	Pl	lodgepole pine	2.5	3.07				
2015	REF-14	REF-14_1	41	Pl	lodgepole pine	NA	0.81				
2015	REF-14	REF-14_1	42	Pl	lodgepole pine	NA	0.48				
2015	REF-14	REF-14_1	43	Pl	lodgepole pine	NA	0.68				
2015	REF-14	REF-14_1	44	Pl	lodgepole pine	NA	0.92				
2015	REF-14	REF-14_1	45	Pl	lodgepole pine	NA	0.35				
2015	REF-14	REF-14_1	46	Pl	lodgepole pine	NA	0.4				
2015	REF-14	REF-14_1	47	Pl	lodgepole pine	NA	1.55				
2015	REF-14	REF-14_1	48	Pl	lodgepole pine	6.8	4.93				
2015	REF-14	REF-14_1	49	Pl	lodgepole pine	3	3.55				
2015	REF-14	REF-14_1	50	Pl	lodgepole pine	NA	0.5				
2015	REF-14	REF-14_1	51	Pl	lodgepole pine	2.4	2.92				
2015	REF-14	REF-14_1	52	Pl	lodgepole pine	NA	0.94				
2015	REF-14	REF-14_1	53	Pl	lodgepole pine	8.1	4.45				
2015	REF-14	REF-14_1	54	Pl	lodgepole pine	NA	0.4				
2015	REF-14	REF-14_1	55	Pl	lodgepole pine	2.6	2.95				
2015	REF-14	REF-14_1	56	Pl	lodgepole pine	3.5	3.55				
2015	REF-14	REF-14_1	57	Pl	lodgepole pine	5.9	4.36				
2015	REF-14	REF-14_1	58	Pl	lodgepole pine	6	4.9				
2015	REF-14	REF-14_1	59	Pl	lodgepole pine	2.1	2.52				
2015	REF-14	REF-14_1	60	Pl	lodgepole pine	2.4	2.8				
2015	REF-14	REF-14_1	61	Pl	lodgepole pine	NA	0.59				
2015	REF-14	REF-14_1	62	Pl	lodgepole pine	NA	0.6				
2015	REF-14	REF-14_1	63	Pl	lodgepole pine	NA	0.67				
2015	REF-14	REF-14_1	64	Pl	lodgepole pine	1.8	2.46				
2015	REF-14	REF-14_1	65	Pl	lodgepole pine	6.9	5.21				
2015	REF-14	REF-14_1	66	Sxw	hybrid hybrid white spruce	NA	0.33				
2015	REF-14	REF-14_1	67	Sxw	hybrid hybrid white spruce	NA	0.73				
2015	REF-14	REF-14_1	68	Pl	lodgepole pine	5.5	5.1				
2015	REF-14	REF-14_1	69	Sxw	hybrid hybrid white spruce	3.8	2.2				
2015	REF-14	REF-14_1	70	Sxw	hybrid hybrid white spruce	NA	0.89				
2015	REF-14	REF-14_1	71	Pl	lodgepole pine	3	4.2				
2015	REF-14	REF-14_1	72	Pl	lodgepole pine	7.2	4.87				
2015	REF-14	REF-14_1	73	Pl	lodgepole pine	5.1	4.31				
2015	REF-14	REF-14_1	74	Sxw	hybrid hybrid white spruce	NA	0.53				
2015	REF-14	REF-14_1	75	Pl	lodgepole pine	5.5	5.07				
2015	REF-14	REF-14_1	76	Pl	lodgepole pine	5.3	4.58				
2015	REF-14	REF-14_1	77	Pl	lodgepole pine	7.6	4.81				
2015	REF-14	REF-14_1	78	Pl	lodgepole pine	5.2	3.74				
2015	REF-14	REF-14_1	79	Pl	lodgepole pine	3.1	3.3				
2015	REF-14	REF-14_1	80	Pl	lodgepole pine	3.9	3.29				
2015	REF-14	REF-14_1	81	Sxw	hybrid hybrid white spruce	1.4	1.62				

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2015	REF-14	REF-14_1	82	Sxw	hybrid hybrid white spruce	NA	1.21				
2015	REF-14	REF-14_1	83	Sxw	hybrid hybrid white spruce	NA	0.99				
2015	REF-14	REF-14_1	201	Pl	lodgepole pine	7.8	4.25				
2015	REF-14	REF-14_1	202	Pl	lodgepole pine	8.3	5.65	Y	9	cored_BH	20.8343
2015	REF-14	REF-14_1	203	Pl	lodgepole pine	1.7	2.2				
2015	REF-14	REF-14_1	204	Pl	lodgepole pine	NA	0.63				
2015	REF-14	REF-14_1	205	Pl	lodgepole pine	4	4.03				
2015	REF-14	REF-14_1	206	Sxw	hybrid hybrid white spruce	NA	0.62				
2015	REF-14	REF-14_1	207	Sxw	hybrid hybrid white spruce	NA	0.73				
2015	REF-14	REF-14_1	208	Pl	lodgepole pine	7.6	5.16				
2015	REF-14	REF-14_1	209	Pl	lodgepole pine	7.4	4.25				
2015	REF-14	REF-14_1	210	Pl	lodgepole pine	3.1	3.78				
2015	REF-14	REF-14_1	211	Pl	lodgepole pine	3.9	3.29				
2015	REF-14	REF-14_1	212	Pl	lodgepole pine	3	3.55				
2015	REF-14	REF-14_1	213	Pl	lodgepole pine	3.5	3.31				
2015	REF-14	REF-14_1	214	Pl	lodgepole pine	6.3	4.84				
2015	REF-14	REF-14_1	215	Pl	lodgepole pine	7.9	5.42				
2015	REF-14	REF-14_1	216	Sxw	hybrid white spruce	3.6	2.82				
2015	REF-14	REF-14_1	217	Sxw	hybrid white spruce	4.6	3.52				
2015	REF-14	REF-14_1	218	Pl	lodgepole pine	5	4.31				
2015	REF-15	REF-15_1	84	Sxw	hybrid white spruce	NA	1.26				
2015	REF-15	REF-15_1	85	Sxw	hybrid white spruce	NA	0.53				
2015	REF-15	REF-15_1	86	Sxw	hybrid white spruce	NA	0.88				
2015	REF-15	REF-15_1	87	Sxw	hybrid white spruce	NA	1.13				
2015	REF-15	REF-15_1	88	Sxw	hybrid white spruce	1	1.5				
2015	REF-15	REF-15_1	89	Sxw	hybrid white spruce	NA	0.54				
2015	REF-15	REF-15_1	90	Sxw	hybrid white spruce	NA	0.72				
2015	REF-15	REF-15_1	100	Pl	lodgepole pine	1.4	2.19				
2015	REF-15	REF-15_1	102	Pl	lodgepole pine	18.1	11.12	Y	17	cored_BH	23.5309
2015	REF-15	REF-15_1	93	Sxw	hybrid white spruce	1.7	2.33				
2015	REF-15	REF-15_1	94	Sxw	hybrid white spruce	2.9	3.54				
2015	REF-15	REF-15_1	95	Sxw	hybrid white spruce	2.5	3.33				
2015	REF-15	REF-15_1	103	Pl	lodgepole pine	14.3	9.43				
2015	REF-15	REF-15_1	97	Sxw	hybrid white spruce	NA	0.92				
2015	REF-15	REF-15_1	105	Pl	lodgepole pine	11	8.36				
2015	REF-15	REF-15_1	110	Pl	lodgepole pine	11.9	9.04				
2015	REF-15	REF-15_1	115	Pl	lodgepole pine	15.4	10.38				
2015	REF-15	REF-15_1	101	Sxw	hybrid white spruce	NA	0.95				
2015	REF-15	REF-15_1	118	Pl	lodgepole pine	14.9	10.35				
2015	REF-15	REF-15_1	121	Pl	lodgepole pine	15.2	10.18				

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2015	REF-15	REF-15_1	104	Sxw	hybrid white spruce	NA	0.81				
2015	REF-15	REF-15_1	125	Pl	lodgepole pine	15	9.62				
2015	REF-15	REF-15_1	106	Sxw	hybrid white spruce	2.9	3.38				
2015	REF-15	REF-15_1	107	Sxw	hybrid white spruce	NA	0.62				
2015	REF-15	REF-15_1	108	Sxw	hybrid white spruce	NA	0.42				
2015	REF-15	REF-15_1	109	Sxw	hybrid white spruce	NA	0.77				
2015	REF-15	REF-15_1	126	Pl	lodgepole pine	14.5	9.12				
2015	REF-15	REF-15_1	111	Sxw	hybrid white spruce	5.3	5.64				
2015	REF-15	REF-15_1	112	Sxw	hybrid white spruce	0.5	1.8				
2015	REF-15	REF-15_1	113	Fd	douglas fir	NA	0.44				
2015	REF-15	REF-15_1	114	Sxw	hybrid white spruce	1.3	2.12				
2015	REF-15	REF-15_1	128	Pl	lodgepole pine	9.9	9.38				
2015	REF-15	REF-15_1	116	Sxw	hybrid white spruce	NA	1.03				
2015	REF-15	REF-15_1	117	Sxw	hybrid white spruce	2.4	3.08				
2015	REF-15	REF-15_1	91	Pl	lodgepole pine	16.9	12.4				
2015	REF-15	REF-15_1	119	Sxw	hybrid white spruce	4.2	3.03				
2015	REF-15	REF-15_1	120	Sxw	hybrid white spruce	15.5	9.74				
2015	REF-15	REF-15_1	92	Pl	lodgepole pine	5.8	5.28				
2015	REF-15	REF-15_1	122	Sxw	hybrid white spruce	3.6	4.18				
2015	REF-15	REF-15_1	123	Sxw	hybrid white spruce	3.2	3.77				
2015	REF-15	REF-15_1	124	Sxw	hybrid white spruce	1.7	2.33				
2015	REF-15	REF-15_1	96	Pl	lodgepole pine	16.8	11.07				
2015	REF-15	REF-15_1	98	Pl	lodgepole pine	2.5	5.02				
2015	REF-15	REF-15_1	127	Sxw	hybrid white spruce	NA	0.65				
2015	REF-15	REF-15_1	99	Pl	lodgepole pine	7.4	6.2				
2015	REF-15	REF-15_1	129	Sxw	hybrid white spruce	2	2.83				
2015	REF-15	REF-15_1	130	Bp	paper birch	1.2	2.03				
2015	REF-15	REF-15_1	190	Sxw	hybrid white spruce	0.5	1.71				
2015	S-1	S-1_1	417	Sxw	hybrid white spruce	7.5	4.49				
2015	S-1	S-1_1	418	Pl	lodgepole pine	15	10.28				
2015	S-1	S-1_1	419	Pl	lodgepole pine	NA	0.72				
2015	S-1	S-1_1	420	Pl	lodgepole pine	1.5	2.54				
2015	S-1	S-1_1	421	Pl	lodgepole pine	NA	1.31				
2015	S-1	S-1_1	422	Pl	lodgepole pine	NA	1.26				
2015	S-1	S-1_1	423	Pl	lodgepole pine	NA	0.43				
2015	S-1	S-1_1	424	Pl	lodgepole pine	NA	0.5				
2015	S-1	S-1_1	425	Pl	lodgepole pine	NA	0.46				
2015	S-1	S-1_1	426	Pl	lodgepole pine	NA	0.71				
2015	S-1	S-1_1	427	Pl	lodgepole pine	3.5	4.43				

Year	Site	PSP	Tag#	Species code	Common name	DBH_cm	Ht_m	SI?	SI_age	SI_age_method	SI_GYPSY
2015	S-1	S-1_1	428	Pl	lodgepole pine	NA	1.23				
2015	S-1	S-1_1	429	Pl	lodgepole pine	NA	0.52				
2015	S-1	S-1_1	430	Pl	lodgepole pine	NA	0.67				
2015	S-1	S-1_1	431	Pl	lodgepole pine	12.6	8.16				
2015	S-1	S-1_1	432	Pl	lodgepole pine	13.6	8.69				
2015	S-1	S-1_1	433	Pl	lodgepole pine	NA	0.8				
2015	S-1	S-1_1	434	Pl	lodgepole pine	12.2	8.62				
2015	S-1	S-1_1	435	Pl	lodgepole pine	3.5	3.98				
2015	S-1	S-1_1	436	Pl	lodgepole pine	13.5	7.86				
2015	S-1	S-1_1	437	Pl	lodgepole pine	NA	0.45				
2015	S-1	S-1_1	438	Pl	lodgepole pine	18.8	10.91				
2015	S-1	S-1_1	439	Pl	lodgepole pine	2.8	3.43				
2015	S-1	S-1_1	440	Pl	lodgepole pine	NA	0.36				
2015	S-1	S-1_1	441	Pl	lodgepole pine	NA	0.38				
2015	S-1	S-1_1	442	Pl	lodgepole pine	1.2	1.85				
2015	S-1	S-1_1	443	Pl	lodgepole pine	1.3	2.23				
2015	S-1	S-1_1	444	Pl	lodgepole pine	1.8	2.42				
2015	S-1	S-1_1	445	Pl	lodgepole pine	2.8	3.53				
2015	S-1	S-1_1	446	Pl	lodgepole pine	0.5	1.44				
2015	S-1	S-1_1	447	Pl	lodgepole pine	0.5	1.43				
2015	S-1	S-1_1	448	Pl	lodgepole pine	3.4	4.63				
2015	S-1	S-1_1	449	Pl	lodgepole pine	1.7	2.22				
2015	S-1	S-1_1	450	Pl	lodgepole pine	NA	0.44				
2015	S-1	S-1_1	451	Pl	lodgepole pine	NA	0.65				
2015	S-1	S-1_1	452	Pl	lodgepole pine	23.4	11.1	Y	24	cored_BH	18.2294
2015	S-1	S-1_1	453	Pl	lodgepole pine	1	1.54				
2015	S-1	S-1_1	454	Pl	lodgepole pine	NA	1.22				
2015	S-1	S-1_1	455	Pl	lodgepole pine	NA	1.04				
2015	S-1	S-1_1	456	Pl	lodgepole pine	NA	0.34				
2015	S-1	S-1_1	457	Pl	lodgepole pine	NA	0.31				
2015	S-1	S-1_1	458	Pl	lodgepole pine	NA	0.55				
2015	S-1	S-1_1	459	Pl	lodgepole pine	NA	0.35				
2015	S-1	S-1_2	460	Pl	lodgepole pine	NA	0.38				
2015	S-1	S-1_2	461	Pl	lodgepole pine	NA	0.96				
2015	S-1	S-1_2	462	Pl	lodgepole pine	1.4	2.83				
2015	S-1	S-1_2	463	Pl	lodgepole pine	NA	0.37				
2015	S-1	S-1_2	464	Pl	lodgepole pine	NA	0.64				
2015	S-1	S-1_2	465	Pl	lodgepole pine	1	2.47				
2015	S-1	S-1_2	466	Pl	lodgepole pine	NA	0.93				
2015	S-1	S-1_2	467	Pl	lodgepole pine	NA	0.56				
2015	S-1	S-1_2	468	Pl	lodgepole pine	4.7	3.17				
2015	S-1	S-1_2	469	Pl	lodgepole pine	16.8	8.67				
2015	S-1	S-1_2	470	Pl	lodgepole pine	NA	0.36				
2015	S-1	S-1_2	471	Pl	lodgepole pine	2.4	3.73				
2015	S-1	S-1_2	472	Pl	lodgepole pine	8.6	7.75				
2015	S-1	S-1_2	473	Pl	lodgepole pine	15.6	10.11				
2015	S-1	S-1_2	474	Pl	lodgepole pine	9.2	7.41				
2015	S-1	S-1_2	475	Pl	lodgepole pine	14.5	6.65				
2015	S-1	S-1_2	476	Pl	lodgepole pine	NA	1.03				
2015	S-1	S-1_2	477	Pl	lodgepole pine	NA	0.34				
2015	S-1	S-1_2	478	Pl	lodgepole pine	NA	0.32				
2015	S-1	S-1_2	479	Pl	lodgepole pine	13	6.2				
2015	S-1	S-1_2	480	Pl	lodgepole pine	NA	0.41				
2015	S-1	S-1_2	481	Pl	lodgepole pine	12.8	8.32				
2015	S-1	S-1_2	482	Pl	lodgepole pine	9	6.62				
2015	S-1	S-1_2	483	Pl	lodgepole pine	NA	0.98				

Year	Site	PSP	Tag#	Species code	Common name	DBH_cm	Ht_m	SI?	SI_age	SI_age_method	SI_GYPSY
2015	S-1	S-1_2	484	Pl	lodgepole pine	NA	0.34				
2015	S-1	S-1_2	485	Pl	lodgepole pine	15.9	8.32	Y	20	cored_BH	15.9548
2015	S-1	S-1_2	486	Pl	lodgepole pine	NA	0.81				
2015	S-1	S-1_2	487	Pl	lodgepole pine	NA	0.77				
2015	S-1	S-1_2	488	Pl	lodgepole pine	13.3	7.21				
2015	S-1	S-1_2	489	Pl	lodgepole pine	NA	0.44				
2015	S-1	S-1_2	490	Pl	lodgepole pine	1.1	2.4				
2015	S-1	S-1_2	491	Pl	lodgepole pine	NA	0.98				
2015	S-1	S-1_2	492	Pl	lodgepole pine	NA	0.31				
2015	S-1	S-1_2	493	Pl	lodgepole pine	NA	0.33				
2015	S-1	S-1_2	494	Pl	lodgepole pine	NA	0.56				
2015	S-1	S-1_3	101	Pl	lodgepole pine	NA	0.9				
2015	S-1	S-1_3	102	Pl	lodgepole pine	NA	0.58				
2015	S-1	S-1_3	103	Pl	lodgepole pine	NA	0.44				
2015	S-1	S-1_3	104	Sxw	hybrid white spruce	NA	0.31				
2015	S-1	S-1_3	105	Pl	lodgepole pine	16.4	6.51				
2015	S-1	S-1_3	106	Pl	lodgepole pine	12.8	5.97				
2015	S-1	S-1_3	107	Pl	lodgepole pine	11.8	9.27				
2015	S-1	S-1_3	108	Pl	lodgepole pine	NA	0.66				
2015	S-1	S-1_3	109	Pl	lodgepole pine	10.2	4.84				
2015	S-1	S-1_3	110	Pl	lodgepole pine	NA	0.44				
2015	S-1	S-1_3	111	Pl	lodgepole pine	9.7	7.22				
2015	S-1	S-1_3	112	Pl	lodgepole pine	5	6.17				
2015	S-1	S-1_3	113	Pl	lodgepole pine	2.8	3.17				
2015	S-1	S-1_3	114	Pl	lodgepole pine	12.7	8.81				
2015	S-1	S-1_3	115	Pl	lodgepole pine	10	9.31				
2015	S-1	S-1_3	116	Pl	lodgepole pine	13.4	9.67				
2015	S-1	S-1_3	117	Pl	lodgepole pine	25.4	12.76	Y	28	cored_BH	18.6008
2015	S-1	S-1_3	118	Pl	lodgepole pine	NA	0.77				
2015	S-1	S-1_3	119	Pl	lodgepole pine	0.5	1.56				
2015	S-1	S-1_3	120	Pl	lodgepole pine	1.8	2.46				
2015	S-1	S-1_3	121	Pl	lodgepole pine	NA	0.69				
2015	S-1	S-1_3	122	Pl	lodgepole pine	NA	0.83				
2015	S-1	S-1_3	123	Pl	lodgepole pine	3.7	6.17				
2015	S-1	S-1_3	124	Pl	lodgepole pine	7.2	7.72				
2015	S-1	S-1_3	125	Pl	lodgepole pine	NA	1.18				
2015	S-1	S-1_3	126	Pl	lodgepole pine	0.5	1.59				
2015	S-1	S-1_3	127	Pl	lodgepole pine	0.5	1.35				
2015	S-1	S-1_3	495	Pl	lodgepole pine	NA	0.86				
2015	S-1	S-1_3	496	Pl	lodgepole pine	0.5	1.6				
2015	S-1	S-1_3	497	Pl	lodgepole pine	NA	0.37				
2015	S-1	S-1_3	498	Pl	lodgepole pine	10.8	8.17				
2015	S-1	S-1_3	499	Pl	lodgepole pine	NA	0.77				
2015	S-1	S-1_3	500	Pl	lodgepole pine	11	9.41				
2015	S-1	S-1_4	128	Pl	lodgepole pine	5.7	4.02				
2015	S-1	S-1_4	129	Pl	lodgepole pine	8	6				
2015	S-1	S-1_4	130	Pl	lodgepole pine	5.7	6.34				
2015	S-1	S-1_4	131	Pl	lodgepole pine	6.7	5.54				
2015	S-1	S-1_4	132	Pl	lodgepole pine	6.8	6.2				
2015	S-1	S-1_4	133	Pl	lodgepole pine	6.3	4.52				
2015	S-1	S-1_4	134	Pl	lodgepole pine	8.6	5.55				
2015	S-1	S-1_4	135	Pl	lodgepole pine	5.1	4.82				
2015	S-1	S-1_4	136	Pl	lodgepole pine	4.3	3.8				
2015	S-1	S-1_4	137	Pl	lodgepole pine	5.5	4.37				
2015	S-1	S-1_4	138	Pl	lodgepole pine	4.6	3.55				

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2015	S-1	S-1_4	139	Pl	lodgepole pine	3.2	2.57				
2015	S-1	S-1_4	140	Pl	lodgepole pine	NA	0.71				
2015	S-1	S-1_4	141	Pl	lodgepole pine	9.7	7.14				
2015	S-1	S-1_4	142	Pl	lodgepole pine	NA	0.64				
2015	S-1	S-1_4	143	Pl	lodgepole pine	8.8	7.05	Y	16	cored_BH	16.1891
2015	S-1	S-1_4	144	Pl	lodgepole pine	4.3	4.23				
2015	S-1	S-1_4	145	Pl	lodgepole pine	NA	0.3				
2015	S-1	S-1_4	146	Pl	lodgepole pine	4.2	3.82				
2015	S-1	S-1_4	147	Pl	lodgepole pine	6.9	5.83				
2015	S-1w	S-1w_w	None	None	NA	NA					
2015	S-3	S-3_1	1	Fd	douglas fir	NA	0.35				
2015	S-3	S-3_1	196	Fd	douglas fir	NA	0.38				
2015	S-3	S-3_1	197	Fd	douglas fir	NA	0.32				
2015	S-3	S-3_1	198	Fd	douglas fir	NA	0.54				
2015	S-3	S-3_1	199	Fd	douglas fir	0.5	1.76				
2015	S-3	S-3_1	200	Fd	douglas fir	NA	0.72				
2015	S-3	S-3_2	2	Fd	douglas fir	NA	0.83				
2015	S-3	S-3_2	3	Pl	lodgepole pine	8.3	4.66	Y	8	cored_BH	18.7984
2015	S-3	S-3_2	4	Fd	douglas fir	NA	0.87				
2015	S-3	S-3_2	5	Pl	lodgepole pine	3	2.63				
2015	S-3	S-3_2	6	Pl	lodgepole pine	2.7	2.56				
2015	S-3	S-3_2	7	Pl	lodgepole pine	5.5	3.88				
2015	S-3	S-3_2	8	Pl	lodgepole pine	7.4	5.05				
2015	S-3	S-3_2	9	Pl	lodgepole pine	9.3	4.39				
2015	S-3	S-3_2	10	Fd	douglas fir	1.5	2.11				
2015	S-3	S-3_2	11	Pl	lodgepole pine	4.5	3.91				
2015	S-3	S-3_2	12	Fd	douglas fir	0.5	1.33				
2015	S-3	S-3_2	13	Pl	lodgepole pine	7.5	4.67				
2015	S-3	S-3_2	14	Pl	lodgepole pine	5.7	3.7				
2015	S-3	S-3_2	15	Fd	douglas fir	NA	0.55				
2015	S-3	S-3_2	16	Pl	lodgepole pine	5.7	4.17				
2015	S-5	S-5_1	219	Fd	douglas fir	5.7	4.72				
2015	S-5	S-5_1	220	Fd	douglas fir	5.3	4.61				
2015	S-5	S-5_1	221	Fd	douglas fir	5.6	3.59				
2015	S-5	S-5_1	222	Fd	douglas fir	4.4	4.46				
2015	S-5	S-5_1	223	Fd	douglas fir	4	3.46				
2015	S-5	S-5_1	224	Fd	douglas fir	10.9	5.85	Y	10	cored_BH	21.0773
2015	S-5	S-5_1	225	Fd	douglas fir	8	5.28				
2015	S-5	S-5_1	226	Fd	douglas fir	5.1	4.73				
2015	S-5	S-5_1	227	Fd	douglas fir	4.2	3.8				
2015	S-5	S-5_1	228	Fd	douglas fir	9.2	5.64				
2015	S-5	S-5_2	None	None	NA	NA					
2015	S-5	S-5_3	387	Fd	douglas fir	NA	0.54				
2015	S-5	S-5_3	388	Fd	douglas fir	NA	0.31				
2015	S-5	S-5_4	386	Fd	douglas fir	NA	0.34				
2015	T-3	T-3_5	17	Fd	douglas fir	NA	0.77				
2015	T-3	T-3_5	18	Fd	douglas fir	NA	0.33				
2015	T-3	T-3_5	19	Fd	douglas fir	NA	0.34				
2015	T-3	T-3_5	20	Fd	douglas fir	NA	0.69				
2015	T-3	T-3_5	21	Fd	douglas fir	NA	0.78				
2015	T-3	T-3_5	22	Fd	douglas fir	NA	0.54				
2015	T-3	T-3_5	23	Fd	douglas fir	NA	0.51				
2015	T-3	T-3_10	24	Fd	douglas fir	NA	0.37				
2015	T-3	T-3_10	25	Fd	douglas fir	NA	0.62				
2015	T-3	T-3_10	26	Fd	douglas fir	NA	0.61				
2015	T-3	T-3_15	27	Fd	douglas fir	NA	0.5				

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2015	T-3	T-3_15	28	Fd	douglas fir	NA	0.54				
2015	T-3	T-3_15	29	Fd	douglas fir	NA	0.5				
2015	T-3	T-3_16	None	None	NA	NA					
2015	T-3	T-3_17	294	Fd	douglas fir	NA	0.45				
2015	T-3	T-3_17	295	Fd	douglas fir	NA	0.56				
2015	T-3	T-3_17	296	Fd	douglas fir	NA	0.42				
2015	T-3	T-3_17	297	Fd	douglas fir	NA	0.56				
2015	T-3	T-3_17	298	Fd	douglas fir	NA	0.72				
2015	T-3	T-3_17	299	Fd	douglas fir	NA	0.61				
2015	T-3	T-3_17	401	Fd	douglas fir	NA	0.56				
2015	T-3	T-3_17	402	Fd	douglas fir	NA	0.61				
2015	T-3	T-3_17	403	Fd	douglas fir	NA	0.48				
2015	T-3	T-3_17	404	Fd	douglas fir	NA	0.41				
2015	T-3	T-3_17	405	Fd	douglas fir	NA	0.41				
2015	T-3	T-3_17	406	Fd	douglas fir	NA	0.56				
2015	T-3	T-3_17	407	Fd	douglas fir	NA	0.67				
2015	T-3	T-3_17	408	Fd	douglas fir	NA	0.63				
2015	T-3	T-3_17	409	Fd	douglas fir	NA	0.6				
2015	T-3	T-3_17	410	Fd	douglas fir	NA	0.45				
2015	T-3	T-3_17	411	Fd	douglas fir	NA	0.3				
2015	T-3	T-3_17	412	Fd	douglas fir	NA	0.39				
2015	T-3	T-3_17	413	Fd	douglas fir	NA	0.47				
2015	T-3	T-3_17	414	Fd	douglas fir	NA	0.49				
2015	T-3	T-3_17	415	Fd	douglas fir	NA	0.37				
2015	T-3	T-3_17	416	Fd	douglas fir	NA	0.5				
2015	T-3	T-3_17	233	Fd	douglas fir	NA	0.44				
2015	T-3	T-3_18	234	Fd	douglas fir	NA	0.59				
2015	T-3	T-3_18	235	Fd	douglas fir	NA	0.54				
2015	T-3	T-3_18	236	Fd	douglas fir	NA	0.55				
2015	T-3	T-3_18	237	Fd	douglas fir	NA	0.7				
2015	T-3	T-3_18	238	Fd	douglas fir	NA	0.31				
2015	T-3	T-3_18	239	Fd	douglas fir	NA	0.38				
2015	T-3	T-3_18	240	Fd	douglas fir	NA	0.44				
2015	T-3	T-3_18	241	Fd	douglas fir	NA	0.83				
2015	T-3	T-3_18	242	Fd	douglas fir	NA	0.32				
2015	T-3	T-3_18	243	Fd	douglas fir	NA	0.77				
2015	T-3	T-3_18	244	Fd	douglas fir	NA	0.42				
2015	T-3	T-3_19	250	Fd	douglas fir	NA	0.68				
2015	T-3	T-3_19	251	Fd	douglas fir	NA	0.93				
2015	T-3	T-3_19	252	Fd	douglas fir	NA	0.9				
2015	T-3	T-3_19	253	Fd	douglas fir	NA	0.53				
2015	T-3	T-3_19	254	Fd	douglas fir	NA	0.83				
2015	T-3	T-3_19	255	Fd	douglas fir	NA	0.8				
2015	T-3	T-3_19	256	Pl	lodgepole pine	NA	0.37				
2015	T-3	T-3_21	257	Fd	douglas fir	NA	0.35				
2015	T-3	T-3_21	258	Fd	douglas fir	NA	0.35				
2015	T-3	T-3_21	259	Fd	douglas fir	NA	0.32				
2015	T-3	T-3_21	260	Fd	douglas fir	NA	0.3				
2015	T-3	T-3_21	261	Fd	douglas fir	NA	0.45				
2015	T-3	T-3_21	262	Fd	douglas fir	NA	0.72				
2015	T-3	T-3_21	263	Fd	douglas fir	NA	0.43				
2015	T-3	T-3_22	264	Fd	douglas fir	NA	0.58				
2015	T-3	T-3_22	265	Fd	douglas fir	NA	0.33				
2015	T-3	T-3_22	266	Fd	douglas fir	NA	0.59				
2015	T-3	T-3_22	267	Fd	douglas fir	NA	0.57				
2015	T-3	T-3_22	268	Fd	douglas fir	NA	0.66				

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2015	T-3	T-3_22	269	Fd	douglas fir	NA	0.47				
2015	T-3	T-3_22	270	Fd	douglas fir	NA	0.59				
2015	T-3	T-3_22	271	Fd	douglas fir	NA	0.41				
2015	T-3	T-3_23	272	Fd	douglas fir	NA	0.43				
2015	T-3	T-3_23	273	Fd	douglas fir	NA	0.32				
2015	T-3	T-3_23	274	Fd	douglas fir	NA	0.45				
2015	T-3	T-3_23	275	Fd	douglas fir	NA	0.34				
2015	T-3	T-3_23	276	Fd	douglas fir	NA	0.59				
2015	T-3	T-3_23	277	Fd	douglas fir	NA	0.5				
2015	T-3	T-3_23	278	Fd	douglas fir	NA	0.42				
2015	T-3	T-3_23	279	Fd	douglas fir	NA	0.37				
2015	T-3	T-3_23	280	Fd	douglas fir	NA	0.33				
2015	T-3	T-3_23	281	Fd	douglas fir	NA	0.49				
2015	T-3	T-3_23	282	Fd	douglas fir	NA	0.35				
2015	T-3	T-3_24	245	Fd	douglas fir	NA	0.51				
2015	T-3	T-3_24	246	Fd	douglas fir	NA	0.45				
2015	T-3	T-3_24	247	Fd	douglas fir	NA	0.63				
2015	T-3	T-3_24	248	Fd	douglas fir	NA	0.3				
2015	T-3	T-3_24	249	Fd	douglas fir	NA	0.57				
2015	T-3	T-3_24	286	Fd	douglas fir	NA	0.41				
2015	T-3	T-3_25	287	Pl	lodgepole pine	NA	0.36				
2015	T-3	T-3_25	288	Fd	douglas fir	NA	0.34				
2015	T-3	T-3_25	289	Fd	douglas fir	NA	0.57				
2015	T-3	T-3_25	290	Fd	douglas fir	NA	0.39				
2015	T-3	T-3_25	291	Fd	douglas fir	NA	0.34				
2015	T-3	T-3_25	292	Fd	douglas fir	NA	0.32				
2015	T-3	T-3_25	293	Fd	douglas fir	NA	0.38				
2015	T-3	T-3_26	283	Fd	douglas fir	NA	0.4				
2015	T-3	T-3_26	284	Fd	douglas fir	NA	0.3				
2015	T-3	T-3_26	285	Fd	douglas fir	NA	0.58				
2015	T-3	T-3_19	300	Fd	douglas fir	NA	0.69				
2015	T-3	T-3_20	None	None	NA	NA					
2013	F-1	F-1_1	8	Fd	douglas fir	NA	1.21				
2013	F-1	F-1_1	11	Fd	douglas fir	NA	0.45				
2013	F-1	F-1_1	12	Fd	douglas fir	NA	0.43				
2013	F-1	F-1_1	13	Fd	douglas fir	NA	0.33				
2013	F-1	F-1_1	14	Fd	douglas fir	NA	1.28				
2013	F-1	F-1_1	15	Fd	douglas fir	NA	0.31				
2013	F-1	F-1_1	26	Fd	douglas fir	NA	0.81				
2013	F-1	F-1_1	27	Fd	douglas fir	NA	1.23				
2013	F-1	F-1_2	3	Fd	douglas fir	NA	0.97				
2013	F-1	F-1_2	4	Fd	douglas fir	NA	0.75				
2013	F-1	F-1_2	5	Fd	douglas fir	NA	0.61				
2013	F-1	F-1_3	6	Fd	douglas fir	NA	0.38				
2013	F-4	F-4_2	38	Pl	lodgepole pine	NA	0.54				
2014	G-2	G-2_2	119	Fd	douglas fir	NA	0.34				
2014	G-2	G-2_4	120	Fd	douglas fir	NA	0.23				
2014	G-2	G-2_4	121	Fd	douglas fir	NA	0.42				
2014	G-2	G-2_4	122	Fd	douglas fir	NA	0.48				
2014	G-2	G-2_4	123	Fd	douglas fir	NA	0.3				
2014	G-2	G-2_4	124	Fd	douglas fir	NA	0.36				
2014	G-2	G-2_4	125	Fd	douglas fir	NA	0.8				
2014	G-2	G-2_4	126	Fd	douglas fir	NA	0.55				
2014	G-2	G-2_4	127	Fd	douglas fir	NA	0.43				
2014	G-2	G-2_4	128	Fd	douglas fir	NA	0.71				
2014	G-2	G-2_4	129	Fd	douglas fir	NA	0.32				

Year	Site	PSP	Tag#	Species code	Common name	DBH _cm	Ht_m	SI?	SI_age	SI_age_method	SI_GYPSY
2013	G-2	G-2_5	16	Fd	douglas fir	NA	0.52				
2014	REF-10	REF-10_1	913	Pl	lodgepole pine	NA	0.96				
2014	REF-11	REF-11_1	919	Bl	subalpine fir	NA	0.85				
2014	REF-11	REF-11_1	921	Bl	subalpine fir hybrid hybrid	NA	1.07				
2014	REF-11	REF-11_1	926	Sxw	white spruce	NA	0.77				
2014	REF-11	REF-11_1	930	Bl	subalpine fir	NA	0.67				
2014	REF-11	REF-11_1	931	Bl	subalpine fir	NA	0.36				
2014	REF-11	REF-11_1	932	Bl	subalpine fir	NA	0.34				
2014	REF-11	REF-11_1	933	Bl	subalpine fir	NA	0.8				
2014	REF-11	REF-11_1	936	Bl	subalpine fir	NA	0.94				
2014	REF-12	REF-12_1	953	Bl	subalpine fir	NA	0.36				
2013	REF-2	REF-2_1	48	Pl	lodgepole pine	NA	1.23				
2013	REF-2	REF-2_1	49	Pl	lodgepole pine	<1	0.9				
2013	REF-2	REF-2_1	50	Pl	lodgepole pine	<1	0.88				
2014	REF-2	REF-2_2	965	Pl	lodgepole pine	NA	0.44				
2014	REF-2	REF-2_2	966	Pl	lodgepole pine	NA	1				
2013	REF-3	REF-3_1	68	Sxw	hybrid hybrid white spruce	NA	0.5				
2013	REF-3	REF-3_1	69	Sxw	hybrid hybrid white spruce	NA	0.58				
2013	REF-3	REF-3_1	70	Sxw	hybrid hybrid white spruce	NA	0.91				
2013	REF-3	REF-3_1	71	Pl	lodgepole pine	NA	0.47				
2013	REF-3	REF-3_1	72	Sxw	hybrid hybrid white spruce	NA	0.75				
2013	REF-3	REF-3_1	74	Pl	lodgepole pine	NA	0.41				
2013	REF-3	REF-3_1	75	Pl	lodgepole pine	NA	0.41				
2013	REF-3	REF-3_1	76	Sxw	hybrid hybrid white spruce	NA	0.57				
2013	REF-3	REF-3_1	77	Pl	lodgepole pine	NA	0.34				
2013	REF-3	REF-3_1	78	Sxw	hybrid hybrid white spruce	NA	0.47				
2013	REF-3	REF-3_1	79	Pl	lodgepole pine	NA	0.53				
2013	REF-3	REF-3_1	80	Pl	lodgepole pine	NA	0.39				
2013	REF-3	REF-3_1	81	Pl	lodgepole pine	NA	0.34				
2013	REF-3	REF-3_1	83	Pl	lodgepole pine	NA	0.34				
2013	REF-3	REF-3_1	85	Sxw	hybrid hybrid white spruce	NA	1.29				
2013	REF-3	REF-3_1	86	Pl	lodgepole pine	NA	0.37				
2013	REF-3	REF-3_1	87	Pl	lodgepole pine	NA	0.41				
2013	REF-3	REF-3_1	88	Pl	lodgepole pine	NA	0.39				
2013	REF-3	REF-3_1	89	Sxw	hybrid hybrid white spruce	NA	0.79				
2014	REF-5	REF-5_1	760	Bl	subalpine fir	NA	0.49				
2014	REF-5	REF-5_1	764	Bl	subalpine fir	NA	1.05				
2014	REF-5	REF-5_1	765	Bl	subalpine fir	NA	0.75				
2014	REF-5	REF-5_1	769	Bl	subalpine fir	NA	0.63				
2014	REF-5	REF-5_1	772	Bl	subalpine fir	NA	0.68				
2014	REF-5	REF-5_1	773	Bl	subalpine fir	NA	1				
2014	REF-5	REF-5_1	774	Bl	subalpine fir	NA	0.45				
2014	REF-5	REF-5_1	775	Bl	subalpine fir	NA	0.38				
2014	REF-5	REF-5_1	786	Bl	subalpine fir	NA	0.48				
2014	REF-5	REF-5_1	787	Bl	subalpine fir	NA	0.35				
2014	REF-5	REF-5_1	788	Bl	subalpine fir	NA	0.31				
2014	REF-6	REF-6_1	796	Bl	subalpine fir	NA	0.9				

Year	Site	PSP	Tag#	Species code	Common name	DBH _cm	Ht_m	SI?	SI_age	SI_age_method	SI_GY PSY
2014	REF-8	REF-8_1	860	Sxw	hybrid hybrid white spruce	NA	0.8				
2014	REF-8	REF-8_1	868	Sxw	hybrid hybrid white spruce	NA	0.44				
2014	REF-8	REF-8_1	869	Sxw	hybrid hybrid white spruce	NA	0.3				
2014	REF-8	REF-8_1	870	Sxw	hybrid hybrid white spruce	NA	0.6				
2014	REF-8	REF-8_1	872	Sxw	hybrid hybrid white spruce	NA	0.82				
2014	REF-8	REF-8_1	873	Sxw	hybrid hybrid white spruce	NA	1.01				
2014	REF-8	REF-8_1	875	Sxw	hybrid hybrid white spruce	NA	0.42				
2014	REF-8	REF-8_1	876	Sxw	hybrid hybrid white spruce	NA	0.66				
2014	REF-8	REF-8_1	883	Sxw	hybrid hybrid white spruce	NA	0.84				
2014	REF-8	REF-8_1	884	Sxw	hybrid hybrid white spruce	NA	0.71				
2014	REF-8	REF-8_1	885	Sxw	hybrid hybrid white spruce	NA	0.67				
2014	REF-8	REF-8_1	886	Sxw	hybrid hybrid white spruce	NA	0.68				
2014	REF-8	REF-8_1	887	Sxw	hybrid hybrid white spruce	NA	0.35				
2014	REF-8	REF-8_1	888	Sxw	hybrid hybrid white spruce	NA	0.69				
2014	REF-8	REF-8_1	892	Sxw	hybrid hybrid white spruce	NA	0.3				
2014	REF-8	REF-8_1	894	Sxw	hybrid hybrid white spruce	NA	0.36				
2014	REF-8	REF-8_1	895	Sxw	hybrid hybrid white spruce	NA	0.65				
2014	REF-8	REF-8_1	896	Sxw	hybrid hybrid white spruce	NA	0.34				
2014	REF-8	REF-8_1	897	Sxw	hybrid hybrid white spruce	NA	0.51				
2014	REF-8	REF-8_1	899	Sxw	hybrid hybrid white spruce	NA	0.33				
2014	REF-8	REF-8_1	900	Sxw	hybrid hybrid white spruce	NA	0.57				
2014	REF-9	REF-9_1	908	Pl	lodgepole pine	NA	0.69				
2014	REF-9	REF-9_1	909	Pl	lodgepole pine	NA	0.4				
2014	REF-9	REF-9_1	910	Sxw	hybrid hybrid white spruce	NA	0.91				
2013	S-2	S-2_2	95	Fd	douglas fir	NA	0.36				
2013	S-2	S-2_2	96	Fd	douglas fir	NA	0.33				
2013	S-2	S-2_2	97	Fd	douglas fir	NA	0.44				
2013	S-2	S-2_2	98	Fd	douglas fir	NA	0.4				
2013	S-2	S-2_2	99	Fd	douglas fir	NA	0.37				
2013	S-2	S-2_2	100	Fd	douglas fir	NA	0.33				
2014	S-2	S-2_3	112	Fd	douglas fir	NA	0.36				
2014	S-2	S-2_3	113	Fd	douglas fir	NA	0.33				
2014	S-2	S-2_5	114	Fd	douglas fir	NA	0.33				
2014	S-2	S-2_5	115	Fd	douglas fir	NA	0.4				
2014	S-2	S-2_5	116	Fd	douglas fir	NA	0.44				
2013	S-2	S-2_6	94	Fd	douglas fir	NA	0.4				
2014	T-2	T-2_4	117	Fd	douglas fir	NA	0.74				

Year	Site	PSP	Tag#	Species code	Common name	DBH _cm	Ht_m	SI?	SI_age	SI_age_method	SI_GYPSY
2014	T-2	T-2_4	118	Fd	douglas fir	NA	0.41				

APPENDIX G – CCME SOIL REFERENCE VALUES (2013-2014 DATA)

	Soil Quality Guidelines for the Protection of Environmental and Human Health																			
	Guideline	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (total)	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Tin	Uranium	Vanadium	Zinc
	Agricultural (mg/kg dw)	20	12	750	4	1.4	64	40	63	70	6.6	5	50	1	20	1	5	23	130	200
	Residential/ parkland (mg/kg dw)	20	12	500	4	10	64	50	63	140	6.6	10	50	1	20	1	50	23	130	200
	Commercial (mg/kg dw)	40	12	2000	8	22	87	300	91	260	24	40	50	2.9	40	1	300	33	130	360
	Industrial (mg/kg dw)	40	12	2000	8	22	87	300	91	600	50	40	50	2.9	40	1	300	300	130	360
PSP	LAYER	Total Antimony (Sb) (mg/kg)	Total Arsenic (As) (mg/kg)	Total Barium (Ba) (mg/kg)	Total Beryllium (Be) (mg/kg)	Total Cadmium (Cd) (mg/kg)	Total Chromium (Cr) (mg/kg)	Total Cobalt (Co) (mg/kg)	Total Copper (Cu) (mg/kg)	Total Lead (Pb) (mg/kg)	Total Mercury (Hg) (mg/kg)	Total Molybdenum (Mo) (mg/kg)	Nickel (Ni) (mg/kg)	Total Selenium (Se) (mg/kg)	Total Silver (Ag) (mg/kg)	Total Thallium (Tl) (mg/kg)	Tin (Sn) (mg/kg)	Total Uranium (U) (mg/kg)	Total Vanadium (V) (mg/kg)	Zinc (Zn) (mg/kg)
F-1_1	TS	0.1	1.09	42	0.46	0.158	2.5	3.24	25.9	1.36	0.05	79.4	2.47	0.5	0.05	0.171	1.15	0.958	28	21.1
F-1_2	TS	0.1	1.01	47.8	0.46	0.099	3.4	4.9	33.1	1.74	0.05	85	3.43	0.5	0.051	0.142	1.08	1.2	23.7	27.4
F-1_3	TS	0.1	0.5	39.9	0.45	0.091	4.3	4.3	39.4	1.2	0.05	70.6	3.57	0.5	0.05	0.121	0.91	1.07	27.8	25.5
F-4_1	TS	0.11	1.46	51.5	0.87	0.591	3	5.13	29.7	2.33	0.05	357	2.58	0.5	0.075	0.264	1.75	1.12	27.7	17.9
F-4_2	TS	0.1	1.18	62.8	0.61	0.107	2.6	4.26	29.4	1.56	0.05	88	3.38	0.5	0.057	0.226	1.3	0.745	25.7	20.2
G-2_1	TS	0.1	1.12	46.8	0.49	0.175	2.8	3.91	25.2	1.46	0.05	93	2.6	0.5	0.05	0.19	1.31	1.1	26.2	20.8
G-2_3	TS	0.1	0.65	35.1	0.4	0.061	2	2.98	19.1	0.84	0.05	44	1.86	0.5	0.05	0.118	0.86	2.23	23	21.1
G-2_5	TS	0.1	0.62	46	0.4	0.177	2.5	3.47	26.1	1.05	0.05	158	2.03	0.5	0.05	0.201	1.15	1.21	23.7	21
R-1_1	TS	0.1	1.86	97.3	1.07	0.252	2	4.31	42	4	0.05	310	2.2	0.5	0.081	0.201	1.44	1.2	28.9	49.4
R-1_1	TS	0.1	1.86	97.3	1.07	0.252	2	4.31	42	4	0.05	310	2.2	0.5	0.081	0.201	1.44	1.2	28.9	49.4
R-2_1	TS	0.23	2.52	76.5	0.71	0.277	12.2	6.16	56.1	8.46	0.05	172	7.75	0.5	0.183	0.151	1.18	1.06	34.1	52.2
R-2_1	TS	0.23	2.52	76.5	0.71	0.277	12.2	6.16	56.1	8.46	0.05	172	7.75	0.5	0.183	0.151	1.18	1.06	34.1	52.2
R-2_2	TS	0.22	2.78	85.5	0.7	0.431	12.4	7.13	60.8	9.67	0.05	161	8.42	0.5	0.172	0.147	1.14	0.985	37.9	58.6
R-2_2	TS	0.22	2.78	85.5	0.7	0.431	12.4	7.13	60.8	9.67	0.05	161	8.42	0.5	0.172	0.147	1.14	0.985	37.9	58.6
REF-1_1	TS	0.1	1.08	25	0.4	0.065	7.3	2.12	5.06	4.53	0.05	54.3	2.61	0.5	0.05	0.05	0.57	0.386	21	30.7
REF-1_1o	F/H	0.11	0.5	107	0.4	0.263	3.7	1.85	18.7	9.05	0.158	680	2.35	0.75	0.112	0.12	0.61	0.434	10.4	72.1
REF-10_1	TS	0.2	0.9	52	0.2	0.07	8.3	2.9	6.9	6	<0.05	12.6	4.6	<0.5	<0.2	<0.1	0.6	0.4	29.1	87
REF-10_1	US	0.4	1.8	58	0.3	<0.04	8.2	3.4	8.7	5.6	<0.05	5.9	5.4	<0.5	<0.2	<0.1	0.4	0.5	28.3	39
REF-11_1	TS	0.2	0.5	35	0.2	0.04	5.2	2	5.9	3.5	<0.05	22.3	2.3	<0.5	<0.2	<0.1	0.6	0.4	19.7	55
REF-11_1	US	0.3	2.6	51	0.5	0.06	13.1	4.6	9	5	<0.05	10.3	9.5	<0.5	<0.2	<0.1	0.7	0.9	38.3	162
REF-12_1	TS	0.3	1.3	95	0.2	0.3	12.3	4.5	6.4	7.6	<0.05	4.5	8.6	<0.5	<0.2	<0.1	0.5	0.4	35.4	117
REF-12_1	US	0.3	2	58	0.3	0.07	12.4	4.3	8.5	9.4	<0.05	1.3	8	<0.5	<0.2	<0.1	0.4	0.5	36.9	58
REF-2_1	TS	0.14	1.43	47.5	0.4	0.05	13.5	4.3	7.51	4.86	0.05	35	8.06	0.5	0.109	0.05	0.73	0.466	47.8	43.4
REF-2_2	TS	0.2	1	56	0.2	<0.04	6.8	1.8	7.8	4.2	<0.05	75.6	3.1	<0.5	<0.2	<0.1	0.5	0.4	20.3	20
REF-2_2	US	0.1	1	40	0.2	<0.04	5.7	1.8	7.7	3.4	<0.05	28.6	3	<0.5	<0.2	<0.1	0.7	0.4	20.2	17
REF-3_1	TS	0.13	1.24	48.1	0.4	0.083	7.9	2.85	6.82	5.27	0.05	13	3.98	0.5	0.065	0.053	0.67	0.865	27.7	30.3
REF-3_1o	LFH	0.15	0.99	143	0.52	0.168	8.9	4.91	17.7	11.2	0.122	169	5.57	0.5	0.369	0.097	1.04	1.11	24.9	57.9
REF-4_1	TS	0.2	1.3	42	0.2	<0.04	7.2	2.1	4.6	4.4	<0.05	32.9	2.9	<0.5	<0.2	<0.1	0.8	0.4	30.3	63
REF-4_1	US	0.2	2	41	0.5	<0.04	7.8	4.6	8.8	5	<0.05	18.4	5.1	<0.5	<0.2	<0.1	0.9	0.7	36.7	62
REF-5_1	TS	0.1	1	38	0.2	<0.04	4.3	1.3	7.7	3.3	<0.05	53.2	1.5	<0.5	<0.2	<0.1	0.7	0.3	18.3	38
REF-5_1	US	0.1	1.7	16	0.3	<0.04	3	0.9	12.5	2.4	<0.05	14.3	1.4	<0.5	<0.2	<0.1	0.6	0.5	14.5	36
REF-6_1	TS	0.3	2.8	81	0.4	0.11	15	4.8	10.8	10.5	<0.05	8.7	11.4	<0.5	<0.2	<0.1	0.6	0.6	39.2	103
REF-6_1	TS	0.3	2.8	81	0.4	0.11	15	4.8	10.8	10.5	<0.05	8.7	11.4	<0.5	<0.2	<0.1	0.6	0.6	39.2	103
REF-6_1	TS	0.3	2.8	81	0.4	0.11	15	4.8	10.8	10.5	<0.05	8.7	11.4	<0.5	<0.2	<0.1	0.6	0.6	39.2	103
REF-6_1	US	0.4	2.6	82	0.3	0.07	15.4	5	10	9.6	<0.05	2.7	10.8	<0.5	<0.2	<0.1	0.4	0.5	40.2	61
REF-7_1	TS	0.8	4	97	0.5	0.14	16.8	7.4	20.3	12	<0.05	6.5	15.4	<0.5	<0.2	<0.1	0.7	0.6	43.7	66
REF-7_1	US	0.7	4	101	0.4	0.09	18.2	7.2	16.3	12.4	<0.05	2.2	14.6	<0.5	<0.2	<0.1	0.4	0.7	46.3	58
REF-8_1	TS	0.3	3.5	125	0.4	<0.04	21.4	7.6	10.9	8.2	<0.05	9.2	15.2	<0.5	<0.2	<0.1	0.5	0.6	57.7	63
REF-8_1	US	0.3	3.7	80	0.3	<0.04	14.8	5.3	10	5.7	<0.05	4.4	9.6	<0.5	<0.2	<0.1	0.4	0.8	41.8	33
REF-9_1	TS	<0.1	<0.4	48	<0.1	<0.04	5.4	4.7	5.1	3	<0.05	14.3	2.4	<0.5	<0.2	<0.1	0.6	0.4	18.8	38
REF-9_1	US	0.1	1.1	44	0.3	<0.04	8.2	3.2	5.9	3.4	<0.05	4.5	5.3	<0.5	<0.2	<0.1	0.5	0.6	32.8	50
S-2_2	TS	0.13	1.49	37.5	0.4	0.142	9	3.42	10.8	3.33	0.05	16.8	6.3	0.5	0.05	0.05	0.32	0.734	27	24.5
S-2_2	TS	0.13	1.49	37.5	0.4	0.142	9	3.42	10.8	3.33	0.05	16.8	6.3	0.5	0.05	0.05	0.32	0.734	27	24.5
S-2_4	TS	0.1	1.84	56.8	0.6	0.157	5.1	4.02	39.9	3.21	0.05	97.9	3.39	0.5	0.05	0.206	1.33	1	30.3	31.5
S-2_4	TS	0.1	1.84	56.8	0.6	0.157	5.1	4.02	39.9	3.21	0.05	97.9	3.39	0.5	0.05	0.206	1.33	1	30.3	31.5
S-2_6	TS	0.15	3.14	65.1	0.72	0.125	7.3	4.79	54	6.09	0.05	64.6	5.53	0.5	0.061	0.226	1.36	1.38	39.3	49.6
S-2_6	TS	0.15	3.14	65.1	0.72	0.125	7.3	4.79	54	6.09	0.05	64.6	5.53	0.5	0.061	0.226	1.36	1.38	39.3	49.6
S-4_1	TS	0.1	0.86	75	1.37	0.176	4.3	4.75	24.7	2.84	0.05	101	2.65	0.5	0.05	0.22	1.25	1.11	30.9	43.2
S-4_1	TS	0.1	0.86	75	1.37	0.176	4.3	4.75	24.7	2.84	0.05	101	2.65	0.5	0.05	0.22	1.25	1.11	30.9	43.2
S-4_2	TS	0.1	1.28	47.9	1.18	0.3	7.7	3.54	23.4	5.62	0.05	95.1	2.13	0.5	0.05	0.113	1.67	0.907	28.3	47.2
S-4_2	TS	0.1	1.28	47.9	1.18	0.3	7.7	3.54	23.4	5.62	0.05	95.1	2.13	0.5	0.05	0.113	1.67	0.907	28.3	47.2
S-6_1	TS	0.1	0.61	53.9	0.42	0.131	3.8	3.36	21.6	2.79	0.05	59.6	3.19	0.5	0.05	0.149	0.95	0.854	24.5	27
S-6_1	TS	0.1	0.61	53.9	0.42	0.131	3.8	3.36	21.6	2.79	0.05	59.6	3.19	0.5	0.05	0.149	0.95	0.854	24.5	27
S-6_2	TS	0.12	1.57	56.9	0.44	0.172	6	4.12	22.3	3.52	0.05	94	4.28	0.5	0.067	0.135	0.99	1.03	33.6	32.5
S-6_2	TS	0.12	1.57	56.9	0.44	0.172	6	4.12	22.3	3.52	0.05	94	4.28	0.5	0.067	0.135	0.99	1.03	33.6	32.5
S-6_3	TS	0.4	2.73	68.7	0.42	0.198	12.8	5.25	14.9	10	0.05	18.8	8.61	0.5	0.097	0.065	0.89	0.794	43.2	55.2
S-6_3	TS	0.4	2.73	68.7	0.42	0.198	12.8	5.25	14.9	10	0.05	18.8	8.61	0.5	0.097	0.065	0.89	0.794	43.2	55.2
T-2_1	TS	1.42	2.31	85.3	0.46	0.312	11.1	4.25	31.8	27.3	0.05	278	6.33	0.5	0.148	0.083	1.95	0.604	33.5	88.3
T-2_1	TS	1.42	2.31	85.3	0.46	0.312	11.1	4.25	31.8	27.3	0.05	278	6.33	0.5	0.148	0.083	1.95	0.604	33.5	88.3
T-2_3	TS	0.17	2.26	53.2	0.5	0.149	9.9	4.54	22	6.05	0.05	134	6.17	0.5	0.111	0.089	0.93	0.638	34.8	47.5
T-2_3	TS	0.17	2.26	53.2	0.5	0.149	9.9	4.54	22	6.05	0.05	134	6.17	0.5	0.111	0.089	0.93	0.638	34.8	47.5
T-2_5	TS	1.98	3.12	56.9	0.42	0.215	9.9	4.61	35	74.2	0.05	178	6.46	0.5	0.124	0.099	1.82	0.693	32.7	77.3
T-2_5	TS	1.98	3.12	56.9	0.42	0.215	9.9	4.61	35	74.2	0.05	178	6.46	0.5	0.124	0.099	1.82	0.693	32.7	77.3

Count of Endako soil samples colleted by IEG Ltd. in 2013 exceeding Soil Quality Guidelines for the Protection of Environmental and Human Health (zero).

Count of 2013 Endako samples greater than CCME limit

Chemical Name	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (total)	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Tin	Uranium	Vanadium	Zinc
Agricultural	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Residential/ parkland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX H - SITE PHOTO CHRONOSEQUENCE

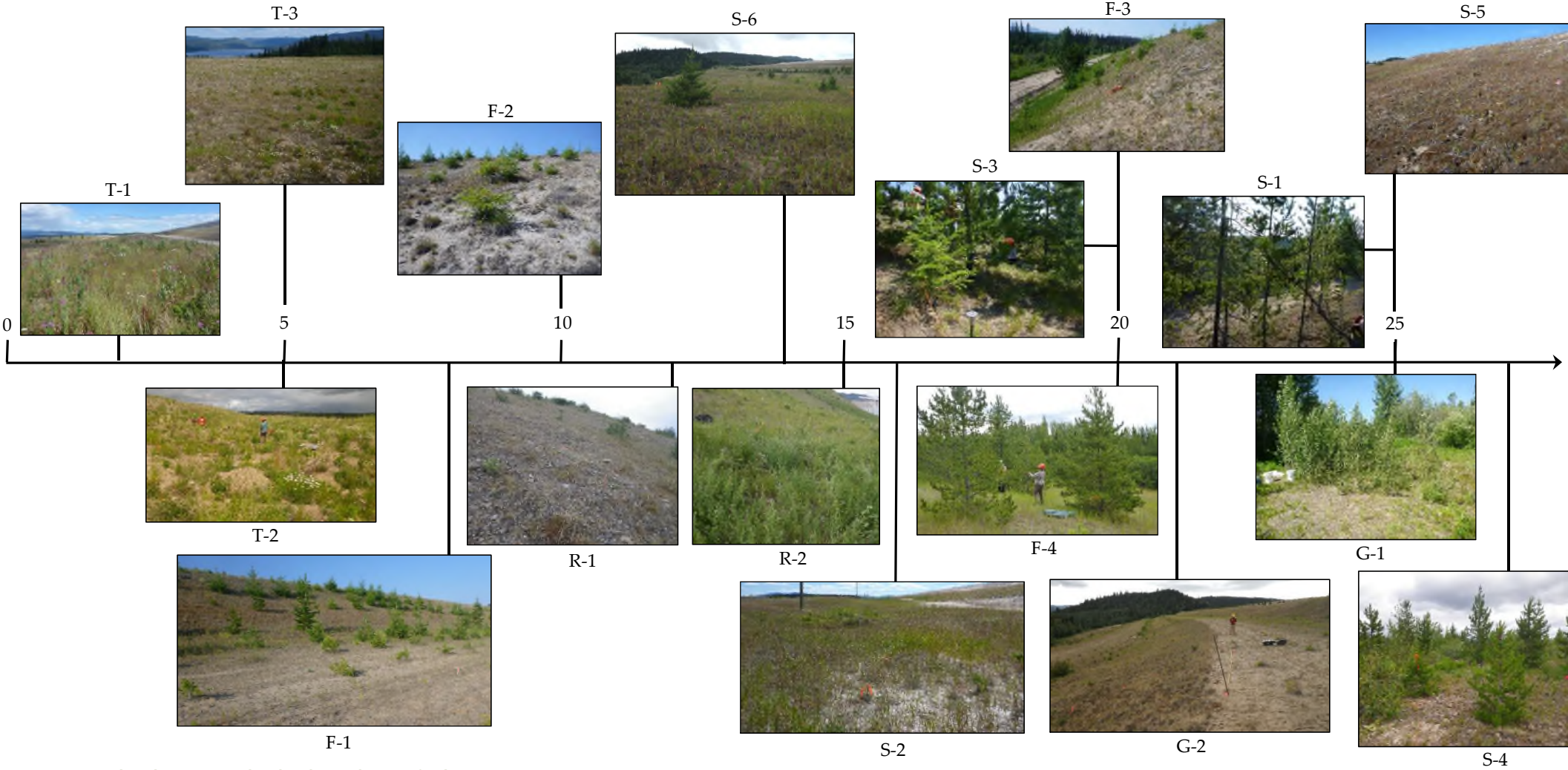


Figure A-2. Site photo chronosequence, based on the sampling age of each site.

Appendix 2

Statement of Author's Qualifications

I, Michael Pond, P.Geo. do hereby certify that:

1. I am currently employed as Regional Exploration Geologist by:

   Thompson Creek Mining Ltd.
   177 Victoria Street
   Suite 100
   Prince George, BC V2L5R8

2. I graduated from the University of British Columbia with a Bachelors of Science, Geology in 1982.

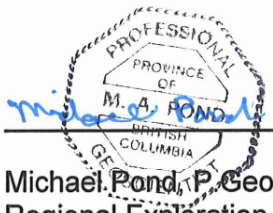
3. I graduated from the British Columbia Institute of Technology with a Diploma of Technology, CAD/CAM in 1986.

4. I am a Registered Professional Geologist with the Association of Professional Engineers and Geoscientists of BC.
   Registration # 18735

5. I have worked as a Geologist for a total of 28 years since my graduation from university.

6. I am not aware of any material fact or material change with respect to the subject matter of the Technical Report that is not reflected in the Technical Report, the omission to disclose which makes the Technical Report misleading.

Respectfully submitted,



Michael Pond, P.Geo.
Regional Exploration Geologist
Thompson Creek Metals Company
April 12, 2016

Appendix 3

Tenure Information

All 26 Endako Mineral Leases are in good standing to September 2016 or beyond.

All 33 Endako Mineral Claims are in good standing to October 2016 or beyond.

Print and Close Cancel

Mineral Titles Online Viewer

Search criteria:

Criteria	Owner	Title Type	Title Status
	140102	M	GOOD

Click here to go back to the previous page
Click here to go back to the titles search page.

Search results: Download to Excel (all results)

Total 59 titles are found.

Title Number	Claim Name	Owner	Title Type	Title Sub Type	Map Number	Issue Date	Good To Date	Status	Area (ha)
243448		140102 100%	Mineral	Lease	093K005	1977/may/06	2017/may/06	GOOD	164.53
243450		140102 100%	Mineral	Lease	093K005	1979/sep/06	2016/sep/06	GOOD	36.92
243457		140102 100%	Mineral	Lease	093K005	1964/sep/23	2016/sep/23	GOOD	19.55
243458		140102 100%	Mineral	Lease	093K005	1964/sep/23	2016/sep/23	GOOD	18.52
243459		140102 100%	Mineral	Lease	093K005	1964/sep/23	2016/sep/23	GOOD	19.75
243460		140102 100%	Mineral	Lease	093K005	1964/sep/23	2016/sep/23	GOOD	20.90
243461		140102 100%	Mineral	Lease	093K005	1964/sep/23	2016/sep/23	GOOD	20.81
243462		140102 100%	Mineral	Lease	093K005	1964/sep/23	2016/sep/23	GOOD	0.73
243463		140102 100%	Mineral	Lease	093K005	1964/sep/23	2016/sep/23	GOOD	18.19
243464		140102 100%	Mineral	Lease	093K005	1964/sep/23	2016/sep/23	GOOD	18.84
243465		140102 100%	Mineral	Lease	093K005	1964/sep/23	2016/sep/23	GOOD	2.05
243466		140102 100%	Mineral	Lease	093K005	1964/sep/23	2016/sep/23	GOOD	7.12
243467		140102 100%	Mineral	Lease	093K005	1964/sep/23	2016/sep/23	GOOD	16.78
243468		140102 100%	Mineral	Lease	093K005	1964/sep/23	2016/sep/23	GOOD	17.26
243469		140102 100%	Mineral	Lease	093K005	1964/sep/23	2016/sep/23	GOOD	0.20
243470		140102 100%	Mineral	Lease	093K005	1967/jan/05	2017/jan/05	GOOD	20.19
243471		140102 100%	Mineral	Lease	093K005	1967/jan/05	2017/jan/05	GOOD	16.25
243472		140102 100%	Mineral	Lease	093K005	1967/jan/05	2017/jan/05	GOOD	0.09
243473		140102 100%	Mineral	Lease	093K005	1967/jan/05	2017/jan/05	GOOD	16.30
243474		140102 100%	Mineral	Lease	093K005	1967/jan/05	2017/jan/05	GOOD	2.06
243482		140102 100%	Mineral	Lease	093K005	1971/jan/29	2017/jan/29	GOOD	2.72
243483		140102 100%	Mineral	Lease	093K005	1971/jan/29	2017/jan/29	GOOD	15.08
243484		140102 100%	Mineral	Lease	093K005	1971/jan/29	2017/jan/29	GOOD	19.96
243485		140102 100%	Mineral	Lease	093K005	1971/jan/29	2017/jan/29	GOOD	20.85
243486		140102 100%	Mineral	Lease	093K005	1971/jan/29	2017/jan/29	GOOD	20.70
244772	SAM 18	140102 100%	Mineral	Claim	093K005	1969/apr/17	2023/feb/15	GOOD	25.00
244774	SAM 20	140102 100%	Mineral	Claim	093K005	1969/apr/17	2023/feb/15	GOOD	25.00
244776	SAM 22	140102 100%	Mineral	Claim	093K005	1969/apr/17	2023/feb/15	GOOD	25.00
244778	SAM 24	140102 100%	Mineral	Claim	093K005	1969/apr/17	2023/feb/15	GOOD	25.00
244780	SAM 26	140102 100%	Mineral	Claim	093K005	1969/apr/17	2023/feb/15	GOOD	25.00
244913	SAM 80	140102 100%	Mineral	Claim	093K005	1969/sep/12	2023/feb/15	GOOD	25.00
244915	SAM 82	140102 100%	Mineral	Claim	093K005	1969/sep/12	2023/feb/15	GOOD	25.00
507165		140102 100%	Mineral	Claim	093K	2005/feb/15	2023/feb/15	GOOD	151.91
507191		140102 100%	Mineral	Claim	093K	2005/feb/15	2023/feb/15	GOOD	75.97
507228		140102 100%	Mineral	Claim	093K	2005/feb/15	2023/feb/15	GOOD	246.78
507245		140102 100%	Mineral	Claim	093K	2005/feb/15	2023/feb/15	GOOD	474.84
507246		140102 100%	Mineral	Claim	093K	2005/feb/15	2023/feb/15	GOOD	398.65
507250		140102 100%	Mineral	Claim	093K	2005/feb/15	2024/feb/15	GOOD	834.88
507253		140102 100%	Mineral	Claim	093K	2005/feb/15	2023/feb/15	GOOD	132.91
507254		140102 100%	Mineral	Claim	093K	2005/feb/15	2023/feb/15	GOOD	37.96
507269		140102 100%	Mineral	Claim	093K	2005/feb/15	2023/feb/15	GOOD	815.97

867201	SATELLITE	140102 100%	Mineral	Claim	093K	2011/jul/22	2023/jul/22	GOOD	228.02
1017547	Kendo 02	140102 100%	Mineral	Claim	093K	2005/feb/15	2023/feb/15	GOOD	664.25
1017549	Kendo 4	140102 100%	Mineral	Claim	093K	2005/feb/15	2023/feb/15	GOOD	189.83
1017551	Kendo 06	140102 100%	Mineral	Claim	093K	2005/feb/15	2023/feb/15	GOOD	398.76
1017558	Kendo 08	140102 100%	Mineral	Claim	093K	2005/feb/15	2023/feb/15	GOOD	721.99
1017560	Kendo 10	140102 100%	Mineral	Claim	093K	2005/feb/15	2023/feb/15	GOOD	113.95
1017562	Kendo 12	140102 100%	Mineral	Claim	093K	2005/feb/15	2023/feb/15	GOOD	1349.27
1017568	Kendo 15	140102 100%	Mineral	Claim	093K	2005/feb/15	2024/feb/15	GOOD	189.82
1017773	KENDO 20	140102 100%	Mineral	Claim	093K	2013/mar/14	2023/mar/14	GOOD	531.24
1017774	KENDO 21	140102 100%	Mineral	Claim	093K	2013/mar/14	2022/mar/14	GOOD	436.75
1017816	KENDO 22	140102 100%	Mineral	Claim	093K	2013/mar/15	2022/mar/15	GOOD	379.61
1017817	KENDO 23	140102 100%	Mineral	Claim	093K	2013/mar/15	2022/mar/15	GOOD	569.37
1017827	KENDO 24	140102 100%	Mineral	Claim	093K	2013/mar/16	2022/mar/16	GOOD	493.22
1017860	KENDO 25	140102 100%	Mineral	Claim	093K	2013/mar/17	2022/mar/17	GOOD	493.22
1017873	KENDO 25	140102 100%	Mineral	Claim	093K	2013/mar/18	2022/mar/18	GOOD	455.70
1021037		140102 100%	Mineral	Claim	093K	2013/jul/16	2022/jul/16	GOOD	94.98
1028911		140102 100%	Mineral	Lease	093K	2014/jun/12	2016/jun/12	GOOD	1607.00
1039549	ENDAKO1	140102 100%	Mineral	Claim	093K	2015/oct/26	2016/oct/26	GOOD	18.98

Total 59 titles are found.

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Appendix 4

Mineral Titles Online – Event 5590861

Appendix 5

Computer Software List

1. Project locations were accurately sited using a Trimble GPS system. Data input and output functions used “Trimble Geomatics Office”, version 1.60.

2. Many plotting and drafting functions were done with the Autodesk – “Autocad 2013” program.

3. General report and documentation has been done using the “Microsoft Office Professional Plus 2010 Suite”. (Word, Excel, Outlook)

4. Document PDF file creation and edits have been done using Nuance “PDF Converter Professional 6.0”.

5. PDF document review and collaboration have also used the Adobe Systems Inc, “Adobe Reader 9”, version 10.1.3.

6. Simple text data file edits and review used the Helios Software Solutions – “TextPad” program, version 5.4.2.

7. Map GIS and coordinate translations were done with “MapInfo” version 8.5.2.

8. Regional and detailed locations and imagery were plotted from “Google Earth”, version 6.2.2.6613.

9. Screen Captures completed with Techsmith SnagIt version 9.1.3.

Appendix 6

Program Expenditures

Date:	Purchase Order Integral Ecology Group	Invoice #	Voucher	Fees & Expenses	Eligible Expenses on Mineral Claims
March 30, 2015	PO019865	1064	VP019758	$16,383.84	
April 13, 2015	PO019865	1085	VP019816	$22,612.65	
July 16, 2015	PO022971	1156	VP020042	$4,935.87	
August 28, 2015	PO022971	1173	VP020112	$46,939.21	
October 16, 2015	PO022971	1217	VP020221	$11,525.25	
November 18, 2015	PO022971	1252	VP020249	$2,146.73	
December 10, 2015	PO022971	1266	VP020297	$13,031.20	
January 11, 2016	PO022971	1297	VP020317	$7,316.63	
				$124,891.36	
				(74.4%) eligible	$92,867.93
Rick Leffers Contracting Ltd. (Hydroseeding)					
October 3, 2015	PO023009	702426	VP020193	$29,313.00	
				(50.5%) eligible	$14,803.07
					$107,671.00

Thompson Creek Mining - Endako Mines
Event 5590861

Michael Anthony Pond
2016.07.14 07:42:11 -
08'00'
Mount Milligan Mine

Exploration Work type	Comment				Totals
Field Work	(details on page 2)			$130,681.26	**$130,681.26**
Geochemical Surveying	**Number of Samples**	**No.**		**Subtotal**	
Drill (cuttings, core, etc.)					
Stream sediment					
Soil	*note: This is for assays or*				
Rock	*laboratory costs*				
Water					
Biogeochemistry-Pacific Soil	144			$6,664.00	
Biogeochemistry-CARO	34			$3,160.00	
Tree Cores - University of BC	21			$270.00	
Other (specify)					
				$10,094.00	**$10,094.00**
Sub Consultants		**No.**		**Subtotal**	
FM Environmental Services	wildlife section			$2,092.50	
Thexlwiz Consulting				$600.00	
				$2,692.50	**$2,692.50**
Transportation / Travel		**No.**		**Subtotal**	
Airfare					
Taxi					
Bridge Toll				$3.00	
BC Ferry				$178.50	
Parking					
truck rental					
kilometers (@ $55/km)	17.64 km.			$970.09	
truck hours (@ $25/hr)	7d *10hr/day			$1,750.00	
ATV					
fuel					
Helicopter (hours)					
Fuel (litres/hour)					
Other	parking/taxi/milage <$50			$185.69	
				$3,087.28	**$3,087.28**
Accommodation & Food	**Rates per day**				
Hotel	4 people * $750 & 2 * 1 night			$2,609.52	
Camp					
Meals	Jul 1-9, 4 per diems			$2,553.00	
				$5,162.52	**$5,162.52**
Miscellaneous					
Telephone					
Other (Specify)					
					$0.00
Equipment Rentals					
Field Gear (Specify)	batteries/plywood/safety gear/bags				
Li-Cor LAI2200	9 days @ $150/day			$1,350.00	
Hypsometer	9 days @ $75/day			$675.00	
Other (Specify)					
				$2,025.00	**$2,025.00**
Field Supplies	London Drugs / Deakin / IEG			$461.80	
				$461.80	**$461.80**
TOTAL Expenditures					**$154,204.36**
Allowable Expenditures	74.4% of Reclamation Assessment				**$92,867.93**
(on Mineral Claim Tenures)	50.5% of HydroSeeding (R.Leffers contract)				**$14,803.07**
					$107,671.00

Thompson Creek Mining - Endako Mines
Event 5590861

Exploration Work type	Comment				Totals
Personnel (Name) IEG	**Field Days (list actual days)**	**Hours**	**Rate**	**Subtotal***	
Justin Straker			$174.30		
Justin Straker			$183.75		
Meghan Laidlaw	Jul.01-09	106.3	$84.00	$8,929.20	
Katherine Garrah			$94.50		
Katherine Garrah					
Trevor Baker			$68.25		
Trevor Baker	Jun. 30-Jul.14; Jul.17; Jul.24	108	$73.50	$7,938.00	
Carolina Mahecha			$21.00		
Barb Riordan	Jul.01-09	109.2	$52.50	$5,733.00	
Michael Fuller			$105.00		
Melissa Iverson			$84.00		
Jeff Anderson	Jun. 30-Jul.13	118.3	$105.00	$12,421.50	
Personnel (Name) Rick Leffers Contracting		**Days**		$29,313.00	
Rick Leffers	Sept. 21-26 ; Sept. 28-30	9			
Tory Carlson	Sept. 21-26 ; Sept. 28-30	9			
Dave Johnston	Sept. 21-26 ; Sept. 28-30	9			
				$64,334.70	**$64,334.70**
Office Studies	**List Personnel (note - Office only, do not include field days)**				
Justin Straker	Data Analysis & Reporting	23.1	$174.30	$4,026.33	
	Data Analysis & Reporting	2.8	$183.75	$514.50	
	Field Planning	3.0	$183.75	$551.25	
	Project Management	0.6	$174.30	$104.58	
	Project Management	2.5	$183.75	$459.38	
Meghan Laidlaw	Field Planning	24.3	$84.00	$2,041.20	
	Project Management	9.5	$84.00	$798.00	
	Data Entry	35.7	$84.00	$2,998.80	
	Data Analysis & Reporting	83.3	$84.00	$6,997.20	
Katherine Garrah	Data Analysis & Reporting	244.9	$94.50	$23,143.05	
	Project Management	0.9	$94.50	$85.05	
Trevor Baker	Data Analysis & Reporting	41.5	$68.25	$2,832.38	
	Data Analysis & Reporting	57.6	$73.50	$4,233.60	
	Field Planning	4.9	$73.50	$360.15	
Carolina Mahecha	Data Analysis & Reporting	51.6	$21.00	$1,083.60	
Barb Riordan			$52.50	$0.00	
Michael Fuller	Data Analysis & Reporting	35.0	$105.00	$3,675.00	
Melissa Iverson	Project Management	4.0	$84.00	$336.00	
	Data Analysis & Reporting	0.5	$84.00	$42.00	
Jeff Anderson	Data Analysis & Reporting	106.5	$105.00	$11,182.50	
	Field Planning	8.4	$105.00	$882.00	
Other (specify)				$0.00	
Data Analysis & Reporting					**$57,730.16**
Field Planning					**$3,834.60**
Project Management					**$1,783.01**
Data Entry					**$2,998.80**
				$66,346.56	
				sub Total	**$130,681.26**