Appendix 4 Vegetation Survey





APACHE CANADA LIMITED

2013 Vegetation Assessment

Pointed Mountain Former Gas Field, NT, 60° 37' N, 123° 49' W

307074-01860-100 - EN-REP-0001

30 September 2014

WorleyParsons Canada

Suite 500, 151 Canada Olympic Rd SW Calgary, AB T3B 6B7 CANADA Phone: +1 403 247 0200 Toll-Free: 1 800 668 6772 Facsimile: +1 403 247 4811 www.worleyparsons.com

© Copyright 2014 WorleyParsons

PROJECT 307074-01860-100 - 2013 VEGETATION ASSESSMENT REV DESCRIPTION ORIG REVIEW PROJECT DATE CLIENT DATE MANAGER APPROVAL 0 Issued as final LΡ CG SB 30-Sep-14 S. Bird L. Pittman C. Gursky

U:\CAL\GBS\307074-01860\100 - 2013 Monitoring Pointed Mtn NWT\12.0_Reports\12.3_Backend\Appendix4-Vegetation Survey\2.0_Veg Final\307074-01860-100-EN-REP-0001-VegAssessment-2013-0.docx Page i Document No. EN-REP-0001

EcoNomics

Disclaimer

This report has been prepared by WorleyParsons for the exclusive use of Apache Canada Limited, who has reviewed the scope of work for this project and understands its limitations. In providing this report, WorleyParsons accepts no liability or responsibility with respect to the property described in this report or for any business decisions relating to the property, including decisions regarding the purchase, sale, or investment in the property. Nothing in this report is intended to constitute or provide a legal opinion.

This report reflects the best judgment of WorleyParsons based on the property conditions observed at the time of the site visit and on information available at the time of preparation of this report. WorleyParsons has exercised reasonable skill, care, and diligence in assessing the information acquired during the preparation of this report, but makes no guarantees or warranties as to the accuracy or completeness of this information. The findings of this report are specific to this property and are based, in part, upon visual observation of the property at the time of the visit, interviews, and a review of available records, as described in this report. Any information that may have been provided by others is believed to be accurate, but has not been independently verified and cannot be guaranteed. The scope of this project specifically excluded the collection of samples for analytical testing. Unless specifically stated otherwise, the findings cannot be extended to previous or future property conditions, or portions of the property that were unavailable for direct observation. If property conditions or applicable standards change, or if any additional information becomes available at a future date, modifications to the findings, conclusions, and recommendations in this report may be necessary.

Any use, reliance on, or decision made, by a third party based on this report is the sole responsibility of said third party. WorleyParsons makes no representation or warranty to any third party with regard to this report and/or the work referred to in this report, and accepts no duty of care to any third party or any liability or responsibility whatsoever for any losses, expenses, damages, fines, penalties or other harm that may be suffered or incurred as a result of the use of, reliance on, any decision made, or any action taken based on, this report or the work referred to in this report.

This report is intended to be used in its entirety, and no individual part of the report may be taken as representative of the findings of the report. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form; by any third party without the expressed written permission of Apache Canada Limited or WorleyParsons.

APACHE CANADA LIMITED 2013 VEGETATION ASSESSMENT POINTED MOUNTAIN FORMER GAS FIELD, NT, 60° 37' N, 123° 49' W

CONTENTS

1.		INTRO	DDUCTION1
	1.1		General1
	1.2		Scope of Work1
2.		ENVI	RONMENTAL SETTING2
3.		METH	IODS2
	3.1		Vegetation Community Classification2
	3.2		Field Survey Methods
	3.3		Vegetation Data Analysis4
		3.3.1	Univariate Comparisons4
4.		RESU	JLTS4
	4.1		Vegetation Community Class Descriptions4
		4.1.1	Broadleaf – Open5
		4.1.2	Coniferous – Open
		4.1.3	Mixedwood – Open
		4.1.4	Forb (Graminoid – Disturbed)6
		4.1.5	Reclassified 2012 Vegetation Communities and Plots6
	4.2		2013 Ground Cover and Species Composition
	4.3		Species Richness and Species Diversity7
	4.4		Comparison of Control and Impact Plots8
	4.5		Invasive and Salt-tolerant Vegetation Species10
	4.6		Temporal and Spatial Comparisons (2012–2013)13
5.		SUM	MARY OF CONCLUSIONS AND RECOMMENDATIONS
6.		CLOS	URE15
7.		REFE	RENCES



Tables within Text

TABLE A	VEGETATION COMMUNITY CLASS DESCRIPTIONS	2
TABLE B	2013 SUMMARY OF PLOTS IN EACH VEGETATION COMMUNITY CLASS AND IMPACT CATEGORY.	5
TABLE C	2013 COMPOSITION OF VEGETATION COMMUNITY CLASSES	7
TABLE D	2013 OBSERVED SPECIES RICHNESS, SPECIES DIVERSITY AND SOIL ELECTRICAL CONDUCTIVITY	7
TABLE E	2013 SUMMARY OF PARAMETERS OBSERVED IN THE CONTROL AND IMPACT PLOTS AND ASSOCIATED STATISTICS	9
TABLE F	2013 OCCURRENCES OF INVASIVE AND NON-NATIVE SPECIES 1	1
TABLE G	2013 OCCURRENCES OF SPECIES WITH SALT TOLERANCE RATINGS OF MODERATE TO HIGH	2

Figures within Text

FIGURE A	2013 MEAN SPECIES RICHNESS AND SOIL ELECTRICAL CONDUCTIVITY
	IN EACH OF THE FOUR VEGETATION COMMUNITY

Tables

TABLE A4-1 VEGETATION SPECIES LIST BY PLOT

Figures

- FIGURE A4-1 VEGETATION COMMUNITY CLASSES
- FIGURE A4-2 2013 VEGETATION IMPACT AND CONTROL PLOTS

Photographs

- PHOTO A4–1 VEGETATION COMMUNITY CLASS BROADLEAF OPEN; CONTROL PLOT 2; ASPEN DOMINANT FOREST – (A), AND MINOR CHLOROSIS AND DECREASED VIGOUR ON WHITE SPRUCE – (B)
- PHOTO A4–2 VEGETATION COMMUNITY CLASS CONIFEROUS OPEN; CONTROL PLOT 8; CONIFEROUS DOMINANT FOREST – (A), AND UNDERSTORY DOMINATED BY COMMON HORSETAIL – (B)

- PHOTO A4–3 VEGETATION COMMUNITY CLASS CONIFEROUS OPEN; IMPACT PLOT 15; CONIFEROUS DOMINANT FOREST FROM NE CORNER – (A), AND NECROSIS ON CANADA BUFFALOBERRY – (B)
- PHOTO A4–4 VEGETATION COMMUNITY CLASS MIXEDWOODS OPEN; CONTROL PLOT 4; MIXEDWOOD FOREST – (A), AND CANADA BUFFALOBERRY WITH GOOD VIGOUR – (B)
- PHOTO A4–5 VEGETATION COMMUNITY CLASS MIXEDWOODS OPEN; IMPACT PLOT 9; MIXEDWOOD FOREST WITH HIGH TREE MORTALITY – (A), AND PRICKLY ROSE WITH CHLOROSIS AND NECROSIS – (B)
- PHOTO A4–6 VEGETATION COMMUNITY CLASS FORB (GRAMINOID DISTURBED); CONTROL PLOT 11, DISTURBED GRAMINOID AREA – (A), AND GRAMINOID VEGETATION – (B)
- PHOTO A4–7 VEGETATION COMMUNITY CLASS FORB (GRAMINOID DISTURBED); IMPACT PLOT 12; DISTURBED GRAMINOID AREA WITH BARE GROUND AREAS – (A), AND GROUND COVER IN DISTURBED AREA WITH ALIEN SPECIES FOXTAIL BARLEY – (B)

1. INTRODUCTION

1.1 General

Apache Canada Limited (Apache) retained WorleyParsons Canada Services Ltd. (WorleyParsons) to conduct a vegetation assessment near the south border of the Pointed Mountain Former Gas Field Plant Site (the "Site"; Figure A4–1). In 2006, the gas plant was decommissioned and most surficial infrastructure was removed except for a surge pond, risers, meter stations, and other associated infrastructure. Much of the underground infrastructure remains. The decommissioning activities were conducted under the Mackenzie Valley Land and Water Board (MVLWB) Land Use Permit MV2002X0007 dated June 7, 2007 (Alpine 2008). The Site is located on Federal Crown Land, which is managed by the MVLWB. Groundwater and surface water monitoring programs have been ongoing at the Site since 1991.

From 2001 to 2007, Alpine (Alpine Environmental Ltd.) conducted a vegetation monitoring program and have documented stressed deciduous trees (i.e. those showing signs of necrosis), south of the former gas plant and downgradient of the surge pond. Alpine (2008) documented that the surge pond area is impacted by BTEX (benzene, toluene, ethylbenzene, and xylenes) and PHC (petroleum hydrocarbon) fractions F1 and F2, elemental sulphur, and salts (exceedance of electrical conductivity and sodium adsorption ratio). The area of stressed deciduous trees did not appear to increase in size between 2001 and 2007 according to Alpine (2008).

From 2008 to 2012, Matrix (Matrix Solutions Inc.) conducted a vegetation monitoring program. In previous investigations undertaken by Matrix (2012), during a 2011 reconnaissance trip, which included a site fly-over, a large area of stressed vegetation characterized by yellowing of leaves (chlorosis), wilting and/or dying of leaves (necrosis) was observed in the area south of the surge pond. An apparent decrease in foliage density of these trees relative to the adjacent vegetation was noted (Matrix 2013). The location and size of the stressed area is illustrated in Figure A4–1.

1.2 Scope of Work

WorleyParsons resurveyed the vegetation plots surveyed by Matrix in 2012 during the 2013 program. Eight new vegetation plots were added to the sampling program to enable a more accurate characterization of the vegetation communities. At all plots, the following were examined:

- species composition (trees, shrubs, herbs and non-vascular);
- plant vigour/health;
- percent ground cover (including bare ground and litter); and
- physical site characteristics: moisture, nutrient, percent slope, aspect.

Comparisons were made between control plots and affected plots where possible. Photographs were taken at each plot location to provide visual comparisons of the plots.



In addition to the monitoring plots, the area of impacted vegetation (trees only) was delineated with a high precision GPS unit, to compare it to the area previously delineated in 2012. A visual comparison of the 2012 and 2013 delineations of stressed tree areas was done to determine if the area of impact is changing over time.

2. ENVIRONMENTAL SETTING

The Site is located in the Boreal Cordillera Mid-Boreal (MB) Ecoregion of the Northwest Territories (Ecosystem Classification Group 2010). The Ecosystem Classification Group (2010) defines this Ecoregion by short, cool and moist summers with cold and snowy winters. A moist and relatively mild climate also exists due to Pacific weather systems. Because of this mild climate, alpine, sub-alpine and boreal plant communities exist, including plant species common to the boreal and to a moister Pacific-Cordilleran climate. Additionally, terrain ranges from high peaks and ridges, to plateaus and deep valleys. Soil development is also wide ranging, from no soil-development to Regosols and Brunisols (Ecosystem Classification Group 2010).

3. METHODS

3.1 Vegetation Community Classification

Vegetation communities were mapped for the Site using the Earth Observation for Sustainable Development (EOSD) of Forests digital imagery and raster dataset for the Northwest Territories (EOSD 2014). Polygon delineations and community classifications were ground truthed during the 2013 field survey. Community classes were defined based upon the Review of Land Cover Data and Suitability by Nishi et al. (2009), as detailed in Table A.

Vegetation Class	Class Description*
Broadleaf – Dense**	Greater than 60% crown closure; deciduous trees are greater than 75% of total crown closure.
Broadleaf – Open	26-60% crown closure; deciduous trees are greater than 75% of total crown closure.
Coniferous – Sparse**	10-25% crown closure; coniferous trees are greater than 75% of total crown closure.
Coniferous – Open	26-60% crown closure; coniferous trees are greater than 75% of total crown closure.

Table A Vegetation Community Class Descriptions

Vegetation Class	Class Description*
Mixedwood – Open	26-60% crown closure; neither coniferous nor deciduous trees are greater than 75% of total crown closure.
Herb (Graminoid – Disturbed)	10-70% crown closure; forb and graminoids are greater than 20% crown closure.
Notes:	
*	EOSD Land Cover Classification Legend Report (Wulder and Nelson 2003).
**	Communities identified based on plot vegetation in the 2012 survey (Matrix 2013), but reclassified based on the observed plot vegetation during the 2013 field program.

3.2 Field Survey Methods

A field survey of the Site was completed by a WorleyParsons Field Biologist during August 8–12, 2013. Vegetation data were collected from 18 plots, with ten plots having been previously established (Matrix 2013) and eight new plots established during the 2013 Site visit (Figure A4–1). Plot layout followed a nested design, with one tree plot (20 m x 20 m), one shrub subplot (5 m x 5 m), and two subplots (1 m x1 m) for forb, graminoid, and non-vascular species. Vegetation monitoring methods followed the Ecological Land Survey Site Description Manual (AEP 1994) and the Ecological Monitoring and Assessment Guidelines (Roberts-Pichette and Gillespie 1999). The 2012 plot locations as established by Matrix (2013) were confirmed in 2013 by GPS coordinates.

For each plot, species composition for trees, shrubs, forbs, graminoids, and non-vascular plants was visually estimated to the nearest 1%. Percent bare ground, litter, and standing water were also recorded. Vegetation photos were taken from the NW and SE corners of each plot using photo point monitoring techniques outlined in Shaff et al. (2007), in order to facilitate repeat photography for monitoring purposes. Nomenclature for species identification followed the Working Group on the General Status of NWT Species General Status Ranks of Wild Species in the Northwest Territories (2011). It should be noted that due to the overlap of vegetation layers (i.e. tree canopy and understory layers of shrubs, forbs, graminoids, non-vasculars, and litter), the percent cover values for a plot may exceed 100%. Plant vigour, an evaluation of plant health, was assessed for each species as a categorical variable according to Alberta Environmental Protection guidelines (AEP 1994), as described below:

- dead most or all plant parts are yellowed or brown (score 0);
- poor plant size is stunted (small plant size) and plant parts may be up to half discoloured (chlorosis) or dead (score 1);
- fair (average) plant species considered average for size and colour, some chlorosis, necrosis or yellowing may be present (up to 25%; score 2);



- good plant species size and colour slightly above average; minor chlorosis, necrosis, or yellowing (5–10%) may be present depending on season (score 3); and
- excellent plant species above average size and colour, very minor, or no, chlorosis, necrosis, or yellowing (<5%) may be present (score 4).

It should be noted that plant health is measured along a continuum, and that stress indicators are subjective to quantify and difficult to separate. Furthermore, plant health can be influenced by a number of localized environmental factors not directly related to Site activities (e.g. drought, frost, disease, insect/fungal pests, plant age/growth stage, and wildlife foraging). Incidental observations of such occurrences were recorded where discernible.

3.3 Vegetation Data Analysis

Data analyses were completed using SYSTAT version 13.0 (SYSTAT 2009). Prior to all analyses, data were screened for outliers using the most appropriate distance measures. Species richness and species diversity were calculated for each plot to monitor change over time. Species richness is defined as the number of species observed, and species diversity is defined as the variety of species, accounting for the relative abundance of each (Ricklefs 2007). Species richness and species diversity (Shannon-Weiner Index = H) were calculated using PC-ORD version 6 (McCune and Mefford 2011).

3.3.1 Univariate Comparisons

Spatial Comparisons

Normality and variance testing was completed to determine which univariate statistical test would be appropriate to compare the vegetation data. The comparison of mean values of ground cover, vigour, species richness, species diversity, and soil EC was completed using either an unpaired two-sample t-test, a non-parametric Mann–Whitney U Test, or a Kruskal-Wallis Test with SYSTAT version 13.0 (SYSTAT 2009). For all comparisons, variance was captured at 0.01 and 0.05 significance levels. Standard error of the mean was calculated based on the sample size.

4. RESULTS

4.1 Vegetation Community Class Descriptions

Eighteen plots were surveyed in four Vegetation Community Classes (Table B; Figure A4–1). Eight of the plots were considered to be "impact" plots (i.e. identified as showing signs of vegetation stress) and ten were considered control plots, outside of the impacted area. The vegetation community classes and their associated dominant species are described in detail in Sections 4.1.1–4.1.5, with complete species lists per plot presented in Table A4–1.

Vecetation Community Closet	Plot Identification Num	ber
vegetation Community Class"	Impact Plots	Control Plots
Broadleaf – Open	N/A	2, 10
Coniferous – Open	15, 17	7, 8
Forb (Graminoid – Disturbed)	12	11
Mixedwood – Open	1, 3, 5, 9, 14	4, 6, 13, 16, 18
Total Plots	8	10

Table B 2013 Summary of Plots in each Vegetation Community Class and Impact Category.

Note:

EOSD Land Cover Classification Legend Report (Wulder and Nelson 2003).

4.1.1 Broadleaf – Open

Two control vegetation plots were located within the Broadleaf – Open vegetation community class (Table B). This vegetation community class consists of greater than 60% cover of trees, which is 75% or greater by basal area, of deciduous species. Within the Site, this community is characterized by a dominant tree layer of trembling aspen (*Populus tremuloides*) and balsam poplar (*Populus balsamifera*), with a small component of white spruce (*Picea glauca*). This community type had a well-developed shrub layer, with dominant shrub species of low-bush cranberry (*Viburnum edule*), prickly rose (*Rosa acicularis*), and Canada buffaloberry (*Shepherdia canadensis*) (Table A4–1; Photo A4–1).

4.1.2 Coniferous – Open

Two control and two impact plots were located within the Coniferous – Open vegetation community, which is characterized by 26-60% crown closure consisting of greater than 75% of the tree species crown closure being coniferous tree species (Table B). The dominant tree species in this class were white spruce (*P. glauca*), with smaller amounts of trembling aspen (*P. tremuloides*) and balsam poplar (*P. balsamifera*). Dominant shrubs were prickly rose (*R. acicularis*), low-bush cranberry (*V. edule*), and Canada buffaloberry (*S. canadensis*). Dominant forbs were common horsetail (*E. arvense*) and bishop's cap (*Mitella nuda*), with a well-developed non-vascular layer dominated by feather moss species; stair-step moss (*Hylocomium splendens*) and Schreber's moss (*Pleurozium schreberi*) (Table A4–1; Photos A4–2 and A4–3).

4.1.3 Mixedwood – Open

Five control and two impact vegetation plots were located in the Mixedwoods – Open vegetation community class, which was the most represented vegetation class in the study area (Table B). This



community consists of 26–60% crown closure of tree species, and neither coniferous nor deciduous trees represent greater than 75% of total crown closure by basal area. This community was characterized by trembling aspen (*P. tremuloides*), balsam poplar (*P. balsamifera*), and white spruce (*P. glauca*). Similar to the Broadleaf – Open, the dominant shrub layer was comprised of low-bush cranberry (*V. edule*), prickly rose (*R. acicularis*), and Canada buffaloberry (*S. canadensis*), with dominant forb species common horsetail (*E. arvense*), and non-vascular feather moss species stair-step moss (*H. splendens*) and Schreber's moss (*P. schreberi*) (Table A4–1; Photos A4–4 and A4-5).

4.1.4 Forb (Graminoid – Disturbed)

One control and one impact vegetation plot were located within the Forb (Graminoid – Disturbed) vegetation community class (Table B). This vegetation class was characterized by less than 5% cover of tree and shrub species, and dominant forb and graminoid layers, and disturbance species. Small amounts of white spruce (*P. glauca*) and willow species (*Salix* spp.) were also present, however the community class was dominated by Kentucky bluegrass (*Poa pratensis*), awnless brome (*Brome inermis*), and white sweet-clover (*Melilotus alba*) (Table A4–1; Photos A4–6 and A4–7).

4.1.5 Reclassified 2012 Vegetation Communities and Plots

Three vegetation plots were reclassified from the 2012 classifications (Matrix 2013) during the 2013 survey. Plot 1, formerly mapped as the Broadleaf – Dense vegetation community (Table A), was reclassified to Mixedwood – Open due to about 20% cover of white spruce (*P. glauca*). Plot 4, formerly mapped as Coniferous – Sparse, was reclassified to Mixedwood – Open due to about 15% cover of trembling aspen (*P. tremuloides*) and about 20% cover of white spruce (*P. glauca*). Although no dying trembling aspen were observed in the plot this shift in community type may be due to mortality in the trembling aspen within the area. Plot 6, formerly mapped as Coniferous – Open, was reclassified to Mixedwood – Open due to about 20% deciduous and about 18% coniferous species composition in the tree layer. Lastly, Plot 7 was changed from an impact to a control plot based on good (3) vegetation vigour and low (49–53 mS/m) soil EC readings from the 2013 Geophysical Investigation (WorleyParsons 2013; Figure A4–2).

4.2 2013 Ground Cover and Species Composition

Mean vegetation cover in all four vegetation communities was similar, with the greatest vascular percent cover observed in the Forb (Graminoid – Disturbed) community ($64\% \pm 9\%$) and the greatest non-vascular percent cover observed in the Coniferous – Open community ($42\% \pm 11\%$; Table C). Mean litter percent covers in the Broadleaf – Open and Graminoid – Disturbed communities were similarly high ($96\% \pm 4\%$ and $93\% \pm 0\%$, respectively), and similarly lower in the Coniferous Open and Mixedwood Open ($62\% \pm 7\%$ and $63\% \pm 5\%$, respectively). No significant bare ground or surface water was observed except for mean bare ground covers of $3\% \pm 1\%$ and $1\% \pm 1\%$ in the Graminoid – Disturbed and Mixedwood – Open community plots, respectively (Table C).

		Percent C (Mean Value ± \$	Cover (%) Standard Error)	
Cover Class	Broadleaf Open	Coniferous Open	Forb (Graminoid Disturbed)	Mixedwood Open
Vascular Species	48 ± 10	40 ± 8	64 ± 9	48 ± 8
Non-vascular Species	3 ± 3	42 ± 11	2 ± 0	36 ± 5
Litter	96 ± 4	62 ± 7	93 ± 0	63 ± 5
Bare Ground	0 ± 0	0 ± 0	3 ± 1	1 ± 1
Surface Water	0 ± 0	0 ± 0	0 ± 0	0 ± 0

Table C 2013 Composition of Vegetation Community Classes

4.3 Species Richness and Species Diversity

The species richness, or number of species observed, was greatest in the Mixedwood – Open and Coniferous – Open communities, where a mean value of 21 individual species was observed in each. The lowest species richness and species diversity was observed in the Forb (Graminoid – Disturbed) community. The highest species diversity (2.42 ± 0.11) was observed in the Coniferous – Open vegetation community (Table D).

		Mean Value	± Standard Error	
	Broadleaf Open	Coniferous Open	Forb (Graminoid Disturbed)	Mixedwood Open
Species Richness	16 ± 3	21 ± 1	14 ± 4	21 ± 2
Species Diversity [H]	2.17 ± 0.24	2.42 ± 0.11	2.00 ± 0.13	2.39 ± 0.12
Soil EC (µS/cm)*	468 ± 43	523 ± 80	873 ± 188	751 ± 65

Table D 2013 Observed Species Richness, Species Diversity and Soil Electrical Conductivity

Note:

* Soil EC (electrical conductivity) values were taken from the WorleyParsons 2013 Geophysical Investigation (WorleyParsons 2013).



High electrical conductivity (EC) values corresponded with low species richness observed in the Forb (Graminoid – Disturbed) community (Table D; Figure A; Figure A4–2). In contrast, lower EC values corresponded with higher species richness in the Broadleaf – Open and Coniferous – Open communities. Kruskal-Wallis Test results showed a significantly higher Soil EC value in the Forb (Graminoid – Disturbed) community compared to the Mixedwood – Open community (*P*<0.001) and, as expected, species richness between these two communities was significantly (*P*<0.001) higher in the Mixedwood – Open community (Figure A).





Note: Error Bars represent Standard Error of the Mean.

4.4 Comparison of Control and Impact Plots

Percent cover of vascular plants, litter, vigour, species richness, and species diversity were all higher in control plots, while percent cover of non-vascular plants, chlorosis, necrosis, dead trees, and EC values were lower in the control plots. However, only percent cover of dead trees, vigour, and soil EC were found to be significantly different (P<0.05) between the impact and control plots. The mean dead tree cover was significantly greater in impact plots, with a difference of about 7% overall, from 0% in

the control plots. Vigour was significantly lower (difference of about 0.59), and soil EC was significantly higher (difference of about 269 μ S/cm) in the impact plots. It is likely that decreases in the chlorosis, necrosis values, and increases in the percent cover of dead trees within the impacted area are directly related to the increases in EC values, because saline conditions may be limiting to plant health (vigour).

	Mean Value ±	Standard Error	Test	Degrees of	D	
Parameter Observed	Control (N=9)	Impact (N=9)	Statistic (U* or t**)	Freedom (df)	P–value (<i>P</i>)	
% Vascular Cover	54 ± 7	40 ± 7	t = 1.442	14.694	0.170	
% Non-vascular Cover	24 ± 7	38 ± 6	t = -1.445	15.992	0.168	
% Litter Cover	71 ± 8	68 ± 5	t = 0.309	15.129	0.761	
% Bare Ground Cover	0 ± 0	1 ± 1	U = 33.000	1.000	0.338	
% Chlorosis	2 ± 1	4 ± 2	U = 33.500	1.000	0.358	
% Necrosis	1 ± 0	3 ± 1	U = 20.500	1.000	0.072	
% Dead Tree Cover	0 ± 0	7 ± 2	U = 20.000	1.000	0.015	
Vigour	2.82 ± 0.09	2.23 ± 0.12	U = 61.000	1.000	0.023	
Species Richness	22 ± 3	17 ± 1	t = 1.768	12.44	0.102	
Species Diversity [H]	2.45 ± 0.12	2.18 ± 0.08	t = 1.867	15.529	0.081	
Soil EC (µS/cm)***	563 ± 35	832 ± 82	t = -2.909	9.008	0.017	

Table E2013 Summary of Parameters Observed in the Control and Impact Plots and
Associated Statistics

Notes:

* Non-parametric Mann-Whitney U test.

** Unpaired, two sample t-test.

*** Soil EC values were taken from the WorleyParsons 2013 Geophysical Investigation (WorleyParsons 2013).

The 2013 vegetation plots are well distributed between the control and impact areas, with eight plots in the impact area and 10 plots in the control area (Table B; Figure A3–2). However; the Broadleaf – Open and Forb (Graminoid – Disturbed) vegetation community class was underrepresented, as no impact Broadleaf – Open plots were recorded. To facilitate statistical comparisons between control and



impacted areas, two additional plots should be added to the total observed for the impacted Forb (Graminoid – Disturbed) community in 2014.

4.5 Invasive and Salt-tolerant Vegetation Species

Nine invasive or non-native vegetation species were observed in the 18 plots during the August 2013 survey. Six of those species are listed as "Alien" according to the Working Group on the General Status of Northwest Territory Species (2006). Alien is defined as "species that have been introduced as a result of human activities" and that the term is "synonymous with exotic or introduced" (Working Group on the General Status of Northwest Territory Species 2006). The observed species included awnless brome (*Bromus inermis*), alfalfa (*Medicago sativa*), white sweet-clover (*Melilotus alba*), yellow sweet-clover (*Melilotus officinalis*), common plantain (*Plantago major*), and alsike clover (*Trifolium hybridum*). The remaining three species are listed as "Exotic" according to the Alberta Rogues Gallery of Invasive Species (ANPC 2013). These species included foxtail barley (*Hordeum jubatum*), Kentucky bluegrass (*Poa pratensis*), and common dandelion (*Taraxacum officinale*).

Occurrences of these species were limited to only plots 9 (impact plot), 11 (control plot), and 12 (impact plot; Table F). Awnless brome (*B. inermis*), Kentucky bluegrass (*P. pratensis*), and common dandelion (*T. officinale*) were observed in the control plot 11. All alien and/or exotic species except for awnless brome (*B.* inermis) were observed in plot 12, which was in the Forb (Graminoid – Disturbed) community. Although plot 11 was a control plot, it was also located in the Graminoid –Disturbed community, which is why alien and/or exotic species were observed there. The occurrences of invasive species should be monitored in future years and a weed management strategy implemented to control their spread throughout the area.

Twelve species with medium to high salt tolerances were found during the 2013 survey (Table G; CEMA 2011). The most commonly occurring species were wild strawberry (*F. virginiana*), northern bedstraw (*G. boreale*), prickly rose (*R. acicularis*), and Canada buffaloberry (*S. canadensis*), all of which have a medium salt tolerance rating (CEMA 2011). Three of the salt tolerant species are also invasive species (foxtail barley [*H. jubatum*], alfalfa [*M. sativa*], and white sweet-clover [*M. alba*]), but are currently only occurring in plots 11 and 12. Salt tolerant species should be monitored for changes in their distribution and density in future years, as indicators of shifts in community composition due to salinity on Site.

APACHE CANADA LIMITED 2013 VEGETATION ASSESSMENT POINTED MOUNTAIN FORMER GAS FIELD, NT, 60° 37' N, 123° 49' W

Plot Type	Plot #	Awnless brome (Bromus inermis)*+	Foxtail barley (<i>Hordeum</i> <i>jubatum</i>)*	Alfalfa (<i>Medicago</i> sativa)*+	White sweet- clover (<i>Melilotus</i> alba)*+	Yellow sweet- clover (<i>Melilotus</i> officinalis)* +	Common plantain (<i>Planta</i> go <i>major</i>)*+	Kentucky bluegrass (Poa pratensis)*	Common dandelion (<i>Taraxacum</i> officinale)*	Alsike clover (<i>Trifolium</i> hybridum)* +	Total Species per Plot
Control	2	-	-	-	-	-	-	-	-	-	0
Control	4	-	-	-	-	-	-	-	-	-	0
Control	6	-	-	-	-	-	-	-	-	-	0
Control	7	-	-	-	-	-	-	-	-	-	0
Control	8	-	-	-	-	-	-	-	-	-	0
Control	10	-	-	-	-	-	-	-		-	0
Control	11	Y	-	-	-	-		Y	Y	-	2
Control	13	-	-	-	-	-	-	-	-	-	0
Control	16	-	-	-	-			-	-	-	0
Control	18	-	-	-	-	-	-	-	-	-	0
Impact	1	-	-	-	-	-	-	-	-	-	0
Impact	3	-	-	-	-	-	-	-	-	-	0
Impact	5	-	-	-	-	-	-	-	-	-	0
Impact	9	-	-	-	-	-	-	-	Y	-	1
Impact	12	-	Y	Y	Y	Y	Y	Y	Y	Y	8
Impact	14	-	-	-	-	-	-	-	-	-	0
Impact	15	-	-	-	-	-	-	-	-	-	0
Impact	17	-	-	-	-	-	-	-	-	-	0
Total Occur	rrences	1	1	1	1	1	1	2	3	1	

Table F 2013 Occurrences of Invasive and Non-native Species

Notes:

* Listed as Exotic according to Rogues Gallery of Invasive Species (ANPC 2013).

+ Listed as Alien according to the General Status Ranks of Wild Species in the Northwest Territories (Working Group on General Status of NWT Species 2006)

Y "Y" indicates that the species was observed in the plot.



Plot Type	Plot #	Common yarrow (Achillea millefolium)	Bluejoint (<i>Calamagrostis</i> <i>canadensis</i>)	Slender wheatgrass (<i>Elymus</i> <i>trachycaulus</i>)	Wild strawberry (<i>Fragaria</i> virginiana)	Northern bedstraw (Galium boreale)	Foxtail barley (<i>Hordeum</i> <i>jubatum</i>)	Alfalfa (Medicago sativa)	White sweet- clover (Melilotus alba)	Prickly rose (Rosa acicularis)	Scouler's willow (<i>Salix</i> scouleriana)	Canada buffaloberry (Shepherdia canadensis)	Wild vetch (<i>Vicia</i> americana)	Total Species per Plot
		Н	M–H	М	М	М	Н	М	М	М	М	Μ	Μ	12
Control	2	-	-	-	Y	Y	-	-	-	Y	-	Y	-	4
Control	4	-	-	-	Y	Y	-	-	-	Y	-	Y	Y	5
Control	6	-	-	-	Y	Y	-	-	-	Y	-	Y	-	4
Control	7	-	-	-	-	Y	-	-	-	Y	-	Y	-	3
Control	8	-	-	-	Y	Y	-	-	-	Y	-	Y	-	4
Control	10	-	-	-	Y	Y	-	-	-	Y	-	-	-	3
Control	11	Y	-	Y	-	-	-	-	Y	-	-	-	Y	4
Control	13	-	-	-	Y	Y	-	-	-	-	-	Y	-	3
Control	16	-	Y	-	Y	Y	-	-	-	Y	Y	Y	-	6
Control	18	-	-	-	-	-	-	-	-	Y	-	Y	-	2
Impact	1	-	-	-	-	Y	-	-	-	Y	-	Y	-	3
Impact	3	-	-	-	Y	Y	-	-	-	Y	-	Y	-	4
Impact	5	-	-	-	Y	Y	-	-	-	Y	-	-	-	3
Impact	9	-	-	-	Y	Y	-	-	-	Y	-	Y	-	4
Impact	12	Y	-	-	Y	-	Y	Y	Y	-	-	-	Y	6
Impact	14	-	-	-	-	-	-	-	Y	-	-	-	-	1
Impact	15	-	-	-	Y	Y	-	-	-	Y	-	Y	-	4
Impact	17	-	-	-	Y	-	-	-	-	Y	-	-	-	2
Total Occurrer	nces	2	1	1	13	13	1	1	3	14	1	12	3	

Table G 2013 Occurrences of Species with Salt Tolerance Ratings of Moderate to High

Notes:

H, M High [H] and Moderate [M] Vegetation Salinity Tolerances taken from CEMA (2011).

Y "Y" indicates that the species was observed in the plot.

4.6 Temporal and Spatial Comparisons (2012–2013)

Temporal comparisons were made between the 2012 (Matrix 2013) and 2013 WorleyParsons vegetation surveys, detailed below. Due to changes in survey methodology, temporal comparisons are based upon visual characterizations rather than detailed measurements. Vigour, a categorical variable, was not used in 2012 to assess plant health, 2012 plant health non-categorically assessed based on signs of chlorosis (yellowing) and necrosis (dying/dead). As the 2013 methodology will be repeated in future years, comparative analyses that are more detailed can be performed to evaluate both quantitative and qualitative changes in vegetation health.

Between Matrix (2013) and WorleyParsons (2013), the control plots 2, 4, 6, 8 and 10 were observed on average to be healthy in 2012, and were all similarly rated with a mean vigour of about 3 (good) in 2013. Although some minor health issues were observed for the control plot vegetation in 2013, they were more indicative of decreased health from natural pest, disease and senescence, which were documented in the field notes. The overall mean vigour rating of the impact plots (2; fair) from 2013 reflect the 2012 vegetation observations from Matrix (2013). Within all impact plots, Matrix (2013) also observed overall stressed (chlorotic) vegetation and in some cases dead vegetation, with the exception of plot 5. In 2012 (Matrix 2013), no dead trees were commented on, whereas in 2013 about 12% of the trembling aspen (*P. tremuloides*) were observed to be dead within plot 5. It should be noted that although plot 7 was re-classed from an impact plot to a control plot, health ratings remain similar between 2012 and 2013. In 2013, vegetation vigour of plot 7 was characterized as fair (2), and it is likely that this plot was characterized as an impact plot in 2012 due to signs of stressed trembling aspen (*P. tremuloides*), which may have been present before contamination to the nearby impact area. Soil EC levels of 49–53 mS/m in plot 7, which are comparable to other control plots, confirm the control classification for this plot (Figure A4–2).

No major changes to the spatial extent of affected vegetation, as delineated in 2012, were observed. Spatial extent was re-evaluated based upon visual assessments of vegetation health and review of corresponding soil EC values. The area of affected vegetation (i.e. impact area) covers about 3.5 hectares, and extends south from the disturbed area and surge pond (Figure A3–1). The extent of affected vegetation will be monitored in future years to determine if there are delayed responses to site conditions with observed signs of decreased health in vegetation.

5. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

The 2013 vegetation assessment revealed that the vegetation communities within the impacted area show signs of stress, similar to those observed during the 2012 survey conducted by Matrix (2013). In 2013, four unique vegetation communities were identified within the Site, with eight new vegetation plots being added to the 2013 assessment to facilitate statistical analysis in the future and ensure representation of the various community types present.



Out of the four vegetation community types characterized on Site (Broadleaf – Open, Coniferous – Open, Mixedwood – Open, and Forb [Graminoid – Disturbed]), the percent cover of vascular plants, litter, water, and bare ground were mostly static across each of the communities (Table C). The non-vascular cover was over 30% higher in both the Coniferous – Open and Mixedwood – Open vegetation communities compared to the Broadleaf – Open and Forb (Graminoid Disturbed) communities. The Coniferous – Open and Mixedwood – Open communities also had the highest species richness values (21 ± 1 species and 21 ± 2 species, respectively); however, species diversity was similar throughout all the community types.

High electrical conductivity (EC) values were found to correspond with low species richness observed in the Forb (Graminoid – Disturbed) community (Table D; Figure A), which had a significantly higher soil EC values (mean: 873 ± 188 ; *P*<0.001) when compared to the other community types.

When comparing control plots to impact plots, the percent cover of dead trees, vigour, and soil EC were found to be significantly different (P<0.05) between control and impact plots. It is likely that reductions in the observed occurrences of chlorosis and necrosis, and increases in the percent cover of dead trees within the impact area are directly related to the increases in EC values, because saline conditions may be limiting to plant health (vigour).

As of the 2013 surveys, the majority of the invasive and non-native species were located within the impacted Forb (Graminoid – Disturbed) vegetation community plot 12 (Table B; Table F), which contained eight out of nine observed species. Higher occurrences of invasive species were expected in disturbed areas; however, the control plot within this vegetation class had lower occurrences of invasive species. Conversely, salt-tolerant plant species on-Site were equally distributed between control vegetation classes and impact classes.

It is recommended that changes in the extent and distribution of invasive and salt tolerant species be monitored in the future. A weed management strategy should be implemented, to restrict and work towards eliminating the occurrences of invasive and non-native species; specifically, scentless chamomile (*Matricaria maritima*), which was observed at the former camp site.

Future vegetation monitoring following remediation activities is recommended to assess the effectiveness of the vegetation control efforts.

APACHE CANADA LIMITED 2013 VEGETATION ASSESSMENT POINTED MOUNTAIN FORMER GAS FIELD, NT, 60° 37' N, 123° 49' W

CLOSURE

We trust that this report satisfies your current requirements and provides suitable documentation for your records. If you have any questions or require further details, please contact the undersigned at any time.

Report Prepared by

Juno fino

Lucas Pittman, B.Sc., B.I.T. Ecologist

Heather Slivinski, B.Sc. Vegetation Ecologist

Senior Review by

Craig Gursky, P.Ag. Senior Environmental Scientist Core Service Manager - Contaminated Sites - Calgary

Prairie Business Unit Infrastructure & Environment WorleyParsons Canada Services Ltd.

7. **REFERENCES**

- AEP (Alberta Environmental Protection), 1994. Ecological Land Survey Site Description Manual. A joint publication of the Canadian Forest Service and Alberta Land and Forest Services. February 1994.
- ANPC (Alberta Native Plant Council)., 2013. A Rogue's Gallery of Invasive Non-native Plants of Alberta. available from http://www.anpc.ab.ca/wiki/index.php/Main_Page [cited February 2014].
- Alpine (Alpine Environmental Ltd.)., 2008. 2007 Supplemental Phase II Environmental Site Assessment Pointed Mountain Gas Field, NWT. Prepared on behalf of Nahendeh Land and Environmental Services LP for BP Canada Energy Company. WARTHOG+, Abandonment, Remediation and Reclamation, Health, Safety, and Environment. May 2008.
- CEMA (Cumulative Environmental Management Association), 2011. Riparian Classification and Reclamation Guide. Reclamation Working Group (RWG), Aquatic Subgroup. Fort McMurray, AB, Canada.
- Earth Observation for Sustainable Development of Forests (EOSD), 2014. Forests dataset for the Northwest Territories. Accessed online February 13, 2014 at https://pfc.cfsnet.nfis.org/mapserver/eosd_portal/htdocs/eosd-cfsnet.phtml
- Ecosystem Classification Group, 2010. Ecological Regions of the Northwest Territories Cordillera. Department of Environment and Natural Resources, Government of the Northwest Territories, Yellowknife, NT, Canada. x + 245 pp. + insert map. Accessed at http://www.enr.gov.nt.ca/_live/documents/content/2010%20Cordillera%20Report_web2.pdf
- Matrix (Matrix Solutions Inc.), 2012., 2011 Supplemental Site Assessment. Apache Pointed Mountain Former Gas Field, West of Fort Liard, Northwest Territories, North Latitude 60° 37' West Longitude 123° 49'. Report prepared for Apache Canada Ltd. January 2012. MVLWB online registry access: http://www.mvlwb.co/Boords/mv/Registry/2007/MV/2007X0007/MV/2007X007% 20-

http://www.mvlwb.ca/Boards/mv/Registry/2007/MV2007X0007/MV2007X007%20-%202011%20Supplemental%20Site%20Assessment%20-%20no%20appendicies.pdf

- Matrix (Matrix Solutions Inc.), 2013., 2012 Preliminary Vegetation Assessment Former Plant Site Area. Apache Pointed Mountain Former Gas Field, Northwest Territories. North Latitude 60°37' West Longitude 123°49'. Report Prepared for: Apache Canada Ltd. Calgary, AB. April 2013.
- McCune, B. and J. Mefford, 2011., PC-ORD. Multivariate Analysis of Ecological Data. Version 6.06 for Windows. MjM Software Design, Gleneden Beach, OR, USA.
- Nishi, J., Antioniuk, T., Stelfox, J.B., 2009. Review of Land Cover Data And Suitability of ALCES for Evaluating Cumulative Effects on Boreal Caribou in the Dehcho Region. Accessed online February 2014: http://www.enr.gov.nt.ca/sites/default/files/182_manuscript.pdf



- Ricklefs, R.E., 2007. The Economy of Nature: Data Analysis Update. Fifth edition. W.H. Freeman and Company. New York, NY.
- Roberts-Pichette, P. and L. Gillespie, 1999. Terrestrial Vegetation Biodiversity Monitoring Protocols. Environment Canada – EMAN Occasional Paper Series Report No. 9, pp. 142.
- Shaff, C., J. Reiher and J. Campbell, 2007. Oregon Watershed Enhancement Board (OWEB) Guide to Photo Point Monitoring. Oregon Watershed Enhancement Boards. Salem, OR, USA.
- SYSTAT, 2009. SYSTAT version 13. SYSTAT Software Inc.
- Working Group on the General Status of NT Species, 2011. NT Species 2011-2015 General Status Ranks of Wild Species in the Northwest Territories, Yellowknife, NT. Pp. 172.
- WorleyParsons (WorleyParsons Canada Services Ltd.)., 2013. 2013 Geophysical Investigation. Pointed Mountain Gas Field Plant Site, near Fort Liard, NT. Unpublished Report. File No. 307074-01860.
- Wulder, M. and Nelson, T., 2003., EOSD Land Cover Classification Legend Report. Canadian Forest Service, Natural Resources Canada.

Tables



Table A4–1

resources & energy

Vegetation Species List by Plot

Transect #	Plot #	Species Common Name	Species Latin Name	
	1	Cladonia species	Cladonia spp.	
		Bunchberry	Cornus canadensis	
		Red-osier dogwood	Cornus stolonifera	
		Common fireweed	Epilobium angustifolium	
		Common horsetail	Equisetum arvense	
		Woodland horsetail	Equisetum sylvaticum	
		Northern bedstraw	Galium boreale™	
		Stair-step moss	Hylocomium splendens	
		Cream-colored vetchling	Lathyrus ochroleucus	
		I winflower	Linnaea borealis	
		Wild Illy-of-the-valley	Malanthemum canadense	
		Dog licnen	Peltigera canina Biasa glaves	
		Sebreber's mass	Picea giauca Picurozium sebreberi	
		Balsam poplar	Pieurozium schreben Populus balsamifora	
		Trembling aspen	Populus tramulaides	
		Knight's plume moss	Ptilium crista-castrensis	
		Prickly rose	Rosa acicularis ^M	
		Dewberry	Rubus pubescens	
		Canada buffalabarn	Shaphardia aanadanaia ^M	
			Viburnum odulo	
		Coarso woody dobris moss	Viburnum edule	
		Total species in 2013	-	22
	2	l indlev's aster	Aster ciliolatus	<u> </u>
	∠	Bunchherry	Cornus canadansis	
		Wild strawborn	Fragaria virginiana ^M	
		Northorn bodetrow	Colium boroclo ^M	
		White spruce		
		Balsam poplar	r icea yiauca Populus halsamifera	
		Tremhling aspen	Populus tremuloides	
		Drickly roso	Rosa acicularis ^M	
		Dowborn	Rusa acicularis Pubus pubascons	
		Willow species	Salix snn	
		Canada buffaloberry	Shenherdia canadensis ^M	
		Low-bush cranberry	Viburnum edule	
		Violet species	Viola spp	
		Total species in 2013		13
	3	Bunchberry	Cornus canadensis	
	•	Red-osier dogwood	Cornus stolonifera	
		Common fireweed	Epilobium angustifolium	
		Dwarf scouring-rush	Equisetum scirpoides	
		Wild strawberry	Fragaria virginiana ^M	
		Northern bedstraw	Galium boreale ^M	
		Northern bastard toadflax	Geocaulon lividum	
		Stair-step moss	Hylocomium splendens	
		Purple peavine	Lathyrus venosus	
		White spruce	Picea glauca	
		Schreber's moss	Pleurozium schreberi	
		Balsam poplar	Populus balsamifera	
		Trembling aspen	Populus tremuloides	
		Prickly rose	Rosa acicularis [™]	
		Dewberry	Rubus pubescens	
		Canada buffaloberry	Shepherdia canadensis ^M	
		Low-bush cranberry	Viburnum edule	
		Kidney-leaved violet	Viola renifolia	
		Total species in 2013		18
	4	Green alder	Alnus viridis	
		Columbine species	Aquilegia spp.	
		Lindley's aster	Aster ciliolatus	
		Common firewood	Cornus stolonilera	
		Common Ineweed	Epilopium angustilolium	
		Dwarf scouring-rush	Equisetum scirpoides	
		Woodland horsetail	Equisetum sulvaticum	
		Wild strawbarry	Fragaria virginiana ^M	
		Northorn badatrow	Galium boracla ^M	
		Twinflower	Linnaea horealis	
		Bishon's-can	Mitella nuda	
		Palmate-leaved coltsfoot	Petasites frigidus var palmatus	
		White spruce	Picea glauca	
		Schreber's moss	Pleurozium schreberi	
		Balsam poplar	Populus balsamifera	
		Trembling aspen	Populus tremuloides	
		Prickly rose	Rosa acicularis ^M	
		Dewberry	Rubus pubescens	
	1		Shepherdia canadensis ^M	
		ICanada puttaloperty	• • • • • • • • • • • • • • • • • • •	
		Low-bush cranberry	Viburnum edule	
		Canada buffaloberry Low-bush cranberry Wild vetch	Viburnum edule Vicia americana ^M	
		Canada buffaloberry Low-bush cranberry Wild vetch Kidney-leaved violet	Viburnum edule Vicia americana ^M Viola renifolia	



Vegetation Species List by Plot

5 Bunchberry Red-osier dogwood Cormus stolonifera Epilobium angustifolium Wild strawberry Cornus stolonifera Epilobium angustifolium Wild strawberry Northern bedstraw Stair-step moss Hylocomium splendens Laftyrus ochrolecuos Linnaea boreatis Bishofys-cap Mitelle nuda White spruce Bishofys-cap Picea glauca Cormus canadersis Bishofys-cap Bishofys-cap Picea glauca Bishofys-cap Nitelle nuda White spruce Picea glauca Bishofys-cap Nitelle nuda Procky rose Rosa accutars ⁴⁴ Low-bush cranberry Viburum edue Total species in 2013 15 6 Green alder Anus viridis Lichens Cladonia spp. Euchorry Cornus stolonifera Common freweed Epilobium angustifolium Ovart scouring-rush Equisetum arvense Dwart scouring-rush Equise	Transect #	Plot #	Species Common Name	Species Latin Name	
Ret-osiar dogwood Cormus stolonifera Common fireweed Epilobium angustifolium Wild strawberry Fragaria virginiana ^M Northem bedstraw Galium boreale ^M Stair-step moss Hylocomium splendens Crean-colored vetchling Lithyrus ochroleucus Bishop's-cap Milella nucla White spruce Picea glauca Schreber's moss Pieurozium schreberi Trembling aspen Populus termulodes Bristly black currant Ribes lacustre Prickly rose Rosa accularis ^M Lindley's aster Astra cilolatus Miki vetch Astragalus spp. Vibrite birch Betula papyrifera Lichens Cladina spp. Lichens Cladina spp. Lichens Cladina spp. Common fireweed Epilobium angustifolium Common fireweed Equisetum acreates Writ strawberry Fragaria virginiara ^M Northem bedstraw Galium boreale ^M Wile is reader Felagaria virginiara ^M Norther bedstraw Galium boreale ^M Virid is rawberry Fragaria virginiara ^M Norther bedstraw Galium boreale ^M Dwart scouring-rush Equisetum scheaders Dwa		5	Bunchberry	Cornus canadensis	
Common fireweed Epilobium angustifolium Wild strawberry Fragaria virginiana ^M Northern bedstraw Galium boreale ^M Stair-step moss Hylocomium splendens Cream-colord vetchling Linnaea borealis Bishop's-cap Mitella nuda White spruce Picea glauca Schreber's moss Pieurozium schreberi Trembling aspen Populus tremuloidos Bristly black currant Ribes lacustre Prick yrose Rosa acicularis ⁴ Low-bush cranberry Viburmum edule Total species in 2013 15 6 Green allder Anus windis Lichens Cladinis spp. Lichens Cladinis spp. Lichens Cladinis spp. Lichens Cladinis spp. Common firewead Epilobium angustifolium Common firewead Equisotum scheberi Common firewead Equisotum scheberi<		_	Red-osier dogwood	Cornus stolonifera	
Wild strawberry Fragaria virginiana ^M Northem bedstraw Galium boreale ^M Stair step moss Lathyrus ochroleucus Twiniflower Linnaea borealis Bishop's cap Minelia nuda White spruce Picea glauca Schreber's moss Pleurozium schreberi Trembling aspen Populus tremuloides Bristly black curant Ribes lacustre Prickly rose Rosa acicularis ^M Low-bush cranberry Viburum edule Total species in 2013 Afrus vindis Lichens Cladina spp. Lichens Cladina spp. Lichens Cladina spp. Lichens Cladinia spp. Dard Sociting-rush Equisetum avense Dward socuting-rush Equisetum avense Wild strawberry Fragaria virginiana ^M Northem bedstraw Galium boreale ^M Stair-step moss Hylocomium splendens Lichens Cladonia spp. Lichens Cladonia spp. Bishop's cap Galium boreale ^M Northem bedstraw Galium boreale ^M Stair-step			Common fireweed	Epilobium angustifolium	
Northern bedstaw Calium boreate ^M Stair-step moss Hylocomium splendens Cream-colored velchling Linnaea boreate ^M Twinflower Linnaea boreate ^M Bishop's-cap Mitella nuda White spruce Picea glauca Schreber's moss Pieurozium schreberi Termbling aspen Populus tremuloides Bristly black currant Ribes facusare Prickly rose Rosa acicularis ^M Low-bush cranberry Viburnum odule 7 torid species in 2013 15 6 Green alder Ahus windis Lichens Cledina spp. Lichens Cledina spp. Bunchberry Corrus canadensis Red-oster dogwood Cornus canadensis Common firewed Epilobium angustifolum Common firewed Epilobium schreder Wild strawberry Fragaria virginiana ^M Northern bedstaw Galium borealie ^M Stair-step moss Hylocomium splendens Wild strawberry Fragaria virginiana ^M Northern bedstaw Galium borealie Stair-step moss <t< td=""><td></td><td></td><td>Wild strawberry</td><td>Eragaria virginiana^M</td><td></td></t<>			Wild strawberry	Eragaria virginiana ^M	
Static-step moss Hylocomium splendens Cream-colored vetching Linnee borealis Twinflower Linnee borealis Bishop's-cap Mitella nuda White spruce Picea glauca Schreber's moss Pleurozium schreberi Termbling aspen Populus trenuloides Bristly black currant Ribes lacustre Prickly rose Rosa acicularis ^M Core alder Ahus viridis Lindley's aster Astro cilicolatus Mite birch Betula papyrifera Lichens Cladina spp. Bunchberry Corrus canadonisis Cormuc herestail Equiselum arvense Dwarf scouring-rush Equiselum arvense Dwarf scouring-rush Equiselum arvense Dwarf scouring-rush Equiselum arvense Dwarf scouring-rush Equiselum scipoides Wild strawberry Fragana vigniana ^M Northern bedstraw Galium boreals Bishop's-cap Mitella nuda Wild strawberry Fragana vigniana ^M Northern bedstraw Galium boreals Bishop's-cap Mitella nuda Palmate-leaved coltsfoot Petajstes frigitus var. palmatus Picea glauca Populus balsamifera Trembling aspen<			Northorn bodstrow	Colium boroolo ^M	
Stati-step Nicks Productinitin splenderis Cream-colored vetching Latityus correcteuss Bishop's-cap Mittella nuda White spruce Pice a glauca Premozium schreberi Premozium schreberi Premozium schreberi Premozium schreberi Prickly rose Rosa acicularis ⁴⁴ Prickly rose Rosa acicularis ⁴⁴ Prickly rose Rosa acicularis ⁴⁴ Low-bush cranberry Viburum edule Total species n2013 15 6 Green alder Milk vetch Aster citolatus Milk vetch Aster citolatus Milk vetch Statia-step noss Bunchberry Cornus canadensis Common fireweed Epiloblum argustifolium Common fireweed Epiloblum splenderis Wild strawberry Fragaria virginiana ⁴⁴ Northem bedstraw Gallum boreale ⁴⁴ White spruce Pree glauca Previsitiong aspen Poulus tremuloides Wild strawberry Fragaria virginiana ⁴⁴ Northem bedstraw Gallum boreale ⁴⁴ Wild strawberry Fragaria virgini			Stoir ston moss		
Twinflower Linnaee borealis Twinflower Linnaee borealis Bishop's-cap Mitella nuda White spruce Preca glauca Schreber's moss Peurozium schreberi Termbing aspen Populus termuloides Bristly black currant Ribes tacustre Low-bush cranberry Vibrum edule Total species in 2013 15 6 Green alder Lindley's aster Aster ciliolatus Milk vetch Astragalus spp. Bunchberry Corrus canadensis Cadina spp. Edulo apprifora Lichens Cladonia spp. Bunchberry Corrus canadensis Common fireweed Epilobium angustifolium Common fireweed Epilobium angustifolium Common fireweed Equisetum arvense Dwart scouring-rush Equisetum arvense Wild strawberry Fragaria virginiana ^M Northern bedstraw Galum boreals Stair-step moss Hylocornium splendens Twinflower Linneee borealis Bishop's-cap Pietusites finglus var. palmatus			Stair-step moss	Hylocomium spiendens	
Initiation Initiate Diversity Biskop's-cap Mitelia nuda White spruce Picea glauca Schreber's moss Pleurozium schreberi Termbing aspen Populus tremuloides Bristly black currant Rosa acicularis ^M Dow-bush cranberry Viburnum edule Total species in 2013 Mite vertice Mike vertice Aster ciliolatus Mike vertice Aster ciliolatus Mike vertice Aster ciliolatus Mike vertice Cornus canadensis Cornus canadensis Cadionia spp. Lichens Cladionia spp. Lichens Cladionia spp. Lichens Cladionia spp. Divart socuring-rush Equisetum arvense Dwart socuring-rush Equisetum arvense Dwart socuring-rush Equisetum arvense White strave Galum boreals ^M Northern bedstraw Galum boreals Stair-step moss Phylocomin splendens Twinflower Lineaea borealis Bishop's-cap Mitelia nuda Lichens Potalist fingidus var. palmatus Stair-step moss Phylocomin splendens Twinflower Lineaea borealis Bishampopla Populus tremuloides <tr< td=""><td></td><td></td><td>Cream-colored vetching</td><td>Lathyrus ochroleucus</td><td></td></tr<>			Cream-colored vetching	Lathyrus ochroleucus	
Bishop S-cap Mittel spruce White spruce Picea glauca Schreber's moss Pleurozium schreberi Termbling aspen Populus termuloides Bristly black currant Ribes facustre Prickly rose Rosa aciculats ^M Low-bush cranberry Viburum edule Total species in 2013 4 Attrast citical spin 4 Milk vetch Astar citical spin Milk vetch Astar citical spin White birch Betula papyrifera Lichens Cladina spin Bunchberry Cornus canadensis Common fireweed Epilobium angustifolium Common fireweed Epilobium arkense Wild strawberry Fragaria virginiana ^M Northern bedstraw Galium boreals ^M Stair-step moss Hyloconium splendens Trimflower Linaea borealis Bishop's-cap Mitelia ruda Lichens Polus termuloides Palamate-leaved coltsfoot Picea glauca Wilte spruce Picea glauca Polus termuloides Piceixel spin Polus termuloides Piceixel spin Davis couring-ush Equisetum arcense Devberry Rubus pubescens Wild strawbe			Twinnower Diskarska sam	Linnaea borealis	
White spruce Pread glauca Schreber's moss Pleurozium schreberi Bristly black curant Ribes lacustre Prickly rose Rosa acicularis ^M Low-bush cranberry Viburrum edule 16 Green alder Antas viridis Aster cilolatus Milk vetch Aster cilolatus Milk vetch Bella papyrifera Lichens Cladino spp. Bunchberry Corrus stolonifera Cormon fireweed Epilobium angustifolium Common fireweed Epilobium angustifolium Common foreweed Epilobium angustifolium Common fireweed Equisetum scirpoides Wrife starw Galium boreale ^M Star-step moss Hylocomium splendens Twinflower Linaea borealis Bishop's-cap Mitella nuda Peltigera spp. Peltigera spp. Palmate-leaved coltsfoot Picasites frigidus var. palmatus Picky rose Rosa acicularis ^M Dewberry Rubus pubescens Willow species Sais spp. Canada buffaloberry Shepherdia canadensis ^M Violet species Sais spp. Canada buffaloberry Rubus pubescens Willow species Sais spp. <tr< td=""><td></td><td></td><td>Bisnop's-cap</td><td>Mitella huda</td><td></td></tr<>			Bisnop's-cap	Mitella huda	
Schreber's moss Pleurozum schreber Termbling aspen Populus termuloides Bristly black currant Ribes lacustre Prickly rose Rosa acicularis ^M Low-bush cranberry Viburnum edule 1 Ceren alder Alurs viridis Lindley's aster Astragalus spp. Milk vetch Astragalus spp. Milk vetch Bunchberry Cladina spp. Lichens Cladina spp. Lichens Cladina spp. Lichens Cladina spp. Bunchberry Cornus canadensis Red-osier dogwood Cornus canadensis Common fireweed Equisetum acrypoides Wild strawberry Fragaria virginiana ^M Morthern bedstraw Galium boreale ^M Stair-step moss Hyloconium splendens Twinflower Linneea borealis Bishop's-cap Mittel anuda Lichens Pictigera spp. Palmate-leaved cottsfoot Petasites frigidus var. palmatus White spruce Picea glauca Shireber's moss Pieurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus balsamifera Total species in 2013 Zi 7 <t< td=""><td></td><td></td><td>White spruce</td><td>Picea glauca</td><td></td></t<>			White spruce	Picea glauca	
I rembing aspen Populus tremuloides Bristly black currant Ribes alcustre Prickly rose Rosa acicularis ^M Low-bush cranberry Viburnum edule Total species in 2013 11 6 Green alder Anus viridis Lindley's aster Aster cilolatus Milk vetch Astragalus spp. Lichens Cladonia spp. Lichens Cladonia spp. Lichens Cladonia spp. Cormon fireweed Equisetum arvense Dwart scouring-rush Equisetum arvense Dwart scouring-rush Equisetum sciproides Twinflower Linnaea borealis Twinflower Linnaea borealis Bishop's-cap Mitella nuda Northern bedstraw Galaum boreale ^M Schreber's moss Pleurozium schreberi Balsam poplar Populus tremuloides Prickly rose Rosa acicularis ^M Willow species Salix spp. Canada bulfaloberry Shepherdia canadensis Uvolus tremuloides Prickly rose Prickly rose Rosa acicularis ^M			Schreber's moss	Pleurozium schreberi	
Instry black currant Pibes lacustre Prickly rose Rosa acicularis ^M Low-bush cranberry Viburnum edule 7 Total species in 2013 11 6 Green alder Anus viridis Lindley's aster Aster ciliolatus 11 1 Mik vetch Astaglus spp. White birch Betula papyrifera Lichens Cladina spp. Lichens Cladina spp. Lichens Cladina spp. Bunchberry Cornus canadensis Common fireweed Epilobium angustifolium Common horsetail Equisetum arryense Dwarf scouring-rush Eduisetum scirpoides Wiid strawberry Fragaria virginiana ^M Northern bedstraw Galium boreale ^M Stair-step moss Hyloconium splendens Twinflower Linaea borealis Bishop's-cap Mittella nuda Lichens Peleigrera spp. Palmate-leaved coltsfoot Petasites frigidus var. palmatus White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus balsamifera Termbling asper Rosa acicularis ^M <			I rembling aspen	Populus tremuloides	
Prickly rose Rosa acicularis ^m Low-bush cranberry Viburnum edule Total species in 2013 11 6 Green alder Anus viridis Milk vetch Astragelus spp. White birch Betula papyrifera Lichens Cladonia spp. Common horsetail Equisetum arvense Dwarf scouring-rush Equisetum scippoides Wild strawberry Fragaria virginiana ^M Northern bedstraw Galium boreale ^M Stair-step moss Hylocomium splendens Twinflower Lineas Lichens Peltigera spp. Palmate-leaved coltsfoot Petesties frigidus var. palmatus White spruce Picea glauca Schreber's moss Pleuus tramuloides Prickly rose Rosa acicularis ^M Dewberry Rubus pubescens White spruce Salix spp. Canada buffaloberry Shepheridia canadensis ^M Lichens			Bristly black currant	Ribes lacustre	
Low-bush cranberry Viburnum edule Total species in 2013 11 6 Green alder Alnus viridis Lindley's aster Aster ciliolatus Milk vetch White birch Betula papyrifera Lichens Lichens Cladina spp. Lichens Bunchberry Cornus canadensis Cardina spp. Bunchberry Cornus canadensis Cardina spp. Wild strawberry Fragaria virginiana ^M Common fireweed Dwarf scouring-rush Equisetum scirpoides Wild strawberry Northern bedstraw Galium boreale ^M Stair-step moss Twinflower Linnaea borealis Bishop's-cap Lichens Pelingera spp. Palmate-leaved coltsfoot White spruce Pica glauca Pelingera spp. Palmate-leaved coltsfoot Pelasites frigidus var. palmatus White spruce Pica glauca Prickly rose Rosa acicularis ^M Dewberry Rubus pubescens Willow species Salix Salix Canada buffaloberry Shepherdia canadensis <td></td> <td></td> <td>Prickly rose</td> <td>Rosa acicularis[™]</td> <td></td>			Prickly rose	Rosa acicularis [™]	
Total species in 2013 11 6 Green alder Alnus viridis Milk vetch Aster ciliolatus Milk vetch Aster ciliolatus Milk vetch Bettud papyrifera Lichens Cladonia spp. Lichens Cladonia spp. Lichens Cladonia spp. Bunchberry Cornus canadensis Red-osier dogwood Cornus canadensis Common firewead Eplibuium angustifolium Common horsetail Equisetum arvense Dwaff scouring-rush Equisetum arvense Dwaff scouring-rush Equisetum arvense Wild strawberry Frageria virginiana ^M Northern bedstraw Galium boreale ^M Stair-step moss Hylocontimus plendens Twinflower Linanea borealis Bishop's-cap Milella nuda Plamate-leaved coltsfoot Petasites frigidus var. palmatus White spruce Picea glauca Schreber's moss Plouvaium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus ternuloides Prickly rose Rosa acicularis ^M Dewberry Rubus pubescens Willow species Salix spp. Canada buffaloberry Shepherdia canad			Low-bush cranberry	Viburnum edule	
6 Green alder Anus viridis Lindley's aster Aster ciliolatus Milk vetch Astargalius spp. White birch Betula papyrifera Lichens Cladina spp. Bunchberry Corrus stolonifera Red-osier dogwood Corrus stolonifera Common fireweed Epilobium angustifolium Dwarf scouing-rush Equisetum arvense Dwarf scouing-rush Equisetum arvense Wild strawberry Fragaria virginiana ^M Northern bedstraw Galium boreale ^M Stair-step moss Hylocomium splendens Twinflower Linneea borealis Bishop's-cap Mitella nuda Lichens Peltigera spp. Palmate-leaved coltsfoot Petasites frigidus var. palmatus White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam popiar Populus tremuloides Prickly rose Rosa acicularis ^M Devberry Rubus preces Canada buffaloberry Shepherdia canadensis Lindley's aster Aster ciliolatus Bunchberry Viburnum edule Violet species Viburnum edule Violet species Corrus stolonifera Corrus cotonifera			Total species in 2013		15
Lindley's aster Aster cilicalus Milk vetch Astragalus spp. White birch Betula papyrifera Lichens Cladina spp. Lichens Cladina spp. Bunchberry Corrus canadensis Red-osier dogwood Corrus solonifera Common firewead Epilobium angustifolium Common horsetail Equisetum arvense Dwaff scouring-rush Equisetum scipoides Wild strawberry Fragaria virginiana ^M Northern bedstraw Galium boreale ^M Stair-step moss Hylocornium splendens Twinflower Linaea borealis Bishop's-cap Mittella nuda Lichens Peltigera spp. Palmate-leaved coltsfoot Petasites frigidus var. palmatus White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus blasmifera Terekty rose Rosa acicularis ^M Dewberry Klubs pubescens Willow species Salix spp. Canada buffaloberry Shepherdia canadensis		6	Green alder	Alnus viridis	
Milk vetch Astragalus spp. White birch Betula papyrifera Lichens Cladonia spp. Lichens Cladonia spp. Bunchberry Cornus canadensis Red-osier dogwood Cornus stolonifera Common fireweed Epilobium angustifolum Common forekead Equisetum arcense Dwarf scouring-rush Equisetum arcense Dwarf scouring-rush Equisetum scirpoides Wild strawberry Fragaria virginiana ^M Northern bedstraw Galium boreale ^M Stair-step moss Hylocomium splendens Twinflower Linnaee borealis Bishop's-cap Milella nuda Lichens Petigera spp. Palmate-leaved coltsfoot Petasites frigidus var. palmatus Schreber's moss Plourozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus tremuloides Prickly rose Rosa acicularis ^M Dewberry Rubus pubescens Willow species Salix spp. Canada buffaloberry Shepherdia canadensis Lichens Cornus stolonifera Common horsetail Equisetum arvense Wilow species Salix spp. Canada buffaloberry Shep			Lindley's aster	Aster ciliolatus	
White birch Betula papyrifera Lichens Cladina spp. Lichens Cladina spp. Bunchberry Cornus canadensis Red-osier dogwood Cornus stolonilera Common fireweed Epilobium angustifolium Common forsetail Equisetum scirpoides Wild strawberry Fragaria viginiana ^M Northern bedstraw Galium boreale ^M Stair-step moss Hylocomium splendens Twinflower Linnaea borealis Bishop's-cap Mitella nuda Lichens Peltigera spp. Palmate-leaved coltsfoot Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus tremuloides Prickly rose Rosa acicularis ^M Dewberry Rubus pubescens Willow species Salix spp. Canada buffaloberry Shepherdia canadensis ^M Low-bush cranberry Viburnum edule Viole tspecies in 2013 Zi 7 Green alder Alrus viridis Lindley's aster Aster cillolatus Bunchberry Cornus sciolonilera Common horsetail Equisetum sylvaticum Northern bedstraw Galium bore			Milk vetch	Astragalus spp.	
Lichens Cladina spp. Lichens Cladina spp. Bunchberry Cornus canadensis Red-osier dogwood Cornus stolonifera Common fireweed Epilobium angustifolium Common horsetail Equisetum arvense Dwaff scouring-rush Fragaria virginina ¹¹ Stair-step moss Hylocomium splendens Twinflower Linnea borealis Schreber's moss Pleurozium schreberi Balsam poplar Populus tremuloides Prickly rose Rosa acicularis ^M			White birch	Betula papyrifera	
Lichers Cladonia spp. Bunchbery Corrus stolonifera Red-osier dogwood Corrus stolonifera Common fireweed Epilobium angustifolium Dwarf scouring-rush Equisetum scippoides Wild strawbery Fragaria virginiana ^M Northern bedstraw Galium boreale ^M Stair-step moss Hylocomium splendens Twinflower Linnaea borealis Lichens Petigera spp. Palmate-leaved coltsfoot Petasites frigidus var. palmatus White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus tremuloides Prickly rose Rosa acicularis ^M Dewberry Rubus pubescens Willow species Salix spp. Canada bulfaloberry Shepherida canadensis ^M Low-bush cranberry Vilour species in 2013 7 Green alder Altrus viridis Lindery's aster Aster ciliolatus Bunchberry Cornus stolonifera Woodland horsetail Equisetum stylvaticum Northern bedstraw Galium boreale ^M			Lichens	Cladina spp.	
Bunchberry Comus canadensis Red-osier dogwood Comus stolonifera Common fireweed Epilobium angustifolium Common horsetail Equisetum arvense Dwarf scouring-rush Equisetum arvense Wild strawberry Fragaria virginiana ^M Northern bedstraw Galium boreale ^M Stair-step moss Hylocomium splendens Twinflower Linnaea borealis Bishop's-cap Mitelia nuda Lichens Peltigera spp. Palmate-leaved coltsfoot Petasites frigidus var. palmatus White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus balsamifera Dewberry Rubus pubescens Willow species Salix spp. Canada buffaloberry Shepherdia canadensis ^M Voolat species in 2013 Z2 7 Green alder Alnus viridis Lindley's aster Aster ciliolatus Bunchberry Cornus candensis Common horsetail Equisetum arvense Woodland horsetail <td></td> <td></td> <td>Lichens</td> <td>Cladonia spp.</td> <td></td>			Lichens	Cladonia spp.	
Red-osier dogwood Corruns stolonifiera Common fireweed Epilobium argustionifiera Common horsetail Equisetum arvense Dwarf scouring-rush Equisetum arvense Wild strawberry Fragaria virginiana ^M Northern bedstraw Galium boreale ^M Stair-step moss Hylocomium splendens Twinflower Linnaea borealis Lichens Peltigera spp. Palmate-leaved coltsfoot Petasites frigidus var. palmatus White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus tremuloides Prickly rose Rosa acicularis ^M Dewberry Rubus pubescens Willow species Salix spp. Canada buffaloberry Shepherdia canadensis ^M Violet species Viloa spp. Total species in 2013 Viburnum edule Violet species Viloa spp. Total species in 2013 Cornus stolonifera Comon horsetail Equisetum arvense Woodland horsetail Equisetum arvense Woodland horsetail Equisetum sylvaticum <t< td=""><td></td><td></td><td>Bunchberry</td><td>Cornus canadensis</td><td></td></t<>			Bunchberry	Cornus canadensis	
Common fireweed Epilobium angustifuum Common horsetail Equisetum arvense Dwarf scouring-rush Equisetum arvense Wild strawberry Fragaria virginiana ^M Northern bedstraw Galium boreale ^M Stair-step moss Hylocomium splendens Twinflower Linnaea borealis Bishop's-cap Mitella nuda Lichens Pelaigera spp. Palmate-leaved coltstoot Petasties frigidus var. palmatus White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus themuloides Prickly rose Rosa acicularis ^M Dewberry Rubus pubescens Willow species Salix spp. Canada buffaloberry Shepherdia canadensis ^M Low-bush cranberry Viburnum edule Violet species in 2013 21 7 Green alder Alnus viridis Lindley's aster Aster ciliolatus Common horsetail Equisetum sylvaticum Northern bedstraw Galium boreale ^M Sweet-scented bedstraw Galium triflorum Sweet-			Red-osier dogwood	Cornus stolonifera	
Common horsetail Equisitum arvense Dwarf scouring-rush Equisitum scippides Wild strawberry Fragaria virginiana ^M Northern bedstraw Galium boreala ^M Stair-step moss Hylocomium splendens Twinflower Linneae borealis Bishop's-cap Mitella nuda Lichens Peligera spp. Palmate-leaved coltsfoot Petasites frigidus var. palmatus White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus termuloides Prickly rose Rosa acicularis ^M Dewberry Rubus pubescens Willow species Salix spp. Canada buffaloberry Shepherdia canadensis ^M Violet species Viloa spp. Total species in 2013 Zi 7 Green alder Lindley's aster Aster ciliolatus Bunchberry Comus canadensis Woodland horsetail Equisetum sylvaticum Northern bedstraw Galium boreale ^M Stair-step moss Hylocomium splendens Lindley's aster Aster ciliolatus			Common fireweed	Epilobium angustifolium	
Joward scouring-rush Equisitium scirpoides Wild strawberry Fragaria virginiana ^M Northern bedstraw Galium boreale ^M Stair-step moss Hylocomium splendens Twinflower Linnaee borealis Bishop's-cap Mitella nuda Lichens Peligera spp. Palmate-leaved coltsfoot Petasites frigidus var. palmatus White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus tremuloides Prickly rose Rosa acicularis ^M Willow species Salix spp. Canada buffaloberry Shepherdia canadensis ^M Low-bush cranberry Viburnum edule Violet species Viloa spp. 7 Green alder Alnus viridis Linnaee doweali Equisetum arvense Gomon horsetail Equisetum scinebri Northern bedstraw Galium boreale ^M Sweet-scented bedstraw Galium boreale Woodland horsetail Equisetum arvense Gomon horsetail Equisetum arvense <			Common horsetail	Equisetum arvense	
Wild strawberry Fragaria virginiana ^M Northern bedstraw Galium boreale ^M Stair-step moss Hylocornium splendens Twinflower Linnaea borealis Bishop's-cap Mitella nuda Lichens Peltigera spp. Palmate-leaved coltsfoot Petasites frigitus var. palmatus White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus tremuloides Prickly rose Rosa acicularis ^M Dewberry Rubus pubescens Willow species Salix spp. Canada buffaloberry Shepherdia canadensis ^M Low-bush cranberry Viburnum edule Violet species Viloa spp. Total species in 2013 Zi 7 Green alder Alnus viridis Lindley's aster Aster ciliolatus Bunchberry Cornus canadensis Woodland horsetail Equisetum arvense Woodland horsetail Equisetum sylendens Stair-step moss Hyloconium splendens Twinflower L			Dwarf scouring-rush	Equisetum scirpoidos	
Wild sträwberky Frägäria virginaria Northern bedstraw Galium boreale ^M Stair-step moss Hylocomium splendens Twinflower Linnaea borealis Bishop's-cap Mitella nuda Lichens Peltigera spp. Palmate-leaved coltsfoot Petasites frigidus var. palmatus White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus tremuloides Prickly rose Rosa acicularis ^M Dewberry Rubus pubescens Willow species Salix spp. Canada buffaloberry Shepherdia canadensis ^M Low-bush cranberry Viloar spp. Viloet species Viloa spp. 7 Green alder Alnus viridis Lindley's aster Aster ciliolatus Bunchberry Cornus canadensis Woodland horsetail Equisetum sylvaticum Northern bedstraw Galium triflorum Stair-step moss Hylocomium splendens Lindley's cap Equisetum sylvaticum Northern bedstraw					
Northern bedstraw Galium boreale ^{-m} Stair-step moss Hylocomium splendens Twinflower Linnaea borealis Bishop's-cap Mitella nuda Lichens Peltigera spp. Palmate-leaved coltsfoot Petasites frigidus var. palmatus White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus tremuloides Prickly rose Rosa acicularis ^M Dewberry Rubus pubescens Willow species Salix spp. Canada buffaloberry Shepherdia canadensis ^M Low-bush cranberry Viloa spp. Yotal species in 2013 2 7 Green alder Alnus viridis Lindley's aster Aster ciliolatus Bunchberry Cornus canadensis Woodland horsetail Equisetum arvense Woodland horsetail Equisetum sylvaticum Northern bedstraw Galium triflorum Stair-step moss Hyloconium splendens Twinflower Linaeles castrees Woodland horsetail Equisetum sylvaticum Northern bedstraw			wild strawberry	Fragaria Virginiana	
Stair-step moss Hylocomium splendens Twinflower Linnaea borealis Bishop's-cap Mitella nuda Lichens Peltigera spp. Palmate-leaved coltsfoot Petasites frigidus var. palmatus White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus termuloides Prickly rose Rosa acicularis ^M Dewberry Rubus pubescens Willow species Salix spp. Canada buffaloberry Shepherdia canadensis ^M Violet species Viloa spp. Total species in 2013 2i 7 Green alder Alnus viridis Lindley's aster Aster ciliolatus Bunchberry Cornus canadensis Woodland horsetail Equisetum arvense Woodland horsetail Equisetum sylvaticum Northern bedstraw Galium boreale ^M Sweet-scented bedstraw Galium triflorum Stair-step moss Hylocomium splendens Twinflower Linnaea borealis Bishop's-cap Mite			Northern bedstraw	Galium boreale™	
Twinflower Linnaea borealis Bishop's-cap Mitella nuda Lichens Petitigera spp. Palmate-leaved coltsfoot Petasites frigidus var. palmatus White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus tremuloides Prickly rose Rosa acicularis ^M Dewberry Rubus pubescens Willow species Salix spp. Canada buffaloberry Viburnum edule Violet species in 2013 21 7 Green alder Lindley's aster Aster ciliolatus Bunchberry Cornus sclonlifera Common horsetail Equisetum arvense Woodland horsetail Equisetum sylvaticum Northern bedstraw Galium triforum Sweet-scented bedstraw Galium tinforum Stair-step moss Hylocomium splendens Twinflower Linaea borealis Bishop's-cap Mitella nuda White spruce Picea glauca Schreber's moss Pleurozium schreberi <td< td=""><td></td><td></td><td>Stair-step moss</td><td>Hylocomium splendens</td><td></td></td<>			Stair-step moss	Hylocomium splendens	
Bishop's-cap Mitella nuda Lichens Peltigera spp. Palmate-leaved coltsfoot Petasites frigidus var. palmatus White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus tremuloides Prickly rose Rosa acicularis ^M Dewberry Rubus pubescens Willow species Salix spp. Canada buffaloberry Shepherdia canadensis ^M Low-bush cranberry Viburnum edule Violet species in 2013 21 7 Green alder Alnus viridis Lindley's aster Aster ciliolatus Bunchberry Cornus canadensis Red-osier dogwood Cornus canadensis Common horsetail Equisetum arvense Woodland horsetail Equisetum sylvaticum Northern bedstraw Galium boraele ^M Sweet-scented bedstraw Galium triflorum Stair-step moss Hylocornium splendens Twinflower Linnaea borealis Bishop's-cap Mitella nuda White spruce <td< td=""><td></td><td></td><td>Twinflower</td><td>Linnaea borealis</td><td></td></td<>			Twinflower	Linnaea borealis	
Lichens Peltigera spp. Palmate-leaved coltsfoot Petasites frigidus var. palmatus White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus tremuloides Prickly rose Rosa acicularis ^M Dewberry Rubus pubescens Willow species Salix spp. Canada buffaloberry Shepherdia canadensis ^M Low-bush cranberry Viburnum edule Violet species in 2013 21 7 Green alder Alnus viridis Lindley's aster Aster ciliolatus Bunchberry Cornus stolonifera Common horsetail Equisetum arvense Woodland horsetail Equisetum sylvaticum Northern bedstraw Galium boreale ^M Sweet-scented bedstraw Galium borealis Bishop's-cap Mitella nuda White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus tremuloides Kriight's plume moss Pleurozium schreberi Balsam poplar <td></td> <td></td> <td>Bishop's-cap</td> <td>Mitella nuda</td> <td></td>			Bishop's-cap	Mitella nuda	
Palmate-leaved coltsfoot Petasites frigidus var. palmatus White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus tremuloides Prickly rose Rosa acicularis ^M Dewberry Rubus pubescens Willow species Salix spp. Canada buffaloberry Viburnum edule Violet species Viloa spp. Total species in 2013 21 7 Green alder Lindley's aster Aster ciliolatus Bunchberry Cornus canadensis Woodland horsetail Equisetum arvense Woodland horsetail Equisetum sylvaticum Northern bedstraw Galium triflorum Stair-step moss Hylocornium splendens Twinflower Linnaea borealis Bishop's-cap Mitella nuda White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus tremuloides Total spece scence Picea glauca Knight's plume moss Pleurozium schreberi			Lichens	Peltigera spp.	
White spruce Picea glauca Schreber's moss Pieurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus tremuloides Prickly rose Rosa acicularis ^M Dewberry Rubus pubescens Willow species Salix spp. Canada buffaloberry Shepherdia canadensis ^M Low-bush cranberry Viburnum edule Violet species in 2013 21 7 Green alder Alnus viridis Lindley's aster Aster ciliolatus Bunchberry Cornus canadensis Red-osier dogwood Cornus stolonifera Common horsetail Equisetum arvense Woodland horsetail Equisetum sylvaticum Northern bedstraw Galium boreale ^M Sweet-scented bedstraw Galium triflorum Stair-step moss Hylocomium splendens Twinflower Linnaea borealis Bishop's-cap Mitel nuda White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus			Palmate-leaved coltsfoot	Petasites frigidus var. palmatus	
Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus tremuloides Prickly rose Rosa acicularis ^M Dewberry Rubus pubescens Willow species Salix spp. Canada buffaloberry Shepherdia canadensis ^M Low-bush cranberry Viburnum edule Violet species Viloa spp. Total species in 2013 21 7 Green alder Alrus viridis Lindley's aster Bunchberry Cornus canadensis Red-osier dogwood Cornus stolonifera Common horsetail Equisetum sylvaticum Northern bedstraw Galium boreale ^M Sweet-scented bedstraw Galium triflorum Stair-step moss Hylocomium splendens Twinflower Linnaea borealis Bishop's-cap Mitella nuda White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus tremuloides Knight's plume moss Pilium crista-castrensis Northern beokstraw Pilium crista-castrensis <td></td> <td></td> <td>White spruce</td> <td>Picea glauca</td> <td></td>			White spruce	Picea glauca	
Balsam poplar Populus balsamifera Trembling aspen Populus tremuloides Prickly rose Rosa acicularis ^M Dewberry Rubus pubescens Willow species Salix spp. Canada buffaloberry Shepherdia canadensis ^M Low-bush cranberry Viburnum edule Violet species Viloa spp. Total species in 2013 21 7 Green alder Lindley's aster Aster ciliolatus Bunchberry Cornus canadensis Red-osier dogwood Cornus canadensis Common horsetail Equisetum arvense Woodland horsetail Equisetum sylvaticum Northern bedstraw Galium boreale ^M Sweet-scented bedstraw Galium triflorum Stair-step moss Hylocomium splendens Twinflower Linnaea borealis Bishop's-cap Mitella nuda White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus tremuloides Knight's plume moss Ptilum crista-castrensis			Schreber's moss	Pleurozium schreberi	
Trembling aspen Populus tremuloides Prickly rose Rosa acicularis ^M Dewberry Rubus pubescens Willow species Salix spp. Canada buffaloberry Shepherdia canadensis ^M Low-bush cranberry Viburnum edule Violet species Viloa spp. Total species in 2013 21 7 Green alder Lindley's aster Aster ciliolatus Bunchberry Cornus canadensis Red-osier dogwood Cornus stolonifera Common horsetail Equisetum arvense Woodland horsetail Equisetum sylvaticum Northern bedstraw Galium boreale ^M Sweet-scented bedstraw Galium triflorum Stair-step moss Hylocomium splendens Twinflower Linneae borealis Bishop's-cap Mitella nuda White spruce Picea glaucca Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus tremuloides Kright's plume moss Ptilium crista-castrensis			Balsam poplar	Populus balsamifera	
Prickly rose Rosa acicularis ^M Dewberry Rubus pubescens Willow species Salix spp. Canada buffaloberry Shepherdia canadensis ^M Low-bush cranberry Viburnum edule Violet species Viloa spp. 7 Green alder Alnus viridis Lindley's aster Bunchberry Cornus canadensis Red-osier dogwood Cornus stolonifera Common horsetail Equisetum arvense Woodland horsetail Equisetum sylvaticum Northern bedstraw Galium boreale ^M Sweet-scented bedstraw Galium trifforum Stair-step moss Hylocomium splendens Twinflower Linnaea borealis Bishop's-cap Mitella nuda White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus tremuloides Knight's plume moss Ptilum crista-castrensis Nuthern pacenchery Bibano popa			Trembling aspen	Populus tremuloides	
Dewberry Rubus pubescens Willow species Salix spp. Canada buffaloberry Shepherdia canadensis ^M Low-bush cranberry Viburnum edule Violet species Viloa spp. 7 Green alder Lindley's aster Aster ciliolatus Bunchberry Cornus canadensis Red-osier dogwood Cornus canadensis Common horsetail Equisetum arvense Woodland horsetail Equisetum sylvaticum Northern bedstraw Galium boreale ^M Sweet-scented bedstraw Galium triflorum Stair-step moss Hylocomium splendens Twinflower Linnaea borealis Bishop's-cap Mitella nuda White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus balsamifera Tembling aspen Populus cartensis			Prickly rose	Rosa acicularis ^M	
Willow species Salix splosocins Canada buffaloberry Shepherdia canadensis ^M Low-bush cranberry Viburnum edule Violet species Viloa spp. 7 Green alder Alnus viridis Lindley's aster Aster ciliolatus Bunchberry Cornus canadensis Red-osier dogwood Cornus stolonifera Common horsetail Equisetum arvense Woodland horsetail Equisetum sylvaticum Northern bedstraw Galium boreale ^M Sweet-scented bedstraw Galium triflorum Stair-step moss Hylocomium splendens Twinflower Linnaea borealis Bishop's-cap Mitella nuda White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus tremuloides Knight's plume moss Ptillium crista-castrensis			Dewberry	Rubus pubescens	
Viniow species Saix spp. Canada buffaloberry Shepherdia canadensis ^M Low-bush cranberry Viburnum edule Violet species Viloa spp. 7 Green alder Alnus viridis Lindley's aster Aster ciliolatus Bunchberry Cornus canadensis Red-osier dogwood Cornus stolonifera Common horsetail Equisetum arvense Woodland horsetail Equisetum sylvaticum Northern bedstraw Galium boreale ^M Sweet-scented bedstraw Galium triflorum Stair-step moss Hylocomium splendens Twinflower Linnaea borealis Bishop's-cap Mitella nuda White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus tremuloides Knight's plume moss Ptilum crista-castrensis			Willow species	Salix snn	
Canada buriatoberry Shepherdia canadensis Low-bush cranberry Viburnum edule Violet species Viloa spp. 7 Green alder Alnus viridis Lindley's aster Aster ciliolatus Bunchberry Cornus canadensis Red-osier dogwood Cornus stolonifera Common horsetail Equisetum arvense Woodland horsetail Equisetum sylvaticum Northern bedstraw Galium boreale ^M Sweet-scented bedstraw Galium triflorum Stair-step moss Hylocomium splendens Twinflower Linnaea borealis Bishop's-cap Mitella nuda White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus tremuloides Knight's plume moss Ptilium crista-castrensis Narther accoekperry Bibao preacekperry			Canada huffalaharra	Shaphardia annadanaia ^M	
Low-busit cranberry Viburnum edule Violet species Viloa spp. Total species in 2013 21 7 Green alder Alnus viridis Lindley's aster Aster ciliolatus 21 8 Bunchberry Cornus canadensis 21 Common horsetail Equisetum arvense 21 Woodland horsetail Equisetum arvense 21 Woodland horsetail Equisetum sylvaticum Northern bedstraw Galium boreale ^M Sweet-scented bedstraw Galium triflorum Stair-step moss Hylocomium splendens Twinflower Linnaea borealis Bishop's-cap Mitella nuda White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus tremuloides Knight's plume moss Ptilium crista-castrensis Norths paceaberry Pibao ownaparthoidop					
Violet species Viloa spp. Total species in 2013 2i 7 Green alder Alnus viridis Lindley's aster Aster ciliolatus Bunchberry Cornus canadensis Red-osier dogwood Cornus stolonifera Common horsetail Equisetum arvense Woodland horsetail Equisetum sylvaticum Northern bedstraw Galium boreale ^M Sweet-scented bedstraw Galium triflorum Stair-step moss Hylocomium splendens Twinflower Linnaea borealis Bishop's-cap Mitella nuda White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus tremuloides Knight's plume moss Ptilium crista-castrensis					
7 Green alder Alnus viridis Lindley's aster Aster ciliolatus Bunchberry Cornus canadensis Red-osier dogwood Cornus stolonifera Common horsetail Equisetum arvense Woodland horsetail Equisetum sylvaticum Northern bedstraw Galium boreale ^M Sweet-scented bedstraw Galium triflorum Stair-step moss Hylocomium splendens Twinflower Linnaea borealis Bishop's-cap Mitella nuda White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus tremuloides Knight's plume moss Ptilium crista-castrensis				viloa spp.	
7Green alderAlnus viridisLindley's asterAster ciliolatusBunchberryCornus canadensisRed-osier dogwoodCornus stoloniferaCommon horsetailEquisetum arvenseWoodland horsetailEquisetum sylvaticumNorthern bedstrawGalium boreale ^M Sweet-scented bedstrawGalium triflorumStair-step mossHylocomium splendensTwinflowerLinnaea borealisBishop's-capMitella nudaWhite sprucePicea glaucaSchreber's mossPleurozium schreberiBalsam poplarPopulus balsamiferaTrembling aspenPopulus tremuloidesKnight's plume mossPtilum crista-castrensis		_	Total species in 2013		2
Lindley's asterAster ciliolatusBunchberryCornus canadensisRed-osier dogwoodCornus stoloniferaCommon horsetailEquisetum arvenseWoodland horsetailEquisetum sylvaticumNorthern bedstrawGalium borealeSweet-scented bedstrawGalium triflorumStair-step mossHylocomium splendensTwinflowerLinnaea borealisBishop's-capMitella nudaWhite sprucePicea glaucaSchreber's mossPleurozium schreberiBalsam poplarPopulus balsamiferaTrembling aspenPopulus tremuloidesKnight's plume mossPtilium crista-castrensisNorthern geosenberryPtilium crista-castrensis		7	Green alder	Alnus viridis	
BunchberryCornus canadensisRed-osier dogwoodCornus stoloniferaCommon horsetailEquisetum arvenseWoodland horsetailEquisetum sylvaticumNorthern bedstrawGalium borealeSweet-scented bedstrawGalium triflorumStair-step mossHylocomium splendensTwinflowerLinnaea borealisBishop's-capMitella nudaWhite sprucePicea glaucaSchreber's mossPleurozium schreberiBalsam poplarPopulus balsamiferaTrembling aspenPopulus tremuloidesKnight's plume mossPtilium crista-castrensisNorthern geosphormPiboo gwapanthoidoo			Lindley's aster	Aster ciliolatus	
Red-osier dogwoodCornus stoloniferaCommon horsetailEquisetum arvenseWoodland horsetailEquisetum sylvaticumNorthern bedstrawGalium borealeSweet-scented bedstrawGalium triflorumStair-step mossHylocomium splendensTwinflowerLinnaea borealisBishop's-capMitella nudaWhite sprucePicea glaucaSchreber's mossPleurozium schreberiBalsam poplarPopulus balsamiferaTrembling aspenPopulus tremuloidesKnight's plume mossPtilium crista-castrensisNarthern geosphornyBiba oxygeonthoiden			Bunchberry	Cornus canadensis	
Common horsetailEquisetum arvenseWoodland horsetailEquisetum sylvaticumNorthern bedstrawGalium borealeSweet-scented bedstrawGalium triflorumStair-step mossHylocomium splendensTwinflowerLinnaea borealisBishop's-capMitella nudaWhite sprucePicea glaucaSchreber's mossPleurozium schreberiBalsam poplarPopulus balsamiferaTrembling aspenPopulus tremuloidesKnight's plume mossPtilium crista-castrensis			Red-osier dogwood	Cornus stolonifera	
Woodland horsetailEquisetum sylvaticumNorthern bedstrawGalium borealeSweet-scented bedstrawGalium triflorumStair-step mossHylocomium splendensTwinflowerLinnaea borealisBishop's-capMitella nudaWhite sprucePicea glaucaSchreber's mossPleurozium schreberiBalsam poplarPopulus balsamiferaTrembling aspenPopulus tremuloidesKnight's plume mossPtilium crista-castrensisNorthern geosphornyPicea orygeopthoiden			Common horsetail	Equisetum arvense	
Northern bedstrawGalium borealeSweet-scented bedstrawGalium triflorumStair-step mossHylocomium splendensTwinflowerLinnaea borealisBishop's-capMitella nudaWhite sprucePicea glaucaSchreber's mossPleurozium schreberiBalsam poplarPopulus balsamiferaTrembling aspenPopulus tremuloidesKnight's plume mossPtilium crista-castrensisNarthern geosphernyPicea orygeopthoiden			Woodland horsetail	Equisetum sylvaticum	
Sweet-scented bedstrawGalium triflorumStair-step mossHylocomium splendensTwinflowerLinnaea borealisBishop's-capMitella nudaWhite sprucePicea glaucaSchreber's mossPleurozium schreberiBalsam poplarPopulus balsamiferaTrembling aspenPopulus tremuloidesKnight's plume mossPtilium crista-castrensisNarthern geospherryPicea orygeopthoiden			Northern bedstraw	Galium boreale ^M	
Stair-step mossHylocomium splendensTwinflowerLinnaea borealisBishop's-capMitella nudaWhite sprucePicea glaucaSchreber's mossPleurozium schreberiBalsam poplarPopulus balsamiferaTrembling aspenPopulus tremuloidesKnight's plume mossPtilium crista-castrensisNorthern geospherryPicea glauca			Sweet-scented bedstraw	Galium triflorum	
TwinflowerLinnaea borealisBishop's-capMitella nudaWhite sprucePicea glaucaSchreber's mossPleurozium schreberiBalsam poplarPopulus balsamiferaTrembling aspenPopulus tremuloidesKnight's plume mossPtilium crista-castrensisNorthern geospherryPicea glauca			Stair-step moss	Hylocomium splendens	
Bishop's-capMitella nudaWhite sprucePicea glaucaSchreber's mossPleurozium schreberiBalsam poplarPopulus balsamiferaTrembling aspenPopulus tremuloidesKnight's plume mossPtilium crista-castrensisNorthern geospherryPicea glauca			Twinflower	Linnaea borealis	
White spruce Picea glauca Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus tremuloides Knight's plume moss Ptilium crista-castrensis Northern geospherny Picea glauca			Bishop's-cap	Mitella nuda	
Write sprace Price grade Schreber's moss Pleurozium schreberi Balsam poplar Populus balsamifera Trembling aspen Populus tremuloides Knight's plume moss Ptilium crista-castrensis Northern geospherny Pilop ovygeonthoides			White spruce	Picea dauca	
Balsam poplar Populus balsamifera Trembling aspen Populus tremuloides Knight's plume moss Ptilium crista-castrensis Northern geospherny Pilop ovygeontheiden			Schrobor's mass	n icea yiauca Plourozium cobrobori	
Daisani popiai Populus baisamirera Trembling aspen Populus tremuloides Knight's plume moss Ptilium crista-castrensis Northern geospherny Pilos evygeoptheides			Balsam poplar	Pieurozium schreben Populuo bolcomiforo	
Formulation Populus tremuloides Knight's plume moss Ptilium crista-castrensis Northern geospherny Pilos evygeoptheides			Trambling canon	Populus baisamilera	
Knight's plume moss Ptillium crista-castrensis			I rembing aspen	Populus treinuloides	
			Ningrit's plume moss	Pillium crista-castrensis	
Notifient gooseberry Ribes oxyacantibutes			normern gooseberry	rtibes oxyacantholdes	

Total species in 2013		23
Low-bush cranberry	Viburnum edule	
Bog cranberry	Vaccinium vitis-idaea	
Canada buffaloberry	Shepherdia canadensis [™]	
Willow species	Salix spp.	
Dewberry	Rubus pubescens	
Prickly rose	Rosa acicularis	



Vegetation Species List by Plot

Transect #	Plot #	Species Common Name	Species Latin Name	
	8	Green alder	Alnus viridis	
		Bunchberry	Cornus canadensis	
		Red-osier dogwood	Cornus stolonifera	
		Common fireweed	Epilobium angustifolium	
		Common horsetail	Equisetum arvense	
		Dwarf scouring-rush	Equisetum scirpoides	
		Wild strawberry	Fragaria virginiana ^M	
		Northern bedstraw	Galium boreale ^M	
		Northern bastard toadflax	Geocaulon lividum	
		Common Labrador tea	Ledum groenlandicum	
		Bishon's-can	Mitella nuda	
		Studded leather lichen	Peltigera aphthosa	
		Palmate-leaved coltsfoot	Petasites frigidus var palmatus	
		White spruce	Picea dauca	
		Balsam poplar	Populus balsamifera	
		Northorn goosphorny	Pibos ovyacanthaidas	
		Drieldy read		
			Rosa acicularis	
		Dewberry	Rubus pubescens	
		Willow species	Salix spp.	
		Canada buffaloberry	Shepherdia canadensis™	
		Low-bush cranberry	Viburnum edule	
		Total species in 2013		21
	9	Wild sarsaparilla	Aralia nudicaulis	
		Bunchberry	Cornus canadensis	
		Red-osier dogwood	Cornus stolonifera	
		Wild strawberry	Fragaria virginiana [™]	
		Northern bedstraw	Galium boreale ^M	
		Sweet-scented bedstraw	Galium triflorum	
		Stair-step moss	Hvlocomium splendens	
		Twinflower	Linnaea borealis	
		Bishop's-cap	Mitella nuda	
		White spruce	Picea glauca	
		Schreber's moss	Pleurozium schreberi	
		Balsam poplar	Populus balsamifera	
		Trembling aspen	Populus tremuloides	
		Driekly roop		
		Prickly rose	Rosa acicularis	
		Dewberry	Rubus pubescens	
		willow species		
		Canada buffaloberry	Shepherdia canadensis [™]	
		Common dandelion	Taraxacum officinale	
		Low-bush cranberry	Viburnum edule	
		Total species in 2013		19
	10	Green alder	Alnus viridis	
		Lindley's aster	Aster ciliolatus	
		Bunchberry	Cornus canadensis	
		Red-osier dogwood	Cornus stolonifera	
		Wild strawberry	Fragaria virginiana ^M	
		Northern bedstraw	Galium boreale [™]	
		Twinflower	Linnaea borealis	
		Wild lily-of-the-vallev	Maianthemum canadense	
		Bishop's-cap	Mitella nuda	
		Palmate-leaved coltsfoot	Petasites frigidus var. palmatus	
		White spruce	Picea glauca	
		Balsam poplar	Populus balsamifera	
		Trembling aspen	Populus tremuloides	
		Prickly rose	Rosa acicularis ^M	
		Dewberry	Rubus nubescens	
		Willow species	Salix snn	
		l ow-bush cranberry	Viburnum edule	
		Kidney-leaved violat	Viola renifolia	
		Total species in 2013		10
			Ashillas milletalium H	10
	11	Common yarrow		
		iviany-flowered yarrow	Achiliea sibirica	
		Awnless brome	Bromus inermis	
		Slender wheatgrass	Elymus trachycaulus™	
		Common fireweed	Epilobium angustifolium	
		Common horsetail	Equisetum arvense	
		White sweet-clover	Melilotus alba ^M	
		Kentucky bluegrass	Poa pratensis	
		Common dandelion	Taraxacum officinale	
		Wild vetch	Vicia americana ^M	
		Total species in 2013		10
	1	1 Juai species III 2013		10



Table A4–1

resources & energy

Vegetation Species List by Plot

Transect #	Plot #	Species Common Name	Species Latin Name
	12	Common varrow	Achillea millefolium ^H
		Many-flowered yarrow	Achillea sibirica
		Rough hair grass	Agrostis scabra
		Common fireweed	Epilobium angustifolium
		Common horsetail	Equisetum arvense
		Wild strawberry	Fragaria virginiana ^M
		Foxtail barley	Hordeum jubatum ^H
		Alfalfa	Medicado sativa ^M
		White sweet clover	
		Vollow swoot-clover	Melilotus alba Melilotus officinalis
		White spruce	Picea dauca
		Common plantain	Plantago major
		Kentucky bluegrass	Poa pratensis
		Willow species	Salix spp
		Common dandelion	Taraxacum officinale
		Alsike clover	Trifolium hybridum
		Wild vetch	Vicia americana ^M
		Total species in 2013	17
	13	Green alder	Alpus viridis
	15	Lindley's aster	Aster ciliolatus
		White birch	Retula papyrifera
		Sedae species	Carex spp
		Lichens	Cladonia spp.
		Bunchberry	Cornus canadensis
		Red-osier dogwood	Cornus stolonifera
		Dwarf scouring-rush	Fauisetum scirpoides
		Woodland horsetail	Equisetum svlvaticum
		Wild strawberry	Fragaria virginiana ^M
		Northern bedstraw	Galium boreale ^M
		Northern bestard toadflax	Gallulli boleale Goocoulon lividum
		Stair-sten moss	Hylocomium splendens
		Twinflower	l innaea borealis
		Wild lily-of-the-valley	Majanthemum canadense
		Bishop's-cap	Mitella nuda
		One-flowered wintergreen	Moneses uniflora
		Studded leather lichen	Peltigera aphthosa
		Dog lichen	Peltigera canina
		Carpet pelt lichen	Peltigera neopolvdactvla
		Palmate-leaved coltsfoot	Petasites frigidus var. palmatus
		White spruce	Picea glauca
		Schreber's moss	Pleurozium schreberi
		Knotweed species	Polygonum spp.
		Balsam poplar	Populus balsamifera
		Trembling aspen	Populus tremuloides
		Prickly rose	, Rosa acicularis
		Dewberry	Rubus pubescens
		Willow species	Salix spp.
		Canada buffaloberry	Shepherdia canadensis ^M
		Low-bush cranberry	, Viburnum edule
		Total species in 2013	31
	14	Bunchberry	Cornus canadensis
		Northern bastard toadflax	Geocaulon lividum
		Stair-step moss	Hylocomium splendens
		Twinflower	Linnaea borealis
		Bishop's-cap	Mitella nuda
		White spruce	Picea glauca
		Trembling aspen	Populus tremuloides
		Prickly rose	Rosa acicularis [™]
		Canada buffaloberry	Shepherdia canadensis
		Low-bush cranberry	Viburnum edule
		Total species in 2013	10
	15	White birch	Betula papyrifera
		Bunchberry	Cornus canadensis
		Red-osier dogwood	Cornus stolonifera
		Common horsetail	Equisetum arvense
		Dwarf scouring-rush	Equisetum scirpoides
		Wild strawberry	Fragaria virginiana ^M
		Northern bedstraw	Galium boreale ^M
		Stair-step moss	Hylocomium splendens
		Twinflower	Linnaea borealis
		Bishop's-cap	Mitella nuda
		Palmate-leaved coltsfoot	Petasites frigidus var. palmatus
		White spruce	Picea glauca
		Schreber's moss	Pleurozium schreberi
		Trembling aspen	Populus tremuloides
		Knight's plume moss	Ptilium crista-castrensis
		Prickly rose	Rosa acicularis ^M
		Dewberry	Rubus pubescens
		Canada buffaloborny	Shenherdia canadensis ^M
		Total species in 2012	
		1 Juai species 111 2013	



Table A4–1

resources & energy

Vegetation Species List by Plot

PROJECT NO.: 307074-01860-100

Transect #	Plot #	Species Common Name	Species Latin Name	
	16	Green alder	Alnus viridis	
		Lindley's aster	Aster ciliolatus	
		White birch	Betula papyrifera	
		Bluejoint	Calamagrostis canadensis ^{M-H}	
		Reindeer lichen	Cladonia rangiferina	
		Lichens	Cladonia spp.	
		Bunchberry	Cornus canadensis	
		Red-osier dogwood	Cornus stolonifera	
		Common fireweed	Epilobium angustifolium	
		Northern willowherb	Epilobium ciliatum	
		Common horsetail	Equisetum arvense	
		Dwarf scouring-rush	Equisetum scirpoides	
		Woodland strawberry	Fragaria vesca	
		Wild strawberry	Fragaria virginiana ^M	
		Northern bedstraw	Galium boreale ^M	
		Stair-step moss	Hylocomium splendens	
		Purple peavine	Lathvrus venosus	
		Twinflower	Linnaea borealis	
		Bishon's-can	Mitella nuda	
		One-flowered wintergreen	Moneses uniflora	
		Carpet pelt lichen	Peltigera neopolydactyla	
		Palmate-leaved coltsfoot	Petasites frigidus var palmatus	
		White spruce	Picea glauca	
		Blunt-leaved bog orchid	Platanthera obtusata	
		Schreber's moss	Pleurozium schreberi	
		Trembling aspen	Populus tremuloides	
		Prickly roso		
		Dowborn	Rubus nuboscons	
			Rubus pubescens	
		Canada buffaloberry	Shepherdia canadensis [™]	
		Low-bush cranberry	Viburnum edule	
		Kidney-leaved violet	Viola renifolia	
	47	Total species in 2013	Alous viridio	33
	17		Annus Vinuis	
		Aster species	Aster spp.	
		Bunchberry Bed easier degwood		
		Wild strawberry	Fragaria Virginiana	
		Stair-step moss	Hylocomium spienaens	
		Common Labrador tea	Ledum groenlandicum	
			Linnaea borealis	
		Stiff club-moss	Lycopodium annotinum	
		Bishop's-cap	Mitella nuda	
		Palmate-leaved coltsfoot	Petasites frigidus var. palmatus	
		vvnite spruce	Picea glauca	
		Baisam poplar	Populus balsamitera	
		Knight's plume moss	Ptilium crista-castrensis	
		Bristly black currant		
		Prickly rose	Rosa acicularis [™]	
		Willow species	Salix spp.	
		Low-bush cranberry	Viburnum edule	
		Kidney-leaved violet	Viola renifolia	-
		Total species in 2013		20
	18	Green alder	Ainus viridis	
		Red-osier dogwood	Cornus stolonitera	
			Epilobium angustifolium	
		Common norsetall	Equisetum arvense	
		Stair-step moss	Hylocomium spiendens	
		Bisnop's-cap	IVIITEIIA NUCA	
		Palmate-leaved coltsfoot	Petasites trigidus var. palmatus	
		White spruce	Picea glauca	
		Balsam poplar	Populus balsamifera	
		I rembling aspen	Populus tremuloides	
		Drickly roco	Rosa acicularis [™]	
		FILCKIY IUSE		
		Dewberry	Rubus pubescens	
		Dewberry Canada buffaloberry	Rubus pubescens Shepherdia canadensis ^M	
		Dewberry Canada buffaloberry Low-bush cranberry	Rubus pubescens Shepherdia canadensis ^M Viburnum edule	

<u>NOTES:</u> ^M medium salinity tolerance, ^H high salinity tolerance (CEMA 2012).

Figures





DATE & TIME: 17/03/2014 9/38/12 AM USER NAME: EGI9J:HOBOR DATE & TIME: 30/09/2014 2:34:17 PM ISSUING OFFICE: CALGARY GIS

SAVE







Photographs





APACHE CANADA LIMITED 2013 VEGETATION ASSESSMENT POINTED MOUNTAIN FORMER GAS FIELD, NWT

Vegetation Assessment Photographs



Photo A4–1 Vegetation Community Class Broadleaf – Open; Control Plot 2; Aspen Dominant Forest – (a), and Minor Chlorosis and Decreased Vigour on White Spruce – (b)



Photo A4–2 Vegetation Community Class Coniferous – Open; Control Plot 8; Coniferous dominant forest – (a), and Understory Dominated by Common Horsetail – (b)





APACHE CANADA LIMITED 2013 VEGETATION ASSESSMENT POINTED MOUNTAIN FORMER GAS FIELD, NWT



Photo A4–3 Vegetation Community Class Coniferous – Open; Impact Plot 15; Coniferous Dominant Forest from NE Corner – (a), and Necrosis on Canada Buffaloberry – (b)



Photo A4–4 Vegetation Community Class Mixedwoods – Open; Control Plot 4; Mixedwood Forest – (a), and Canada Buffaloberry with Good Vigour – (b)





APACHE CANADA LIMITED 2013 VEGETATION ASSESSMENT POINTED MOUNTAIN FORMER GAS FIELD, NWT



Photo A4–5 Vegetation Community Class Mixedwoods – Open; Impact Plot 9; Mixedwood Forest with High Tree Mortality – (a), and Prickly Rose with Chlorosis and Necrosis – (b)



Photo A4–6 Vegetation Community Class Forb (Graminoid – Disturbed); Control Plot 11, Disturbed Graminoid Area – (a), and Graminoid Vegetation – (b)





APACHE CANADA LIMITED 2013 VEGETATION ASSESSMENT POINTED MOUNTAIN FORMER GAS FIELD, NWT



Photo A4–7 Vegetation Community Class Forb (Graminoid – Disturbed); Impact Plot 12; Disturbed Graminoid Area With Bare Ground Areas – (a), and Ground Cover in Disturbed Area with Alien Species Foxtail Barley – (b)

