CHARACTERIZATION OF VEGETATION ENVIRONMENT AND EFFECTS ASSESSMENT – PROJECT 7A

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BASELINE VEGETATION DATA

FINAL REPORT

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EXECUTIVE SUMMARY

Manitoba Floodway and East Side Road Authority (MFESRA) has been tasked to provide improved, safe, and more reliable transportation services among all of the communities on the East Side of Lake Winnipeg. Part of this initiative is to construct an all-season road from Little Grand Rapids First Nation and Pauingassi First Nation to Little Grand Rapids Airport. To assist with Environment Act proposal and project design, MFESRA is required to conduct a vegetation study to provide an adequate understanding of the vegetation environment and conditions in the Project Assessment Area. The vegetation baseline data will allow MFESRA to avoid or minimize any adverse environmental effects caused by road construction on existing vegetation, especially rare species and Plant Species of Interest. Species of Interest are those that are traditionally used by Aboriginal people for medicinal, subsistence and/or cultural purposes.

A vegetation survey was conducted in the project study area between September 21 – 26, 2013. As part of the vegetation study, existing forest inventory data was accessed to help develop a sample design of the forest types along the proposed route. Eleven forest cover types, representing 89 per cent of the area occupied by the route were sampled. Fifteen vegetation and soil plots were surveyed and a total of 68 species of vascular plants, 4 species of lichen and 3 species of moss were documented in plot and from off plot observations. Based on existing plant information in Punter (1993), descriptions of forest communities in Zoladaski et al (1995) and the experience of the survey team, the plant and soils data collected during the survey is consistent with the vegetation communities expected to be found along the proposed route, according to the existing land classification data available from Manitoba Land Initiative (MLI)

No species protected under the Federal Species at Risk Act (SARA) or Manitoba Endangered Species Act were found in the study area. Six “Species of Conservation Concern”, which are species that are rare, disjunct, or at risk throughout their range or in Manitoba and in need of further research were observed. Ten “Plant species of Interest’ were found during the survey. Given the time of year the survey was conducted, positive identification of some species was difficult while some early-flowering species were missed altogether.

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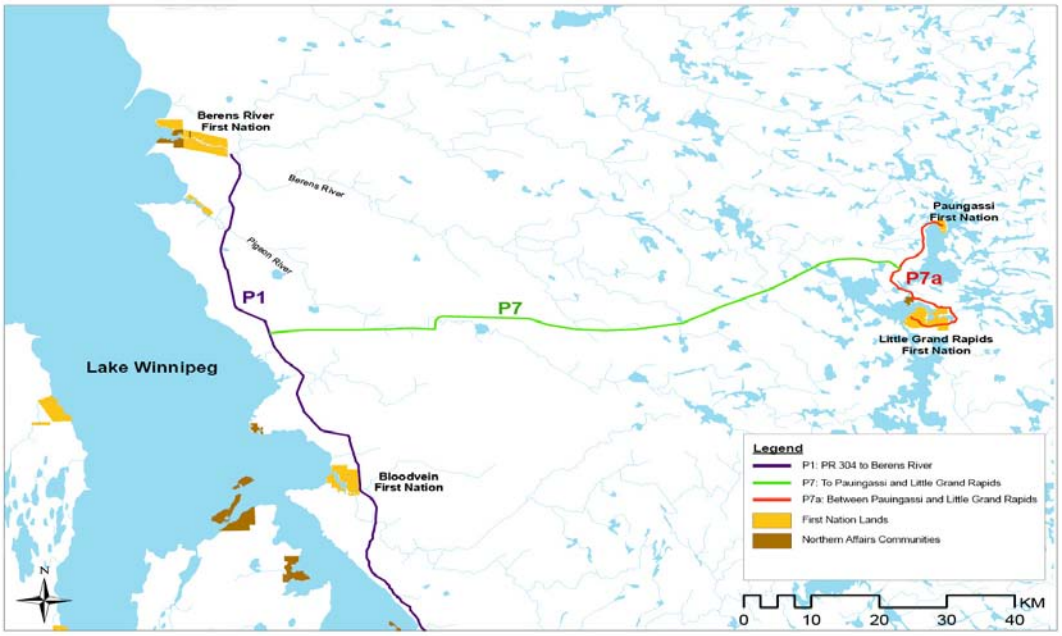
1.0 INTRODUCTION

One initiative of the Manitoba Floodway and East Side Road Authority (MFESRA) is to provide a safe transportation corridor connecting Little Grand Rapids (LGR) and Pauingassi First Nations to the LGR Airport (Figure 1). The proposed all-season road, approximately 36.7 km in length, linking Pauingassi First Nation, Little Grand Rapids First Nation to the Little Grand Rapids Airport will require an Environmental Impact Assessment (EIA). In support of the EIA, MFESRA has requested the services of Scatliff+Miller+Murray Inc. to conduct a vegetation survey to better understand the site conditions along the route and to collect vegetation baseline data. The goal of the vegetation survey was to characterize the vegetation environment and document the presence of species listed under the federal Species at Rick Act, Manitoba Endangered Species Act (rare plants) and species that are traditionally used for medicinal, subsistence or cultural purposes along the route. The results of which would be for use in the development of mitigation measures in the protection plan where necessary.

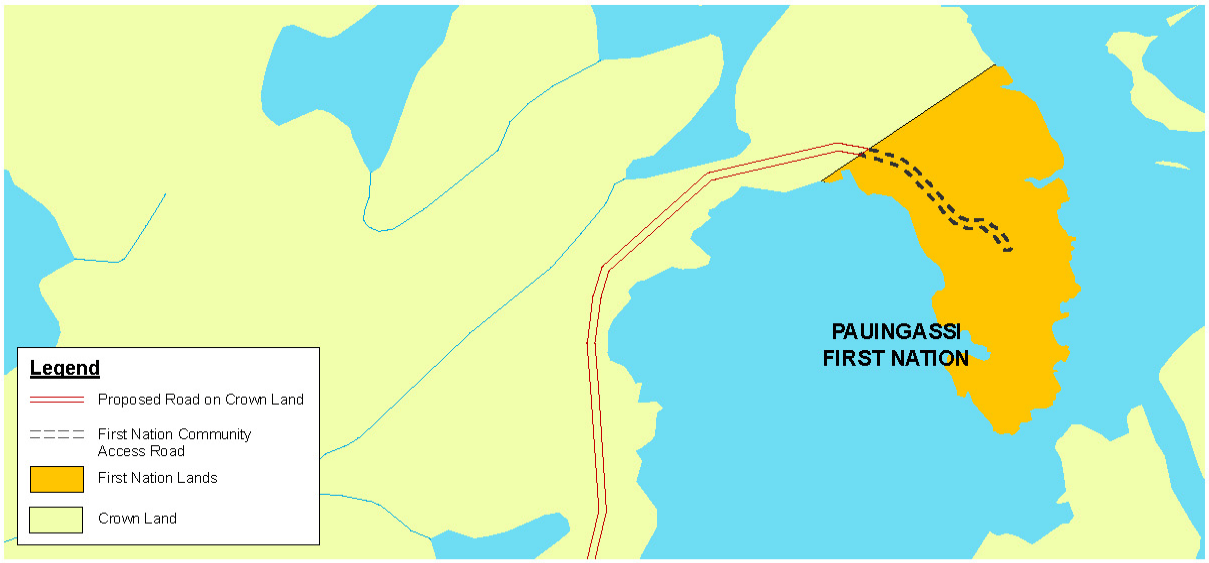


Source: MFESRA, 2013

Figure 1. Map of Pauingassi and Little Grand Rapids First Nations Vegetation Study Area, – Project 7a.

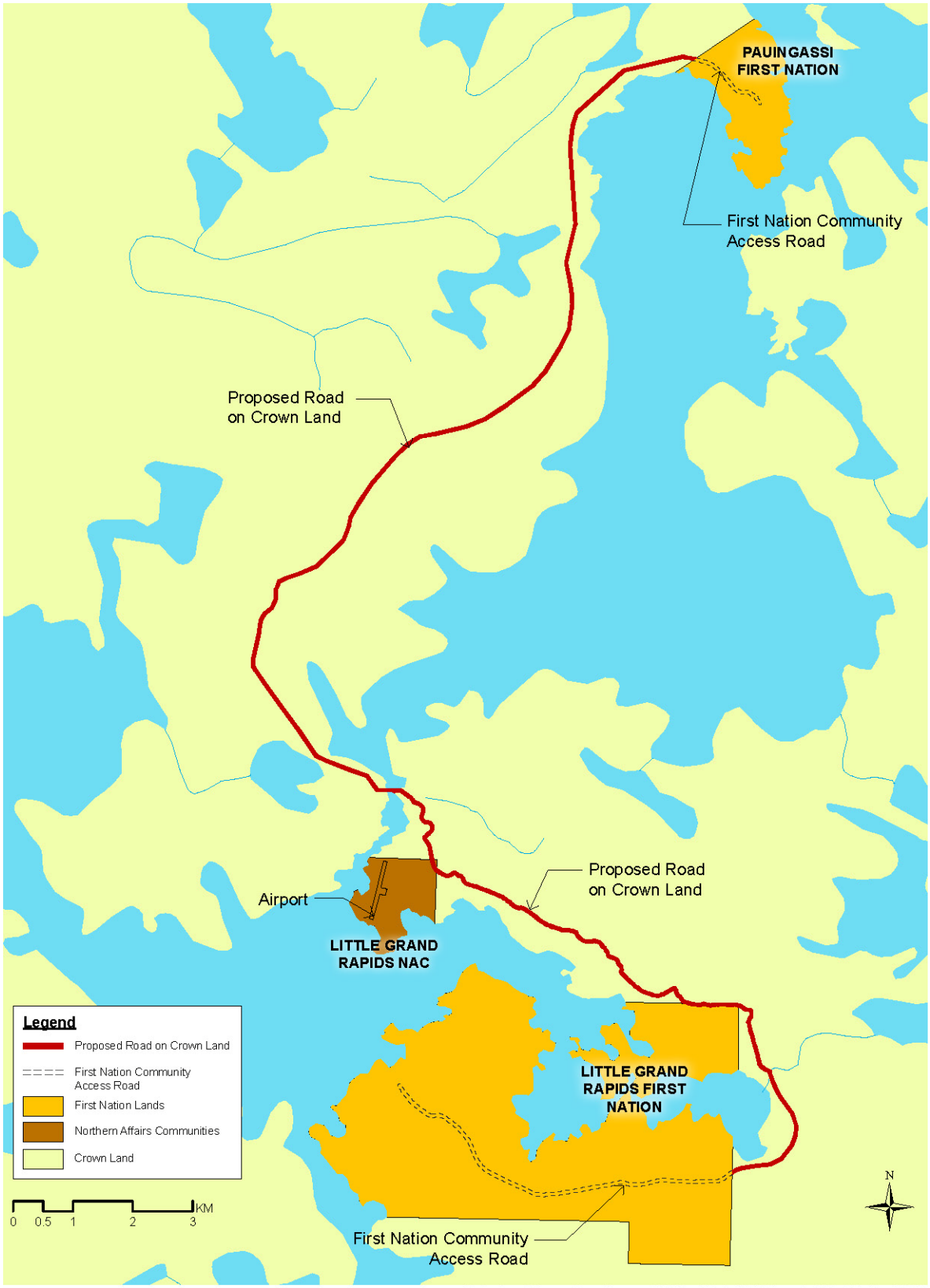
The route dissects three administrative land units – Pauingassi First Nation (F/N) Reserve Land, Little Grand Rapids F/N Reserve Land and Provincial Crown Land. At the northern end of the proposed alignment, the Pauingassi Reserve Access Road is 1.2 km in length (Figure 2). Proceeding south, the route

dissects Provincial Crown Land for a distance of 28.9 km (Figure 3). The Little Grand Rapids Reserve Access Road makes up the remaining 6.6 km of the proposed route (Figure 4).



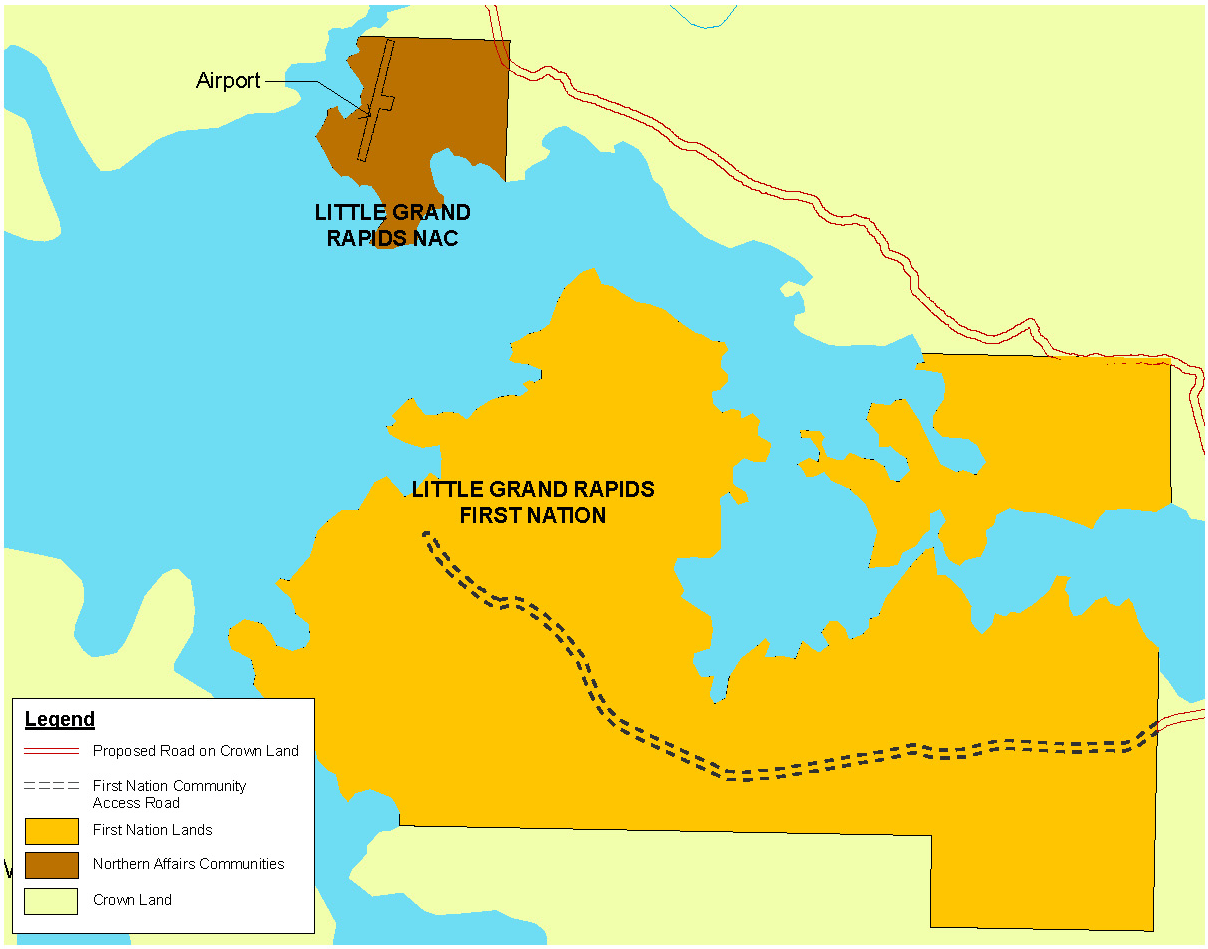
Adapted from GeoBase, 2013; MLI, 2013 and MFESRA, 2013

Figure 2. Pauingassi Reserve Access Road section of Proposed All-Season Road – Project 7a.



Adapted from GeoBase, 2013; MLI, 2013 and MFESRA, 2013

Figure 3. Provincial Crown Land section of proposed All-Season Road – Project 7a.



Adapted from GeoBase, 2013; MLI, 2013 and MFESRA, 2013

Figure 4. Little Grand Rapids Reserve Access Road section of Proposed All-Season Road – Project 7a.

The vegetation survey took place between September 21 and 26, 2013. Baseline vegetation data collection activities included the identification and description of the various plant communities as well as the associated soils. In addition, any rare or endangered plant species, as well as unique vegetation occurrences were also documented.

2.0 Study Area

2.1 Lac Seul Upland Ecoregion

The study area is located in the Lac Seul Upland Ecoregion, a region of the province within the Boreal Shield Ecozone. Lac Seul Upland is classified as having a subhumid mid-boreal ecoclimate with warm summers and very cold winters. This ecoregion is comprised of many forest cover types which are dominated primarily by coniferous species such as black spruce, jack pine and balsam fir. Although spruce and pine are dominant, they seldom occur in pure stands along the southern portion of the boreal forest where the study area is located. Depending on site conditions, they often grow with other species such as trembling aspen, balsam poplar or white birch, forming mixed-wood stands. In bogs and fens, black spruce is the dominant species with tamarack making up a minor component in poorly drained areas. The landscape of the ecoregion is marked by undulating outcrops of bedrock, shallow layers of glacial till, glaciolacustrine deposits and wetlands.

2.2 First Nations Communities

Little Grand Rapids and Pauingassi First Nations are located approximately 260km northeast of Winnipeg, Manitoba and within 12 km of the Ontario border. Currently, the only road access to the communities is by winter road from Bloodvein First Nation. The communities are linked in winter by an ice road on Family Lake. The Little Grand Rapids airport is located approximately 2 km northwest from LGR Reserve and 13km southwest from Pauingassi Reserve and is accessible by boat in summer, winter road, and helicopter in spring and fall during ice break-up and freeze-up.

3.0 METHODS

3.1 DEVELOPMENT OF SURVEY DESIGN

3.1.1 Survey Design

The Manitoba Land Initiative (MLI), provides various types of geographic data for government departments and the public (MLI, 2013). The MLI was the source of information on the regions plant communities used for this study. From the MLI, a forest cover map was produced from the forest cover dataset in the Forest Inventory category which delineates all the forest subtypes encountered along the proposed route (Figure 5). In the hierarchy of land classification used in the Manitoba Forest Inventory program, the primary division in land classification is on the basis of land being either "Forested" or "Non-Forested" (Manitoba Forestry,1998). In the "Forested" division of land classification, there is the "Productive Forest" and "Non-Productive Forest" categories. Using provincial forest mapping nomenclature, most of the forest subtypes occurring along the route fall under the four broad forest cover types which include "Softwood", "Mixedwood" (softwood dominant [s/h]) , "Mixedwood" (hardwood dominant [h/s]) and "Hardwood" which are within the "Productive Forest" category of "Forested Land" (Manitoba Forestry,1998). The remaining forest subtypes sampled such as "Treed Muskeg" and "Treed Rock" fall under the "Non-Productive Forest" category (Ibid, 1998).

The proposed alignment was superimposed on the forest cover map to identify what forest subtypes occurred along the route. Based on a 60m wide Right-of-Way (ROW) and 36km in length, the area of the route represented by each forest cover subtype was calculated (Table 1). Eleven forest subtypes were selected for the study representing 89.1% of the area in the ROW (Table 2). The remaining 10.9% of the area fell under "Non-Forested Land" such as townsites, roads, and area occupied by water and excluded from the survey

Some forest subtypes were selected based on the large percentage in area they occupied of the route, while the remaining subtypes were chosen to ensure adequate representation in the cover types (Softwood, Mixedwood [s/h], Mixedwood [h/s]), as well as in species (black spruce, jack pine and trembling aspen). The number of plots selected for each subtype was relatively proportionate to the area it occupied along the route. S+M+M selected the forest subtypes that occupied the greatest area and those

anticipated to contain unique or uncommon species. The only exception to the above selection criteria was in regards to Forest Subtype 53 (3.35% of area), which was excluded from the survey. The shrub and ground cover species associated with this forest subtype are not a unique assemblage of plants and typically occur in a wide range of forest habitats. In contrast, a very small area occupied by Forest Subtype 702 – Tamarack/Treed Muskeg (0.58% of area) was sampled in particular on account of the moisture regime or degrees of wetness. Due to site conditions unique to this forest subtype, there is a greater likelihood of encountering species that occur in no other plant community along the route. Based on the composition and number of forest cover types, transportation costs and time, plots surveyed per day and available sunlight in mid September, 15 plots were chosen to complete the survey.

Table 1: Forest subtypes, area (ha), and cover (%) of each subtype along proposed route.

Code	Cover Classification "Forested"	Area (m^2)	Hectares	Percentage
6	Jack Pine 40-70%; 2nd major species Spruce	441,913	44.20	19.70
4	Jack Pine 71-100%	377,496	37.70	16.83
81	Trembling Aspen: 2nd major species Jack Pine	334,389	33.44	14.91
44	Jack Pine 51%; 2nd major species Hardwood	206,384	20.64	9.20
13	Black Spruce 71-100%	201,418	20.10	8.98
46	Jack Pine <50%; 2nd major species Spruce; 3rd major species Hardwood	135,260	13.53	6.03
82	Trembling Aspen: 2nd major species Spruce or Balsam Fir	123,971	12.40	5.53
53	Black Spruce 51%+; 2nd major species Hardwood	75,118	7.51	3.35
14	Black Spruce 40-70%; 2nd major species Jack Pine	73,855	7.39	3.29
701	Black Spruce Treed Muskeg	58,721	5.87	2.62
711	Jack Pine Treed Rock	31,314	3.13	1.40
15	Black Spruce 40-70%; 2nd major Balsam Fir	20,075	2.01	0.89
58	Black Spruce 50% or less; 2nd major sp. White Spruce; 3rd major species Hdwd	19,718	1.97	0.88
16	Black Spruce 40-70%; 2nd major species Tamarack/Larch	19,458	1.95	0.87
90	Trembling Aspen	10,100	1.01	0.45
702	Tamarack/Larch Treed Muskeg	12,966	1.30	0.58
11	White Spruce 40-70%; 2nd major species Jack Pine	5,934	0.59	0.26
	Cover Classification "non-Forested"			
844	Transmission Lines - Pipelines	51,912	5.19	2.31
848	Beaver Flood	36,447	3.64	1.62
900	Water	6,627	0.67	0.30
	Total	2,243,076	224.24	100.00

Source: MLI, 2013.

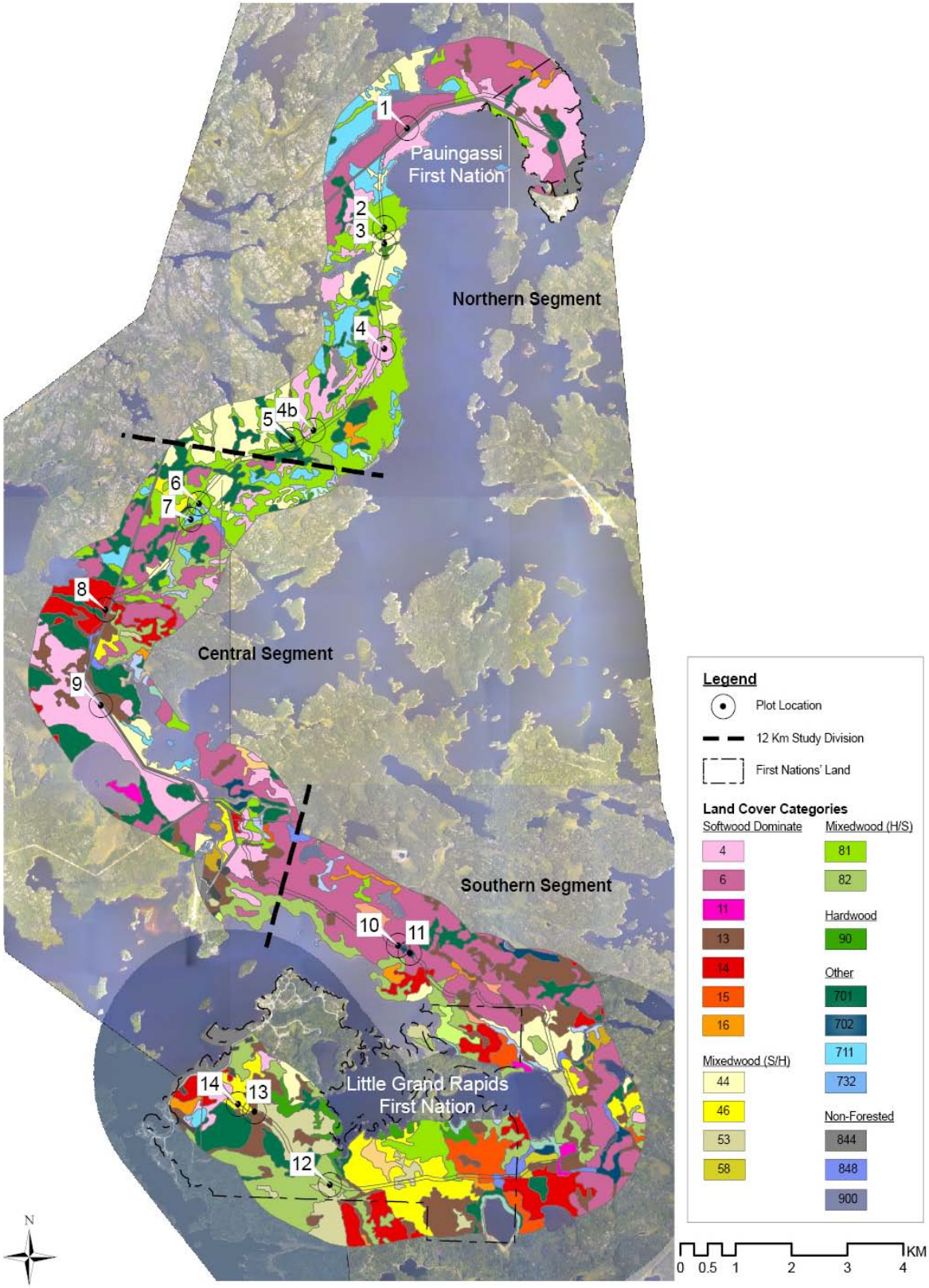
The 36km route was divided into 3 – 12km segments and an effort was made to spread the 15 survey plots amongst the 3 units as equally as possible (Figure 5). The location of the boundary between the northern

and middle segments corresponded closely to the boundary that separates the traditional resource use areas for each First Nations community. There were no pre-survey assessments of the forest stands prior to the field surveys beyond initial reconnaissance made from the helicopter prior to landing.. Therefore, plots were randomly placed in the respective forest cover subtypes under the premise that each subtype was an homogenous entity. A detailed map of the forest subtypes and the respective plots is presented in Appendix I. The system of classification for Forest Inventory is based on the dominant vegetation layer – the tree canopy. The purpose of this classification is primarily for timber productivity and usually ignores details in composition and pattern of undergrowth species (Mueller-Dombois and Ellenberg, 1974). Occasionally, there is a range of moisture conditions, soil types and slope within a stand which results in a non-uniform distribution of plant species. However, the aim of this vegetation survey was to capture the floristic diversity of the plant assemblages that were most representative of the sampled forest stands along the proposed route and attempt to verify the presence/absence of "*Species of Conservation Concern"* and "*Species of Interest*".

Table 2: Forest cover type, cover (%), number of plots and description of each forest subtype sampled along the proposed route – Project 7a.

Code	Cover Type	% of Route	# of plots	Description
6	*softwood*	19.7	2	Jack Pine 40-70%: 2nd major species Spruce
4	*softwood*	16.8	2	Jack Pine 71-100%
13	*softwood*	9.0	1	Black Spruce 71-100%
14	*softwood*	3.3	1	Black Spruce 40-70%: 2nd major species Jack Pine
711	*softwood*	1.4	1	Jack Pine treed rock
44	*mixedwood (s/h)*	9.2	1	Jack Pine 51%: 2nd major species Hardwood
46	*mixedwood (s/h)*	6.1	1	Jp <50%: 2nd major species Spruce: 3rd major species Hardwood
81	*mixedwood (h/s)*	14.9	3	Trembling Aspen: 2nd major species Jack Pine
82	*mixedwood (h/s)*	5.5	1	Trembling Aspen: 2nd major species Spruce or Balsam Fir
701	*Other*	2.6	1	Black Spruce Treed Muskeg
702	*Other*	0.6	1	Tamarack/Larch Treed Muskeg
	Total	89.1	15	

Source: MLI, 2013



Adapted from: MLI, 2013

Figure 5. Forest Subtypes and Plot Locations along Proposed All-Season Road – Project 7a.

3.1.2 Plot, Sub-plot and Quadrat Sizes

The size of the sampling areas for tree, shrub and ground cover strata at each sampling location were adopted from the vegetation sampling protocol employed by Manitoba Conservation. These sampling protocols have been used to inventory numerous Wildlife Management Areas for Manitoba Conservation and in vegetation research projects in northern Manitoba for Manitoba Hydro. At each of the 15 locations, a vegetation "*plot*" was setup to measure tree, shrub and ground cover vegetation (Figure 6).

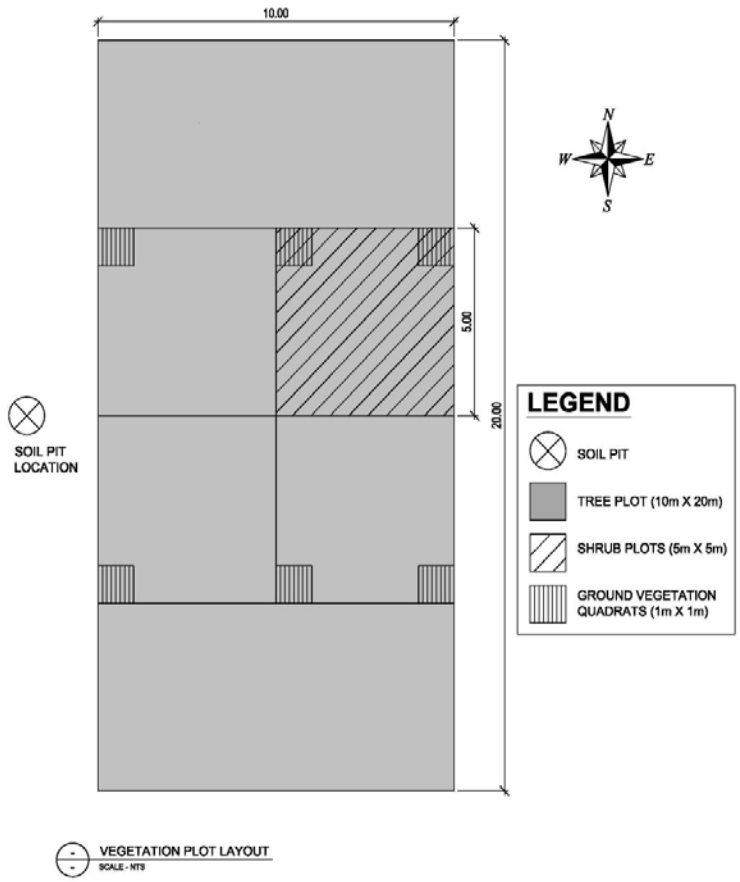


Figure 6. Configuration and Dimensions of Sampling Areas and Soil Pit Location at a Vegetation Plot.

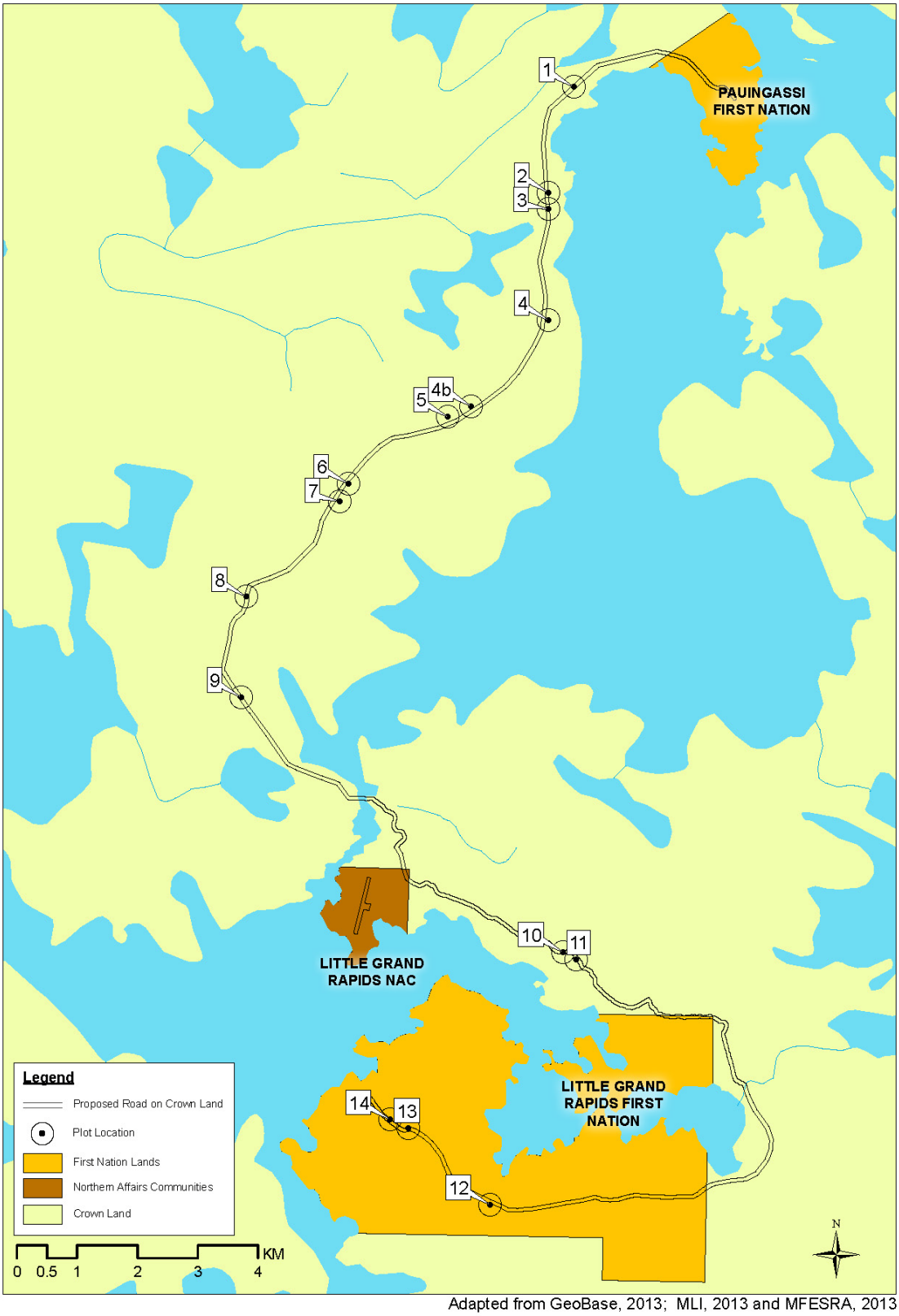
In this report, "*plot*" is used in a general collective sense and will be referred to hereafter as vegetation plot. As indicated in Roberts-Pichette and Gillespie (1999), plot and quadrat are standard terms used for measured areas of vegetation used for sampling. The area to sample trees was 10m x 20m (200m^2) and will be referred to as the tree plot. The area for sampling shrubs, nested inside the tree plot (200m^2) plot,

was 5m x 5m (25m^2) and will be referred to as the shrub sub-plot. The area for sampling the ground cover vegetation was comprised of 6 – 1m^2 quadrats evenly spaced in the 200m^2 plot (Figure 6). The layout of the various measured areas at each plot, as illustrated in Figure 6, was the same for all 15 plots. The soil pit was established 5m outside and at the mid-point of the plot on the west side. Placing the soil pit outside the plot prevented any trampling of the ground cover and shrub vegetation inside the plot.

3.1.3 Vegetation Plots on Reserve Land

The proposed route (Project 7a) is located on lands designated as First Nations Reserve, Provincial Northern Affairs, and Provincial crown (Figure 7). Three vegetation plots including 12, 13 and 14 were established on Little Grand Rapids First Nation Reserve Land with the remaining 12 plots established on Provincial Crown land. No plots were established on Pauingassi Reserve Land because most of the route through the reserve was in close proximity to the hydro transmission line ROW. Although only 20% of the plots were on reserve land, the importance of the area to the people of both First Nations communities extends well beyond the reserve boundary. The survey design took into account traditional resource use areas, the cultural and traditional uses of plants, and local aboriginal knowledge of the land.

A First Nations field assistant was selected by each First Nation to help with the field survey within each of their respective traditional territories. The field assistants provided an historical perspective of the areas ecology such as the occurrence of forest fires, seasonal habitats and associated browse species favoured by moose, and trails and routes utilized to access hunting, fishing and gathering sites. The anecdotal information or traditional knowledge provided by the First Nations field assistants in regards to the areas plant species and ecology was incorporated into the results section of this report where applicable.



Adapted from GeoBase, 2013; MLI, 2013 and MFESRA, 2013

Figure 7. First Nations Reserve, Provincial Northern Affairs and Crown Lands in Study Area.

3.1.4 Existing Information Sources

In 1993, Punter conducted a survey of vascular plants in the Manitoba Model Forest. Most of the model forest is located within the Lac Seul Upland Ecoregion, therefore the plant inventory and annotated checklist served as a useful baseline of data upon which the Project 7a results could be compared. Punter's (1993) report also focused on the occurrences of rare species of plants in order to provide them protection as well as the specialized habitats in which they occur. The Manitoba Conservation Data Centre (CDC) has compiled a list of "Species of Conservation Concern" that includes species that are rare, disjunct, or at risk throughout their range or in Manitoba that occur on the Lac Seul Upland Ecoregion. In addition, the CDC has given a conservation status rank to all the plant species known to occur in the province and both sets of data are available on the Manitoba CDC website. For all "Species At Risk" in Manitoba, they are offered protection under the *Manitoba Endangered Species Act*. The species list is updated by Manitoba Conservation's Wildlife Branch and available to the public on the department's website.

The Federal *Species at Risk Act* (SARA) was created to prevent wildlife species from disappearing (extinct or extirpated) and to manage species of special concern to prevent them from becoming endangered or threatened. The federal government is responsible for aquatic species, terrestrial species situated on federal lands, and most migratory birds (Environment Canada, 2009). However, federal and provincial/territorial governments share the responsibility for the conservation and protection of wildlife in Canada (Ibid, 2009). Under SARA, information on the status of wildlife species at risk across Canada is available through the Public Registry. GeoBase is a federal, provincial and territorial initiative which provides access to a common and up-to-date base of geospatial data (GeoBase, 2014). For the purpose of this report, GeoBase was accessed to retrieve the Administrative Boundaries – Aboriginal Lands dataset in order to develop the figures.

3.2 Field Work

Prior to any field work, meetings were held with Chiefs and Councils of LGR and Pauingassi First Nations to introduce the S+M+M field staff, describe the work and discuss the role of the F/N field assistants. Both communities provided a field assistant for the survey. The remoteness of the study area necessitated the use of a helicopter to access the vegetation plots as well as transporting the crew between camp, First

Nation communities and the field. Much of the boreal forest along the proposed route is intact and openings in the forest canopy large enough to land a helicopter were infrequent. Alternative landing sites such as beaver dams, creek beds, and the shore of nearby Family Lake were identified to facilitate access to the plots.

3.2.1 Plot Setup

The UTM coordinates of the fifteen sample plots were uploaded to a GPS unit to be used in the field. From the helicopter, a reconnaissance was done of the perspective forest stand (subtype) to be surveyed prior to the field survey. This technique allowed the field crew to compare the species composition of the forest stand on the ground to that on the forest cover map.

A second assessment of the forest stand was made at the plot to ensure it represented the forest type category outlined on the forest cover map. For example, if one was sampling Forest Subtype 44 (*Jack pine 51%: 2nd major species Hardwood*), and upon assessment the stand contained more than 50% jack pine and the second major species was trembling aspen, then the plot was set up. In mixedwood forests for example, there may be subtle changes in the composition of tree species within a stand. When this occurred, the crew conducted an ocular survey of the surrounding forest and relocate the plot to a spot deemed more representative of the stand. Typically, an alternative sample plot was located within 75m of the original plot location.

Using GPS, the UTM coordinates for the plot were taken at the southeast corner of the 10m x 20m plot (Appendix II). A survey pin was placed at each corner of the plot and 30m measuring tapes were used to mark the outer boundary. The north and south edges were 10m in length and the east and west edges 20 metres. Photos of the forest vegetation were taken at the south-east corner including one facing north and another facing west (Appendix III). Two - 10m tapes were placed at the 5m and 15m marks along the east and west edges of the plot to be used as a guide for setting up the sub-plot and quadrats. The 6 – 1m^2 quadrats were setup using 3 - 1m sticks.

A soil pit was dug approximately 5m west of the plot to a depth of 1m, or C-horizon, or where bedrock or water was encountered. A photo of each pit was taken and soil characteristics were recorded including the identification and thickness of soil horizons, C-horizon texture, soil type and soil moisture regime following Canada Soil Survey Committee (1978) and Scott, G. (1995). A tree core was collected and diameter was recorded of a select number of trees that were representative of the forest subtype. Consideration was given to a tree's height, position in the canopy and species. Examples of the trees chosen for coring are presented in Tree and Shrub Data (Appendix VI). The cored trees were only those from within the 200m^2 plot. The core samples were taken about 1 foot above the ground and placed in a drinking straw, labelled and secured with masking tape. The tree rings were later counted in the office.

The equipment used in the field included 2 – 30m measuring tapes, 2 – 10m tapes, GPS unit, camera, 11 survey pins, 4 – 1m sticks, increment bore, 100 straws, diameter tape, shovel, soil bags, clipboard, Ziploc bags, data sheets (write in the rain), flagging tape, masking tape, clipboard, forest cover maps, and aerial photos. A first aid kit, satellite phone, lunch, extra water and extra clothes were packed into the field each day and reflective vests worn at all times. Daily communication with S+M+M was in place for safety purposes and in the event of an emergency, a work plan and emergency phone numbers were submitted to a contact person in the office.

3.2.2 Data Collection and Analysis

Data collected from the overstorey strata (trees) included tree species and composition, number of stems, diameter, and age. Using the Forest Ecosystem Classification (FEC) for Manitoba in Zoladeski et al, (1995) as a guide, field staff identified and described the conditions of the particular forest stand in which a plot was set up. Based on the tree and understorey species, the forest stand was assigned a vegetation type (V-type) which listed the possible soil types (S/SS–type) and drainage classes associated with a particular forest stand (Appendix IV). Rings of the trees cored were counted and the ages determined to within +/- 2 years. Depending on site conditions, heartwood of mature to over-mature hardwood tree species such as trembling aspen and balsam poplar deteriorates over time. Individual rings become

difficult to discern and consequently, the accuracy of age determination is reduced (Wimmer and Vetter, 1999).

Shrubs were defined as a plant with a perennial woody stem from 0.5m to 5m in height. This category was based on height class and included typical shrub species as low bush cranberry and Labrador tea in addition to tree species such as white birch, balsam fir and black spruce. The field method used to determine which stems to count was any woody-stemmed plant at or above the knee (0.5m or 18”). Ground cover vegetation was recorded on a presence/absence basis. This category would include perennial woody stems ie. typical shrubs less than 0.5m, tree seedlings, forbs, grasses and sedges. The presence and absence of plant species in the plot was the primary objective of the ground cover vegetation surveys. The presence of moss and lichen was noted and cover values were estimated. Primarily forest floor mosses were identified to species as well as a few club and shrub lichens. When unknown species of moss or lichen were encountered, it was recorded as Moss sp(p) or Lichen sp(p) on the data sheet. Other relevant forest floor information collected was the amount of ground cover occupied by woody debris, litter, bare mineral soil and water. Plant identification books by Johnson et al (1995), Soper and Heimburger (1990), Looman and Best (1987), and Scoggan, H.J. (1957) were sourced. Nomenclature of surveyed species follows Kartesz (1999), Looman and Best (1987), and Johnson et al, (1995).

An important component of the data gathering process was the search for rare and endangered species of plants as well as *Plant Species of Interest*. There was no formal sampling protocol established for species rare in occurrence. Rarer species are typically much more dispersed throughout a plant community and regardless of the sampling intensity, they are seldom captured in standard plot sampling methods. While the field crew was carrying out the plot surveys and while walking between plots or from the helicopter, the surrounding vegetation was carefully monitored for occurrences of less common, unique, rare and endangered species. When such a species was encountered, the location was GPS’d, a photo taken and a brief description of habitat and phenology was noted. For the *Plant Species of Interest,* the same data gathering process was undertaken. Finally, an information reguest was made to Manitoba Conservation Data Centre for any occurrences of rare and endangered species in the study area.

4.0 RESULTS AND DISCUSSION

The eleven forest cover subtypes sampled represented 89.1% of the area occupied in the All Season Road ROW between Pauingassi and Little Grand Rapids First Nations. A total of 68 species of vascular plants, 4 species of lichen and 3 species of moss were documented among 15 surveyed plots and from off plot observations (Appendix V). The data in Chapter 4 is organized according to forest subtype and presented in numerical order. The discussion consists of a brief summary of the tree, shrub, ground cover and soil data gathered from surveys, as well as, a description of any unique or intriguing characteristic of each forest subtype. A key for the Vegetation Types (V-Types) and Soil Types (S-Types) from Zoladeski et al (1995) referenced throughout the report is presented in Appendix IV. An accompanying table summarizes of the entire breadth of data collected at the plot(s) of the respective forest subtypes. The vegetation data recorded on the field data sheets has been entered into an electronic version and presented in Appendices VI and VII. A profile of the soil horizons encountered at each soil pit is presented in Appendix VIII.

The complete complement of species occurring in each forest subtype and their respective level of endangerment ranking is presented in Appendix IX. Because three of the plots (12 – 14) were located on First Nations Reserve Land, it seemed appropriate to present this data separate in Appendix XI, but, in conjunction with all of the vegetation data gathered in the study area. To further clarify the previous point, the First Nations data in Appendix XI is not additional data, but a subset of the total dataset (all 15 plots) presented in Appendix IX. Presented in this manner, the data is readily available for other resource management purposes. In forestry mapping and reports, abbreviations are often given to tree species for reasons of convenience. The abbreviations of the respective tree species referenced in this report are as follows: Bf – *Balsam fir*, Bp – *Balsam poplar,* Bs – *Black spruce,* Jp - *Jack pine*, La – *Larch/Tamarack,* Po – *Poplar (Trembling Aspen),* Wb – *White birch, and* Ws – *White spruce*. These abbreviations are used to label a forest stand based on the species composition and percentage of each in the stand. An example of the labelling system would be Jp_7 Po_2 Sb_1 (Jack Pine 70%, Trembling Aspen 20%, Black Spruce 10%). The labelling system for stand species composition is included in Tables 3 – 13.

4.1 VEGETATION AND SOIL ATTRIBUTES

4.1.1 Forest Cover Subtype No. 4 (Jack pine 71-100%)

Large diameter jack pine (*Pinus banksiana*) (32.8 – 26.5cm) in Plots 4 and 9, occurred in this forest cover subtype ranging in age from 58 – 78 years with estimated heights of 24 – 26m (Appendix VI). The species composition was Jp_9, Sb_1 /Po_1 in *Plots* 4 and 9 with a sparse understorey of balsam fir and white birch (Table 3). Green alder (*Alnus crispa*) was present in the shrub plot in *Plot* 4, but was observed only sparsely in the 200m^2 plot at *Plot* 9. Labrador tea (*Ledum groenlandicum*) occurred in both plots. There were 17 herbaceous species in each plot and a total of 28 species recorded amongst both plots (Appendix IX). Herb species such as Twinflower (*Linnaea borealis*) was frequently recorded, but the forest floor was thickly covered by Stiff club-moss (*Lycopodium annotinum)* (Appendix III – Photo 1). The combination of tree, shrub and ground cover species recorded in the plot best describe the V16 – Jack Pine Mixedwood/Feather Moss vegetation type assigned for both plots (Table 3).

Soil types S2 and S10 are those that originate from similar soil forming processes and have developed mainly in lacustrine and glaciofluvial or morainal parent materials (Zoladeski et al, 1995). Jack pine typically occurs on sandy, well-drained, upland sites such as eskers or moraines which originate from various glaciofluvial processes. The presence of jack pine and a high ground cover of feathermoss is consistent with these soil types (Table 3). The presence of Ae, Bt, and Bg horizons in the soil profile (Appendix VIII-4) would suggest a Gleysolic soil, but the soils in this order have features indicative of periodic or prolonged saturation of water (CSSC, 1978) which was not apparent at Plot 4. Rock outcrops occurred north of the plot and the general area had about a 10% slope.

Table 3. Vegetation and soil characteristics of Forest Subtype 4. (September, 2013).

Species composition: *Plot 4 (Jp9,Po1)*	V-type (FEC): *V16*
Species composition: *Plot 9 (Jp9,Sb1)*	V-type (FEC): *V16*
Tree Species: *jack pine, black spruce, trembling aspen, (white birch, balsam fir in shrub size)*	
Shrub species: *green alder, pincherry, blueberry, Labrador tea, bearberry*	
Herb species: *twin flower, bunchberry, prince's-pine, stiff club-moss, sarsaparilla*	
Moss and Lichen species: *Schreber's moss, feathermoss spp., red pixie-cup club*	
Soil-type(s) (FEC): *S10 ● Very Moist/Fine Loamy-Clayey (Plot 4), S2 ● Fresh/Fine Sandy (Plot 9),*	

Soil and Vegetation Types Adapted from: Zoladeski et al, 1995

4.1.2 Forest Cover Subtype No. 6 (Jack Pine 40-70%: 2nd major species Spruce)

The condition of the forest stand could be best described as mature to overmature based on several characteristics such as age, understorey structure, and site conditions. The stands sampled in Plots 1 and 10 had an age range of 81 to 91 years (Appendix VI), a very open understorey and some blowdown (Appendix III). In general, the forest stand at Plot 10 was not uniformly mixed as jack pine was dominant in places and black spruce in others. It was shrub and herb poor forest subtype, but with a continuous cover of feather moss (Appendix III – Image 2), primarily Schreber's moss *(Pleurozium schreberi*) (Table 4), nearly 100% in several quadrats (Appendix VII). The V-28 – Jack Pine-Black Spruce/Feather Moss vegetation type is comprised of a poorly-developed shrub and herb layer, and significant cover of feather moss on the forest floor. Blueberry was present and the only herb species documented in both plots was pink corydalis (*Corydalis sempervirens*).

An S12F soil type typically indicates wet, poorly drained, low-lying or depressional sites, often associated with depressions in upland bedrock (Zoladeski et al, 1995) which was the case in Plot 1. This is a wet to very wet organic soil and covered by a dominant cover of feather moss (Ibid, 1995). Some exposed bedrock, woody debris and forest litter were documented in a few of the 1m^2 quadrats at Plot 1. In Plot 10, an S4 soil type was identified and it is commonly associated with trembling aspen mixedwoods and jack pine mixedwoods. The presence of aggregates in B and C horizons (Appendix VIII-10) would suggest a soil from morainal parent materials.

Table 4. Vegetation and soil characteristics of Forest Subtype 6. (September, 2013)

Species composition: *Plot 1 (Sb6,Jp4)*	V-type (FEC): *V28*
Species composition: *Plot 10 (Jp5,Sb5)*	V-type (FEC): *V28*
Tree Species: *jack pine, black spruce, trembling aspen, white birch (shrub size)*	
Shrub species: *labrador tea, blueberry, leather-leaf, low-bush cranberry*	
Herb species: *pink corydalis*	
Moss and Lichen species: *Schreber's moss, stair-step moss, plume moss*	
Soil-type(s) (FEC): *S12F ● Wet/Organic (Feather moss) (Plot 1), S4 ● Fesh/Silty Loamy (Plot 10)*	

Soil and Vegetation Types Adapted from: Zoladeski et al, 1995

4.1.3 Forest Cover Subtype No. 13 (Black Spruce 71-100%)

Plot 13 was located in a narrow strip of riparian habitat, primarily comprised of conifers. The plot was located in V-type 17 (Black spruce Mixedwood/Shrub- and Herb-Rich), a highly variable mix of tree species, site conditions and exposed sunlight. Two dominant black spruce selected for tree coring, were 102 and 105 years respectively (Appendix VI). Six tree species were documented in the 200m^2 plot, reflecting this forest's diverse site conditions and topography (Table 5). Over 20 species of plants were identified to species, not including two mosses and a few unknown herb species (Appendix VII). On average, 50% of the forest floor was covered by litter. Being a riparian or transition plant community, it supports species from treed bog/woodland swamp habitat and from a well-drained, upland, mixed-wood forest community. It is also an uneven-aged forest with a patchwork of shrubs, well developed understorey, complex vertical structure and potentially supporting rarer species.

An S6 soil type is typically developed in lacustrine parent materials, associated with mixedwoods, and has a well-developed feather moss ground cover (Zoladeski et al, 1995). The soil profile presented for Plot 13 (Appendix VIII-13), contains a Bt horizon and has a clayey C-horizon, typical of a depositional process in a lake, characteristics of a Luvisolic soil (CSSC, 1978).

Table 5. Vegetation and soil characteristics of Forest Subtype 13 (September, 2013).

Species composition: *Sb6,Fb2,Po1,Bw1*	V-type(s) (FEC): *V17*
Tree Species: *black spruce, balsam fir, balsam poplar, trembling aspen, white birch, larch*	
Shrub species: *red-osier dogwood, Wood's rose, Labrador tea, blueberry, currant sp.*	
Herb species: *dewberry, bunchberry, horsetail sp., twinflower, sedge spp.*	
Moss and Lichen species: *Schreber's moss, stair-step moss, plume moss*	
Soil-type(s) (FEC): *S6 ● Fresh/Clayey*	

Soil and Vegetation Types Adapted from: Zoladeski et al, 1995

4.1.4 Forest Cover Subtype No. 14 (Black spruce 40-70%: 2nd major species Jack pine)

Two dominant black spruce and one co-dominant jack pine were cored and the ages were 62, 64 and 69 years respectively in Plot 8 (Appendix VI). Five species of trees were present in the 200m^2 plot and no species of shrub in the sub-plot. Four herb species including lesser rattlesnake plantain (*Goodyera repens*) (Table 6), two shrub species one of which is blueberry were scattered throughout the plot (Appendix VII). It had an open understorey, moss cover of 85 -100% of forest floor, a few fallen trees and a number of old decayed logs (Appendix III – Photo 4). A charcoal covered tree stump was present in the plot indicating a forest fire had been through the stand about 60+ years ago. The site is herb and shrub poor, moss rich, thus indicative of a mature forest (Appendix III- Photo 4).

An S1 soil type, comprised of fine to very coarse sandy soils develops primarily in lacustrine, glaciofluvial and morainal parent materials (Zoldeski et al, 1995). Occurring in glaciaofluvial or morainal parent materials (glacial till), the presence of aggregates in the Bm horizon is consistent with an S1 soil (Appendix VIII-8). This soil type is also associated with a significant amount of feather moss or lichens covering the forest floor. The V18 – Black Spruce Mixedwood/Feather Moss vegetation type occurs on fresh, well-drained, fine-textured mineral soils (Zoladeski et al, 1995) that are dry, sandy and deep.

Table 6. Vegetation and soil characteristics of Forest Subtype 14. (September, 2013).

Species composition: *Sb6,Jp4*	V-type(s) (FEC): *V18*
Tree Species: *black spruce, jack pine, white birch, balsam fir, trembling aspen (seedling size)*	
Shrub species: *blueberry*	
Herb species: *lesser rattlesnake-plantain, twinflower, sarsaparilla, stiff club-moss*	
Moss and Lichen species: *Schreber's moss, stair-step moss, plume moss*	
Soil-type(s) (FEC): *S1 ● Moderately Dry/sandy*	

Soil and Vegetation Types Adapted from: Zoladeski et al, 1995

4.1.5 Forest Cover Subtype No. 44 (Jack pine 51%:2nd major species hardwood)

Regardless of the forest strata or species in Plot 3, there was a relatively narrow age range (19 to 27 years) amongst the sampled trees (Appendix VI). The difference in ages (4 yrs) amongst the 3 jack pine would suggest this stand is of fire origin within the last 25 – 27 years. The species composition in Table 7 better reflects the forest cover type than the original plot location where jack pine was 100% of stand. According to the FEC field guide (Zoladeski et al, 1995), this stand is classified as V24 - Jack Pine Conifer, an even-aged jack pine dominant forest with a dense understorey of shrubs and close to half the forest floor covered by litter. In the shrub plot, 46 stems were recorded among six tree and shrub species (Appendix VI). As shown in Image 5 (Appendix III), there is a distinct shrub layer and a sparse herb layer. Given the survey was undertaken in autumn, the amount of foliage depicted in the photo is less than typically present in the summer.

A relatively shallow layer (5 – 12cm) of mineral soil mixed with aggregates covered the underlying bedrock (Appendix VIII-3). The SS6 soil type, usually developed in morainal parent material, best describes the soil profile and conditions at Plot 3. The depth to the underlying bedrock was not documented.

Table 7. Vegetation and soil characteristics of Forest Subtype 44. (September, 2013).

Species composition: *Jp6,Bw3,Po1*	V-type(s) (FEC): *V24*
Tree Species: *jack pine, white birch, trembling aspen*	
Shrub species: *green alder, pincherry, Bebb's willow, (raspberry and blueberry ground cover size)*	
Herb species: *prince's pine, twinflower, woodland horsetail, ground cedar, sarsaparilla*	
Moss and Lichen species: *Schreber's moss, fork moss, reindeer lichen (2)*	
Soil-type(s) (FEC): *SS6 ● Shallow-Moderately Deep/Coarse Loamy*	

Soil and Vegetation Types Adapted from: Zoladeski et al, 1995

4.1.6 Forest Cover Subtype No. 46 (Jp<50%: 2nd major species Spruce: 3rd major species Hardwood)

The collection of tree species in *Plot* 14 closely represents the forest cover description above. In reviewing the data, notes and photos, trembling aspen was primarily in the subcanopy and ought to have been reversed with black spruce in the species composition listed in Table 8. Five tree species were recorded in the 200m^2 plot (Appendix VI) and 4 species recorded in the shrub category. From a forest succession perspective, the structure of the stand in and around the plot didn't follow the normal progression of succession. Typically, early successional species such as jack pine and trembling aspen make up the greatest percentage of the main canopy followed by an understorey layer of spruce and balsam fir. In this case, the ages of the two spruce sampled clearly indicates they are 12 to 20 years older than the pine and aspen. A possible explanation could be some individuals survived a fire and continued growing. Based on the forest structure, associated species, and composition in the plot, using Zoladeski et al's, (1995) field guide, the forest type was keyed out as V15 - Jack Pine Mixedwood/Shrub-Rich (Table 8).

In the shrub cover plot, twenty-seven stems from four species were recorded including white birch, green alder, black spruce and balsam fir. In the ground cover plots, there were 12 vascular plant species and 10 lichen and moss species (Appendix VII). Of the 12 species, only 5 were herbaceous (Table 8.) while the other 7 were shrub and tree species. There is a thick understorey of shrubs, a limited presence of herb species and a cover value of litter estimated to be 70% of the forest floor (Appendix III – Photo 6).

Similar to *Plot* 4, the S10 Soil Type identified in *Plot* 14 (Table 8) has developed in lacustrine or morainal parent materials. Because of the presence of clay and silt in the C-horizon of *Plot* 14's soil profile, that would suggest the parent material originated in a lacustrine (lake deposition) environment (Appendix VIII-14). According to Zoladeski et al, (1995), S10 soils are common in Manitoba and associated with a wide range of forest communities from trembling aspen to black spruce.

Table 8. Vegetation and soil characteristics of Forest Subtype 46. (September, 2013).

Species composition: *Jp4,Po3,Sb2,Bw1*	V-type(s) (FEC): *V15*
Tree Species: *black spruce, jack pine, trembling aspen, (white birch and balsam fir in shrub size)*	
Shrub species: *green alder, blueberry, rose sp.*	
Herb species: bunchberry, *dewberry, twin flower, sarsaparilla, pink wintergreen*	
Moss and Lichen species: *stairstep moss, Schreber's moss, felt lichen*	
Soil-type(s) (FEC): *S10 ● Very Moist/Fine Loamy-Clayey*	

Soil and Vegetation Types Adapted from: Zoladeski et al, 1995

4.1.7 Forest Cover Subtype No. 81 (Trembling aspen: 2nd major species Jack Pine)

There was a broad mix of tree species (5) in Subtype 81 (Table 9) in Plots 2, 4b and 6 and with the exception of large aspen in Plots 2 and 4b, the trees were relatively even-aged within each plot. Plots 2, 4b and 6 had age ranges of 15 – 22, 21 – 31 and 62 – 75 years respectively (Appendix VI). A consistent theme in the shrub data was the high stem counts of 58, 53 and 60 with green alder being the overwhelming dominant species represented in the plots as viewed in Appendix III - Photos 7 & 8). There were 46 species of trees, shrubs, herbs, mosses and lichens among the 3 plots (Appendix IX). In hindsight, one or two additional 1m^2 quadrats ought to have been sampled in *Plots* 2 and 4b in order to capture more of the herb species present (Appendix VII). The richness in the shrub and herb layers amongst these 3 plots is representative of V-Types 9 and 10 which are usually rich in broadleaved species (Zoladeski et al, 1995). One noticeable difference between the plots was the higher cover value of Schreber's moss (*Pleurozium schreberi*) in Plot 6 (Appendix VII).

The mixedwood (hardwood/softwood) nature of these 3 plots is best reflected in the V9 – Tembling Aspen Mixedwood/Low Shrub and V10 – Trembling Aspen Mixedwood/Feahermoss vegetation types described in Zoladeski et al, 1995. Trembling aspen mixedwoods are primarily associated with S4 soils and stands dominated by a range of species are associated with S6 soils (Zoladeski et al, 1995). Characteristic of S4 soils, carbonates if present, may occur above 50 cm in the silts of the profile (Ibid, 1995) and were present at a depth of 26 cm in the Bm horizon of Plot 2 (Appendix VIII-2). In *Plot* 6, there was a well-developed layer of feathermoss, carbonates encountered at 30cm, and a prevalence of clay in the soil profile, all features of the S6-Fresh/Clayey soil type.

Table 9. Vegetation and soil characteristics of Forest Subtype 81. (September, 2013).

Species composition: *Plot 2 (Po6,Bw2,Jp1,Sb1)*	V-type (FEC): *V9*
Species composition: *Plot 4b (Po5,Jp2,Bw2,Fb1)*	V-type (FEC): *V9*
Species composition: *Plot 6 (Po7,Jp2,Fb1)*	V-type (FEC): *V10*
Tree Species: *trembling aspen, white birch, jack pine, black spruce, balsam fir*	
Shrub species: *green alder, Bebb's willow, low-bush cranberry, bush honeysuckle, raspberry*	
Herb species: *fireweed, bunchberry, twinflower, wild lily-of-the-valley, starflower*	
Moss and Lichen species: *Schreber's moss, plume moss, reindeer lichen (2), felt lichen*	
Soil-type(s) (FEC): *S4 ● Fresh/Silty-Loamy (Plots 2, 4b), S6 ● Fresh/Clayey (Plot 6)*	

Soil and Vegetation Types Adapted from: Zoladeski et al, 1995

4.1.8 Forest Cover Subtype No. 82 (Trembling aspen: 2nd major species Spruce or Balsam Fir)

The species in the mixedwood stand of trembling aspen/balsam fir/black spruce/white birch were well represented in Plot 12 (Appendix VI). One shrub species, blueberry *(Vaccinium myrtilloides)* and 3 herb species occurred in the ground cover plots (Table 10) (Appendix VII). V-type 9 (Trembling Aspen Mixedwood/Low Shrub) typically has a rich herb and shrub layer, but in this case it was poorly developed. The plot was in a very dense stand of many small diameter stems mostly black spruce and fir and some scattered blowdown (Appendix III-Image 9). Six moss species were present in the ground cover plots but only sparsely covering the forest floor. As previously described, S4 soils are most common on deep lacustrine and glaciofluvial deposits (Zoladeski et al, 1995) and associated with mixedwood forests. This is consistent with the silty texture of the C-horizon in the plot and the presence of 4 tree species.

Table 10. Vegetation and soil characteristics of Forest Subtype 82. (September, 2013).

Species composition: *Po5, Fb2, Sb2, Bw1*	V-type(s) (FEC): *V9*
Tree Species: *trembling aspen, black spruce, balsam fir, white birch*	
Shrub species: *blueberry*	
Herb species: *stiff club-mosses, ground cedar, bunchberry*	
Moss and Lichen species: stairstep moss, plume moss, felt lichen, *Schreber's moss, moss spp.*	
Soil-type(s) (FEC): *S4 ● Fresh/Silty-Loamy*	

Soil and Vegetation Types Adapted from: Zoladeski et al, 1995

4.1.9 Forest Cover Subtype No. 701 (Black Spruce Treed Muskeg)

Forty of 41 tree stems counted in the 200m^2 were black spruce and the other stem was larch at Plot 5 (Appendix VI). Two dominant black spruce were cored and their ages were 86 and 89 years and the solitary larch was aged at 101 years. Leatherleaf (*Chamaedaphne calyculata*) and Labrador tea represented over 90% of the tallied shrub stems in the plot. It had an open understorey as shown in Image 10 (Appendix III) with a few shrub-sized black spruce stems and with 7 herb species recorded in ground cover quadrats (Appendix VII). Sphagnum moss (*Sphagnum spp.)* covered 94.5% of the forest floor which is consistent with amount of moss cover described in Zoladeski et al, 1995. Sphagnum moss was equally abundant throughout much of the plot. The V33 – Black Spruce/Sphagnum vegetation type is a successionally mature forest and the ages of the trees sampled reflect this characteristic.

S12S soils are associated with wet tolerant vegetation types such as lowland black spruce and tamarack forests (Zoladeski et al, 1995). It is an organic soil and the only horizon recorded was Of and the water table was encountered at 16cm (Appendix VIII-5).

Table 11. Vegetation and soil characteristics of Forest Subtype 701. (September, 2013).

Species composition: *Sb10*	V-type(s) (FEC): *V33*
Tree Species: *black spruce, larch*	
Shrub species: *leather leaf, Labrador tea, bog laurel, bog cranberry, dwarf birch*	
Herb species: *cloudberry, 3-leaved Solomon's seal, sedge spp., stiff club-moss, wild lily-of-the-valley, Indian pipe*	
Moss and Lichen species: *sphagnum spp., moss (Dicranum) sp, red pixie-cup syn. "British soldier"*	
Soil-type(s) (FEC): *S12S ● Wet/Organic (Sphagnum)*	

Soil and Vegetation Types Adapted from: Zoladeski et al, 1995

4.1.10 Forest Cover Subtype No. 702 (Tamarack/Larch Treed Muskeg)

Stand cover type 702 found in Plot 11 was black spruce dominant. One hundred forty six tree-sized stems of spruce and seven larch/tamarack were recorded in the 200m^2 plot. Four dominant/co-dominant trees were cored and the age range was between 46 and 61years (Appendix VI). Tamarack is a very minor component in the stand but most stems were 5 – 8m taller than the tallest spruce. Shrub species encountered in the 25m^2 plot included Labrador tea and common meadowsweet (*Spiraea alba*). Other shrub species were counted in the ground cover quadrats included leatherleaf and bog cranberry (*Vaccinum oxycoccus*). Wild lily-of-the-valley (*Maianthemum canadense*) and cloudberry (*Rubus chamaemorus*) were the only herb species in the quadrats (Table 12) (Appendix VII). As viewed in Image 11, a continuous carpet of feathermoss was present in the plot and stand (Appendix III-Photo 11).

Assigned the same S12S soil type designation as in *Plot* 5, this location was only moderately wet. After reviewing the data in *Plot* 11, an S12F – Wet/Organic (Feather Moss) soil type was assigned to the site. Soil horizons identified in the profile included Of, Om and Oh and the water table was encountered at 52cm (Appendix VIII-11). No mineral contact was made in the soil pit.

Table 12. Vegetation and soil characteristics of Forest Subtype 702. (September, 2013).

Species composition: *Sb9, La1*	V-type(s) (FEC): *V33*
Tree Species: *black spruce, larch*	
Shrub species: *Labrador tea, meadow sweet, bog cranberry, leather-leaf*	
Herb species: *wild lily-of-the-valley, cloudberry*	
Moss and Lichen species: *Schreber's moss, sphagnum spp., stairstep moss, moss spp., moss (Dicranum) sp.*	
Soil-type(s) (FEC): *S12S ● Wet/Organic (Sphagnum)*	

Soil and Vegetation Types Adapted from: Zoladeski et al, 1995

4.1.11 Forest Cover Subtype No. 711 (Jack Pine Treed Rock)

As shown in Photo 12 in Appendix III, Plot 7 was located on outcrops of lichen covered rocks, had a low crown closure, and an open understorey. Three trees (2Jp and an Sb) were cored and the ages were determined to be 68, 64 and 51 years respectively (Appendix VI). Green alder (*Alnus crispa*), Pussy willow (*Salix discolor*) and black spruce stems were tallied in the shrub plot. Blueberry and green alder and 4 herb species including northern rice grass (*Piptatherum pungens*) were present in the quadrats (Table 13). (Appendix VII). Three common reindeer lichen species carpeted the forest floor as well as patches of feathermoss (Appendix VII).

An SS1 soil in *Plot* 7 (Table 13) is a very shallow soil type, has a discontinuous moss and lichen cover, and has no mineral soil matrix (Zoladeski et al, 1995). Only an L horizon has developed on this treed rock forest type (Appendix VIII-7).

Table 13. Vegetation and soil characteristics of Forest Subtype 711. (September, 2013).

Species composition: *Jp9, Po1*	V-type(s) (FEC): *V26*
Tree Species: *jack pine, trembling aspen, black spruce*	
Shrub species: *blueberry, green alder, pussy willow*	
Herb species: *northern rice grass, 3-toothed cinquefoil, spreading dogbane, wild lily-of-the-valley*	
Moss and Lichen species: *Schreber's moss, yellow reindeer lichen, star reindeer lichen, true reindeer lichen, moss (Dicranum) sp.*	
Soil-type(s) (FEC): *SS1 ● Discontinuous Organic Mat on Bedrock*	

Soil and Vegetation Types Adapted from: Zoladeski et al, 1995

4.2 Rare and Endangered Species

4.2.1 Manitoba's Listed Endangered Species

Any plant and animal species listed as Endangered or Threatened in Manitoba are protected under the Manitoba Endangered Species Act. The prevention of species becoming extirpated or extinct in Canada falls under the Federal Species at Risk Act (SARA). In Manitoba, there are 5 species of plants listed as Endangered and 7 species listed as Threatened under the Manitoba Endangered Species Act (Appendix X). The same 12 species and the Flooded Jellyskin (*Leptogium rivulare*) lichen are listed federally under the Species at Risk Act (Appendix X). Eleven of the protected species occur on dry, mixed-grass and tall grass prairie complexes in south-eastern, south-central and south-western regions of Manitoba. None of the 12 species listed under the MB Endangered Species Act or under SARA occur in the study area. However, the Flooded Jellyskin, a small foliose lichen is known to occur in the Mixedwoods Plain and Boreal Shield Ecozones (COSEWIC, 2004). It most prefers growing on bark of living hardwood tree species and always below the high water mark on periodically inundated substrate (Ibid, 2004). No Flooded Jellyskin was found during the survey.

4.2.2 Species of Conservation Concern in Study Area

Manitoba Conservation Data Centre (CDC) has assigned a conservation status rank to native plants occurring in Manitoba and a description of the ranking system. All the plant species documented by S+M+M in the plots and their corresponding rank status are presented in Appendix IX. Manitoba Conservation has created a list of plants and assigned ranks which occur in each of the province's ecoregions.

In the Lac Seul Upland Ecoregion, the CDC has identified 56 plant species which are considered "Species of Conservation Concern". Species are evaluated and ranked by the CDC on the basis of their range-wide (global) status and their province-wide (subnational – S) status according to a standardized procedure (MB CDC, 2013). The codes and respective definitions of the ranking system used across Canada are presented in Table 14. Included in the Lac Seul Upland Ecoregion list are 9 - S1 species, 25 - S2 species, 19 - S3 species and 3 - U species. A species designated as uncertain - "U" is due to insufficient information on which to make a status determination. None of these species thus far, are legally protected under either of the aforementioned acts.

Table 14. Ranking Codes and Definitions for Species in Canada

Rank	Definition
1	Very rare throughout its range or in the province (5 or fewer occurrences, or very few remaining individuals). May be especially vulnerable to extirpation
2	Rare throughout its range or in the province (6 to 20 occurrences). May be vulnerable to extirpation.
3	Uncommon throughout its range or in the province (21 to 100 occurrences)
4	Widespread, abundant, and apparently secure throughout its range or in the province, with many occurrences, but the elelement is of long-term concern (>100 occurrences)
5	Demonstrably widespread, abundant, and secure throughout its range or in the province, and essentially impossible to eradicate under present conditions
U	Possibly in peril, but status uncertain; more information needed

Source: MB CDC, 2013

In reviewing the species documented in the field, six species fall under the category of "Species of Conservation Concern" (Table 15). The term *Species of Conservation Concern* has been defined as:

> "species that are rare, disjunct, or at risk throughout their range or in Manitoba and in need of further research. The term also encompasses species that are listed under the Manitoba Endangered Species Act (MBESA), or that have a special designation by the Committee On the Status of Endangered Wildlife in Canada (COSEWIC)" (MB CDC Website, 2013).

Table 15. List of "Species of Conservation Concern" Observed Along the Proposed Route.

Common Name	*Scientific Name*	*Provincial Listing*	*Global Listing*	*Habitat and/or descriptive comments*
1. Fragrant Shield fern	*Dryopteris fragrans*	*S3S4*	*G5*	*grows on rock faces and cliffs*
2. Wood's Rose	*Rosa woodsia*	*S4*	*G5*	*found infrequently in boreal forest, moist habitat*
3. Prince's pine	*Chimaphila umbellata*	*S3-S5*	*G5T5*	*3 varieties, depending on habitat*
4. Trailing club-moss	*Diaphasium complanatum*	*S3S4*	*G5*	*found in wooded areas aka. Ground Cedar*
5. Ground Pine	*Lycopodium dendroideum*	*S3S4*	*G5*	*found in moist, rich wooded forests*
6. Indian Pipe	*Monotropa uniflora*	*S4*	*G5*	*parasitic plant in rich woodland forests*

* *G1 – Critically Imperiled; G2 – Imperiled; G3 – Vulnerable; G4 – Apparently Secure; G5 - Secure*

*** The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species Global rank. T5 – Secure.*

An orchid, which most resembled Hooker's Orchid (*Platanthera hookeri)* an S2 species*,* was observed on upland jack pine habitat in some of the plots and along routes travelled between pickup and dropoff spots. The orchid had brown, withered leaves, no flowering structures and presented few morphological features typically used for identification purposes. Because of the time of year, identification to species could not be verified. Another species of concern, Smooth Woodsia (*Woodsia glabella*) considered rare (S2) in Manitoba grows on rock outcrops and cliff faces and may occur in the study area. A species of tree, Mountain Ash (*Sorbus decora*) an S4, was observed on a few occasions adjacent to a few of the plots. The solitary individuals were usually less than 3-4 feet in height, growing on moist to dry sites in semi-open forests and along rock outcrops. In Punter (1994), Mountain Ash was recorded in the Manitoba Model Forest and designated as scarce (1-5 individuals per site) in abundance and scattered (several discontinuous sites) in distribution. Occurrences of Mountain Ash in eastern Manitoba are at or near the western limit of their range in Canada. A *Species of Conservation Concern,* Tesselated Rattlesnake Plantain (*Goodyera tesselata*) an S2, was documented in the study area but the exact location is unknown (Friesen, C, pers. comm., 2014).

A follow-up survey of unique or sensitive habitats that potentially contain such plant species as rare and endangered is recommended. In particular, cliffs and rock faces where some fern species of conservation grow, as well as, the Jack pine treed rock habitat which is the preferred habitat of the Hooker's orchid. The absence of data in some of the unique habitats does not necessarily mean that species or communities of conservation concern are not present.

4.3 Plant Species on First Nations Land

Three plots (12 - 14) were established close to Little Grand Rapids First Nation on reserve land. Among the 3 plots, 28 species of vascular plants, lichens and mosses were documented (Appendix XI). Two species considered uncommon throughout its range or in the province occurred in the plots including Trailing Club-moss (*Diaphasium complanatum*) and Prince's Pine (*Chimaphila umbellata*). Both First Nations assistants recognized the presence of blueberry (*Vaccinium myrtilloides)* in the study plots. Although few native plant species were specifically identified as being important to the two First Nations field assistants, historically plants have been very important to native people.

During the process of surveying Plot 13, an area consisting of woodland swamp and adjacent beaver pond beyond Plot 13 was briefly assessed and identified as an important environmentally sensitive site. Observations of several different components of this habitat are worth mentioning. As previously mentioned, Plot 13 was established in riparian habitat close to this wettish type area. In addition to the unique plant community sampled, the diverse range of site conditions around the swampy area could possibly contain some plants considered "Species of Conservation Concern". The range of plant communities and habitats in the vicinity of Plot 13 was quite broad and S+M+M recommends that this forest subtype and associated riparian habitats in the general area ought to be further investigated.

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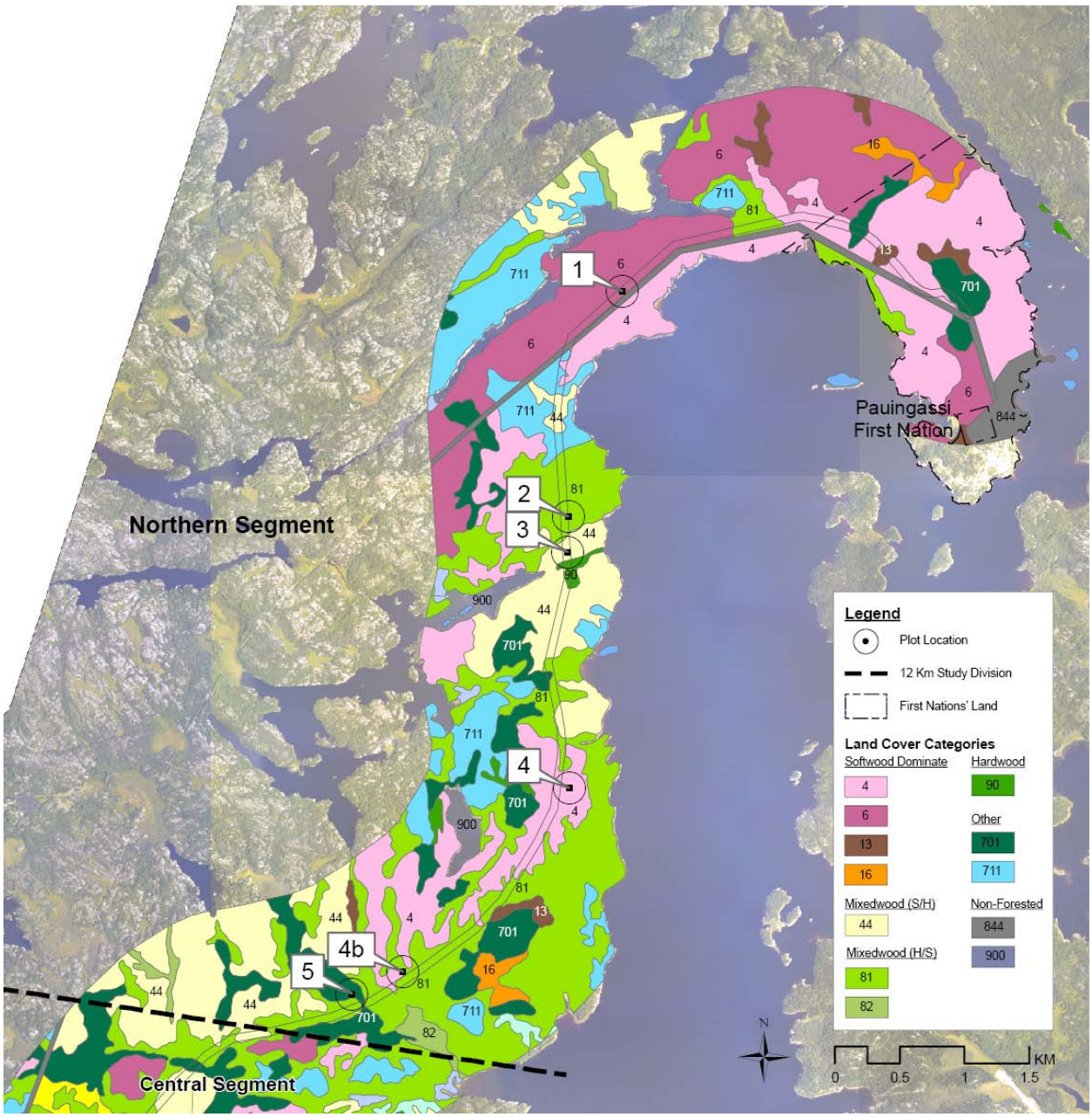
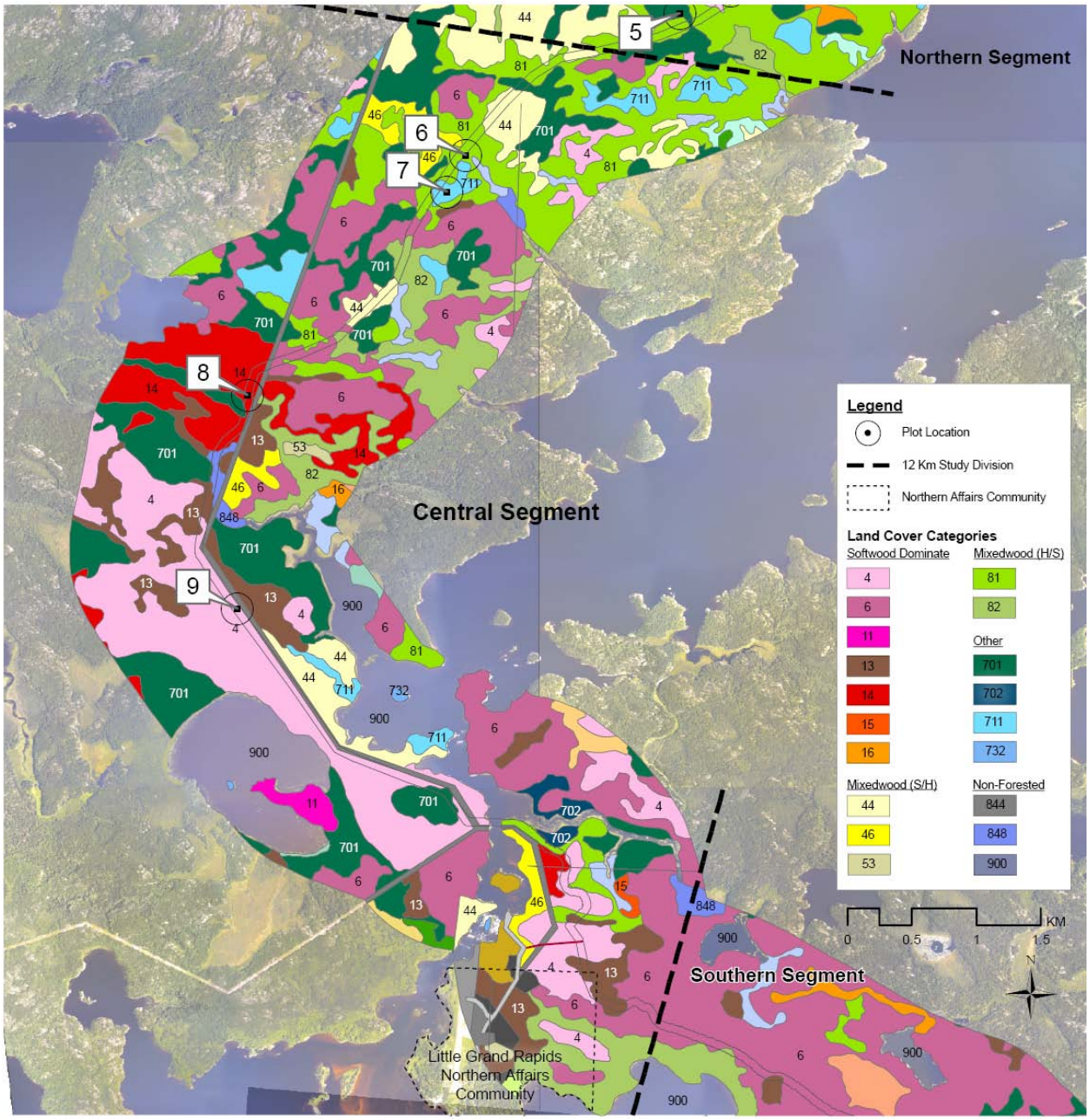
APPENDIX I

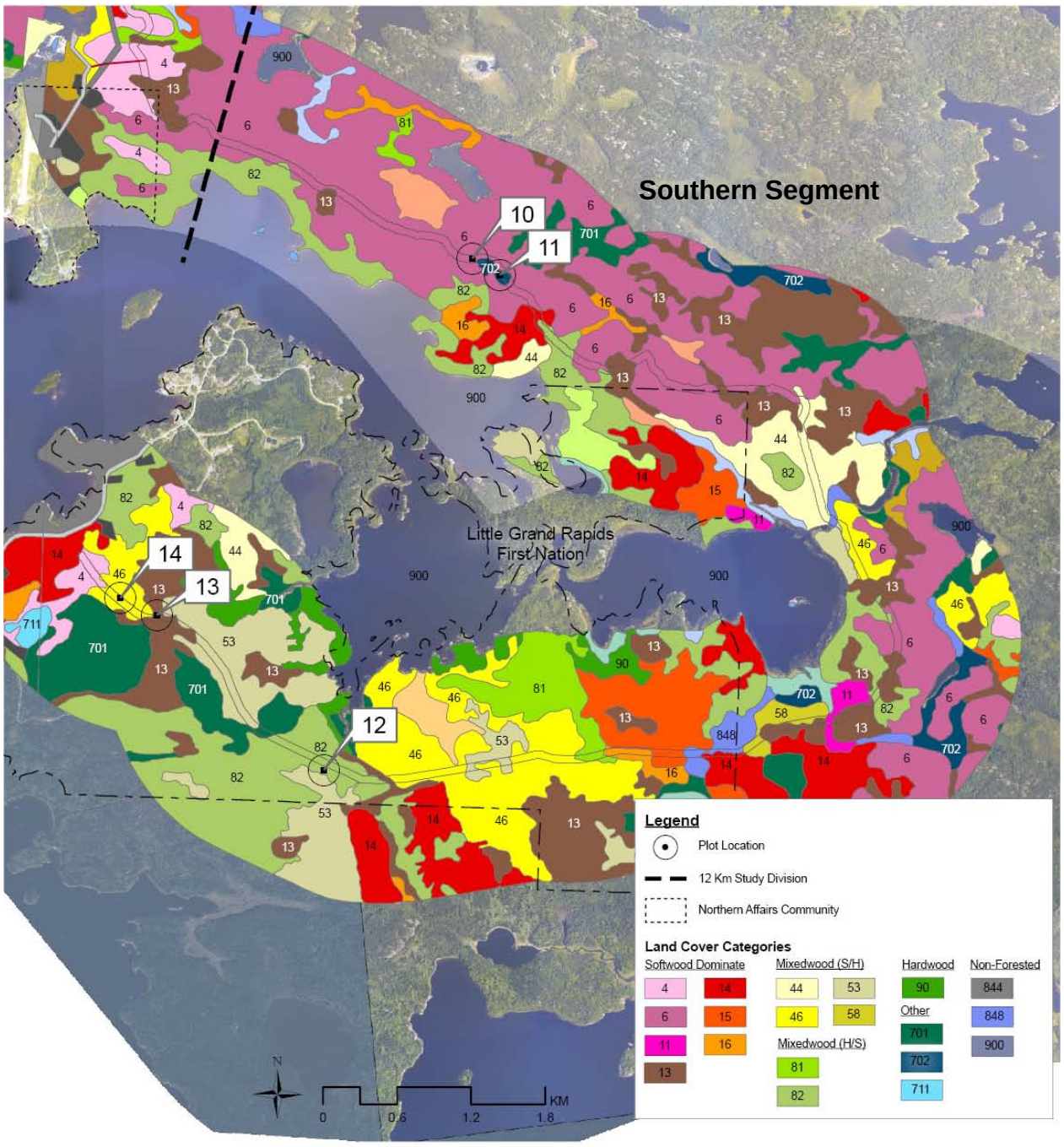
MAP OF FOREST SUBTYPES IN NORTHERN, CENTRAL, AND SOUTHERN SEGMENTS OF STUDY AREA



MAP OF FOREST SUBTYPES IN NORTHERN SEGMENT OF STUDY AREA



MAP OF FOREST SUBTYPES IN CENTRAL SEGMENT OF STUDY AREA



MAP OF FOREST SUBTYPES IN SOUTHERN SEGMENT OF STUDY AREA

APPENDIX II

UTM COORDINATES OF THE FIFTEEN VEGETATION SAMPLE PLOTS

UTM COORDINATES OF VEGETATION PLOTS				
Plot #	**UTM Coordinates**	**Date Created**	**Code**	**Forest Cover Subtype**
Plot 1	15 U 334659 5782171	9/21/2013 11:26:22 AM	6	Jack Pine 40-70%: 2nd major species Spruce
Plot 2	15 U 334243 5780433	9/21/2013 2:27:17 PM	81	Trembling Aspen: 2nd major species Jack Pine
Plot 3	15 U 334235 5780160	9/22/2013 9:45:19 AM	44	Jack Pine 51%: 2nd major species Hardwood
Plot 4	15 U 334246 5778335	9/22/2013 12:39:23 PM	4	Jack Pine 71-100%
Plot 4b	15 U 332964 5776916	9/23/2013 11:07:04 AM	81	Trembling Aspen: 2nd major species Jack Pine
Plot 5	15 U 332573 5776746	9/22/2013 3:23:14 PM	701	Black Spruce Treed Muskeg
Plot 6	15 U 330935 5775586	9/24/2013 12:41:00 PM	81	Trembling Aspen: 2nd major species Jack Pine
Plot 7	15 U 330772 5775360	9/24/2013 3:43:28 PM	711	Jack Pine treed rock
Plot 8	15 U 329229 5773791	9/26/2013 9:50:30 AM	14	Black Spruce 40-70%: 2nd major species Jack Pine
Plot 9	15 U 329148 5772137	9/26/2013 11:37:05 AM	4	Jack Pine 71-100%
Plot 10	15 U 334481 5767956	9/25/2013 11:51:10 AM	6	Jack Pine 40-70%: 2nd major species Spruce
Plot 11	15 U 334707 5767824	9/25/2013 9:41:14 AM	702	Tamarack Larch Treed Muskeg
Plot 12	15 U 333275 5763802	9/26/2013 1:51:59 PM	82	Trembling Aspen: 2nd major species Spruce or Balsam Fir
Plot 13	15 U 331920 5765059	9/25/2013 3:09:13 PM	13	Trembling Aspen: 2nd major species Spruce or Balsam Fir
Plot 14	15 U 331620 5765197	9/25/2013 5:05:00 PM	46	Pj <50%: 2nd major species Spruce: 3rd major species Hardwood

APPENDIX III

PHOTOS OF FOREST COVER TYPES SAMPLED ALONG PROPOSED ROUTE

Forest Cover Subtype: 4-Jack pine 71-100%

Image 1: Photo of Plot 4 in Forest Cover Subtype 4 (September, 2013)

Forest Cover Subtype: 6-Jack Pine 40-70%: 2nd major species Spruce

Image 2: Photo of Plot 10 in Forest Cover Subtype 6 (September, 2013)

Forest Cover Subtype: 13 - Black Spruce 71-100%

Image 3: Image of Plot 13 in Forest Cover Subtype 13 (September, 2013)

Forest Cover Subtype: 14 - Black spruce 40-70%: 2nd major species Jack pine

Image 4: Photo of Plot 8 in Forest Cover Subtype 14 (September, 2013)

Forest Cover Subtype: 44-Jack pine 51%:2nd major species hardwood.

Image 5: Photo of Plot 3 in Forest Cover Subtype 44 (September, 2013)

Forest Cover Subtype: 46 - Jp<50%: 2nd major species Spruce: 3rd major species Hardwood

Image 6. Photo of Plot 14 in Forest Cover Subtype 46 (September, 2013).

Forest Cover Subtype: 81-Trembling aspen: 2nd major species Jack Pine.

Image 7. Image of Plot 4b in Forest Cover Subtype 81 (September, 2013).

Image 8. Image of Plot 6 in Forest Cover Subtype 81 (September, 2013).

Forest Cover Subtype: 82-Trembling aspen: 2nd major species Spruce or Balsam Fir

Image 9. Photo of Plot 12 in Forest Cover Subtype 82 (September, 2013).

Forest Cover Subtype: 701 - Black Spruce Treed Muskeg

Image 10. Photo of Plot 5 in Forest Cover Subtype 701 (September, 2013).

Forest Cover Subtype : 702 - Tamarack/Larch treed Muskeg

Image 11. Photo of Plot 11 in Forest Cover Subtype 702 (September, 2013).

Forest Cover Subtype: 711 - Jack pine treed rock

Image 12. Photo of Plot 7 in Forest Cover Subtype 711 (September, 2013).

APPENDIX IV

VEGETATION TYPES (V-TYPES) AND SOIL TYPES (S-TYPES)

Vegetation Types (V-Types) and Soil Types (S-Types) in Forest Ecosystem Classification for Manitoba

Vegetation Types (V-Types)	
Mainly Hardwood	
V9	Trembling Aspen Mixedwood/Low Shrub
V10	Trembling Aspen Mixedwood/Feather Moss
Conifer Mixedwood	
V15	Jack Pine Mixedwood/Shrub-Rich
V16	Jack Pine Mixedwood/Feather Moss
V17	Black Spruce Mixedwood/Shrub- and Herb- Rich
V18	Black Spruce Mixedwood/Feather Moss
Conifer	
V24	Jack Pine Conifer
V26	Jack Pine -Black Spruce/Lichen
V28	Jack Pine-Black Spruce /Feather Moss
V33	Black Spruce/Sphagnum
Soil Types (S-Types)	
Deep Mineral	
S1	Moderately Dry/Sandy
S2	Fresh/Fine Sandy
S4	Fresh/Coarse Loamy
S6	Fresh/Clayey
S10	Very Moist/Fine Loamy-Clayey
Deep Organic	
S12F	Wet/Organic (Feather Moss)
S12S	Wet/Organic (Sphagnum Moss)
Very Shallow	
SS1	Discontinuous Organic Mat on Bedrock
Shallow to Moderately Deep	
SS6	Shallow-Moderately Deep/Coarse Loamy

Source: Zoladeski et al, 1995

APPENDIX V
PLANT SPECIES DOCUMENTED ALONG PROPOSED ROUTE

LIST OF VASCULAR PLANTS, LICHENS AND MOSSES - Project 7a

Family and Scientific Names	Common Name	Plots[1]
VASCULAR PLANTS		
APOCYNACEAE (Dogbane family)		
Apocynum androsaemifolium L.	Spreading Dogbane	7
ARALIACEAE (Ginseng Family)		
Aralia nudicaulis L.	Wild Sarsaparilla	2,3,4,8,9,14
BETULACEAE (Birch Family)		
Alnus crispa (Ait.) Pursh	Green or Mountain Alder	2,3,4,4b,6,7,14
Betula papyrifera Marsh.	White Birch	2,3,4b,5,6,8,9,10,12,13,14
B. pumila L. var. glandulifera Regel	Swamp Birch	5
CAPRIFOLIACEAE (Honeysuckle Family)		
Diervilla lonicera Mill.	Bush-Honeysuckle	2,6
Linnaea borealis L.	Twinflower	2,3,4,4b,6,8,9,10
Viburnum edule (Michx.) Raf.	Low Bush Cranberry	1,2
COMPOSITAE (Composite Family)		
Petasites palmatus (Ait.)	Palmate-leaved Colt's-foot	2,4b,6,13
CORNACEAE (Dogwood Family)		
Cornus canadensis L,	Bunchberry	2,4,4b,6,9,12,13,14
C. stolonifera Michx.	Red Osier Dogwood	2,13
CYPERACEAE (Sedge Family)		
Carex disperma Dewey	Two-seeded Sedge	5,13
C. trisperma Dewey	Three-seeded Sedge	3
EQUISETACEAE (Horsetail Family)		
Equisetum pratense Ehrh.	Meadow Horsetail	13
E. scirpoides Michx.	Dwarf Scouring-rush	13
E. sylvaticum L.	Woodland Horsetail	2,3,4,4b
ERICACEAE (Heath Family)		
Arctostaphylos uva-ursi (L.) Spreng.	Common Bearberry	9
Chamaedaphne calyculata (L.) Moench.	Leatherleaf	1,5,11
Gaultheria hispidula (L.) Muhl.	Creeping Snowberry	8,9,13
Kalmia polifolia Wang.	Bog Laurel	5
Ledum groenlandicum Oeder	Labrador Tea	1,4,4b,5,6,9,10,11,13
FUMARIACEAE (Fumitory Family)		
Corydalis sempervirens (L.) Pers.	Pink Corydalis	1
GRAMINEAE (Grass Family)		
Piptatherum pungens (Torr.) Romasch	Northern Rice Grass	3,4b
Phragmites communis Trin.	Common Reed Grass	3

Plant List cont'd		
LILIACEAE (Lily Family)		
Clintonia borealis (Ait.) Raf.	Bluebead Lily	2,4,6
Maianthemum canadense Desf.	Wild Lily-of-the-valley	2,3,4,4b,5,6,7,9,11
M. trifolium (L.) Sloboda	Three-leaved Solomon's Seal	5,11
LYCOPODIACEAE (Club-moss Family)		
Diphasium complanatum (L.) Rothm.	Trailing Club-moss	3,4,4b,6,9,12
Lycopodium annotinum L.	Stiff Club-moss	4,4b,5,,8,9,12
L. dendroideum L.	Ground Pine	6
MONOTROPACEAE (Indian-pipe Family)		
Monotropa uniflora L.	Indian Pipe	5,13
ONAGRACEAE (Evening-primrose Family)		
Epilobium angustifolium L.	Fireweed	2,3,4b,6,9
ORCHIDACEAE (Orchid Family)		
Goodyera repens (L.) Br.	Lesser Rattlesnake-Plantain	8,13
PINACEAE (Pine Family)		
Abies balsamea (l.) Mill.	Balsam Fir	4b,6,8,9,12,13,14
Larix laricina (Du Roi) Koch	Larch/Tamarack	5,11,13
Picea mariana (Mill.) BSP.	Black Spruce	All except plot 3
Pinus banksiana Lamb.	Jack Pine	1,2,3,4,4b,6,7,8,9,10,14
POLYPODIACEAE (Fern Family)		
Cystopteris fragilis (L.) Bernh.	Fragile fern	4
Dryopteris carthusiana (Villosa) H.P. Fuchs	Fragrant Fern	4b
Polypodium virginianum L.	Rock Polypody	9
PRIMULACEAE (Primrose Family)		
Trientalis borealis Raf.	Northern Starflower	2,4,4b,6
PYROLACEAE (Wintergreen Family)		
Chimaphila umbellata (L.) Barton	Prince's Pine	3,4,9,13
Pyrola asarifolia Michx.	Pink Wintergreen	2,14
P. elliptica Nutt.	White Wintergreen	4b,6
P. secunda L.	One-sided Wintergreen	3,9,13
P. virens Schweigger	Greenish-flowered Wintergreen	4,13
ROSACEAE (Rose Family)		
Amelanchier alnifolia Nutt.	Saskatoon	2,4b
Fragaria virginiana Dcne.	Smooth Wild Strawberry	2,3,4b
Prunus pensylvanica L.f.	Pincherry	3,4
Rosa acicularis Lindl.	Prickly Rose	13
R. woodsia Lindl.	Wood's Rose	13
Rubus chamaemorus L.	Cloudberry	5,11
R. idaeus (Michx.) Maxim.	Wild Red Raspberry	2,3,6
R. pubescens Raf.	Dewberry	2,3,4,4b,13,14

Plant List cont'd		
Sibbaldiopsis tridentata (Ait.) Rydb.	Three-toothed cinquefoil	3,7
Sorbus decora (Sarg.) C.K.	Mountain Ash	4
Spiraea alba Du Roi	Meadowsweet	2,11
RUBIACEAE (Madder Family)		
Galium triflorum Michx.	Sweet-scented Bedstraw	2
SALICACEAE (Willow Family)		
Populus balsamifera L.	Balsam Poplar	13
P. tremuloides Michx.	Trembling Aspen	2,3,4,4b,6,8,9,12,13,14
Salix bebbiana Sarg.	Bebb's Willow	3,4b
S. discolor Muhl.	Pussy Willow	4b,7
SAXIFRAGACEAE (Saxifrage Family)		
Mitell nuda L.	Bishop's Cap	13
Ribes oxyacanthoides L.	Northern Gooseberry	2
VACCINIACEAE (Huckleberry Family)		
Vaccinium myrtilloides Michx.	Blueberry	All except plots 5 and 11
V. oxycoccus L.	Small Bog Cranberry	5,11
V. vitis-idaea L.	Bog Cranberry	9,11
VIOLACEAE (Violet Family)		
Viola canadensis L.	Canada Violet	2

LICHENS		
CLADONIACEAE (Lichen Family)		
Cladina mitis (Sandst.) Hustich	Green Reindeer Lichen	1,7,9
C. rangiferina (L.) Nyl.	Grey Reindeer Lichen	1,3,7
C. stellaris (Opiz) Brodo	Northern Reindeer Lichen	1,3,7
Cladonia borealis S. Stenroos	Red Pixie-Cup "British Soldier"	1,3,4,5

MOSSES		
HYLOCOMIACEAE		
Hylocomium splendens (Hedw.) Schimp.	Stair-step Moss	1,2,3,6,8,10,11,12,13,14
Pleurozium schreberi (Brid.) Mitt.	Schreber's Moss	All except plot 5
HYPNACEAE		
Ptilium crista-castrensis (Hedw.) De Not.	Knight's Plume	1,4,4b,6,8,10,11,12,13

[1] Plots where species occurred

APPENDIX VI

TREE AND SHRUB DATA SHEETS

ESRA Vegetation Survey - Tree and Shrub Data (Project 7A)

Plot No.: 1

Surveyors: C. Higgs, T. Jordan, Colin Owens

Productivity Code and Cover Type: 6 (Jack pine 40-70%: 2nd maj. Species Spruce)

Date: Sept 21, 2013

Time: 11:30 am

Waypoint Name/No. : 001

TREE DATA (Overstorey) (10m x 20m)

V-type (FEC): V28

S-Type (FEC): S12F

Species Comp.: Sb6 Jp4 (Overstorey species)

(ie. Jp6,Po3,Sb1 - Jack pine 60%, Aspen 30%, Black Spruce 10%)

i) Tree Cores:

Tree No.	Species	Diameter (cm)	Canopy Status	Age
1	Sb	16.0	D	91 ± 2
2	Sb	16.4	D	83 ± 2
3	Jp	14.2	C	53 ± 2
4	Jp	9.9	S	46 ± 2
5	Sb	7.2	S	41 ± 2
6				

Jp - Jackpine
Sb - Black Spruce
Po - Trembling Aspen
Bw - White Birch
La - Larch
Fb - Balsam Fir

ii) Stem Counts:

Species	No. of stems	Species	No. of stems
Pj	9		
Sb	38		

2 cores (min) from main canopy:

2 cores from dominant species and 1 core for other species in canopy

2 cores (max) from subcanopy:

1 core/species or 2 cores from single species in subcanopy

Canopy status

D - Dominant
C - Co-dominant
S - Subcanopy

Notes:

SHRUB DATA (Understorey) (5m x 5m)

Species (Check if collected)	No. of stems
Picea mariana	7
Ledum groenlandicum	5

Photo No.

Notes:

ESRA Vegetation Survey - Tree and Shrub Data (Project 7A)

Plot No.: 2 | Date: Sept 21, 2013

Surveyors: C. Higgs, T. Jordan, Colin Owens | Time: 3:40 pm

Productivity Code and Cover Type: 81 (Po: 2nd major species Jp) | Waypoint Name/No. : 002

TREE DATA (Overstorey) (10m x 20m)

V-type (FEC): V9 | S-Type (FEC): S4

Species Comp.: Po6,Bw2,Jp1,Sb1 (ie. Jp6,Po3,Sb1 - Jack pine 60%, Aspen 30%, Black Spruce 10%)

(Overstorey species)

i) Tree Cores:

Tree No.	Species	Diameter (cm)	Canopy Status	Age
1	Po	24.2	D	85 ± 2
2	Po	8.6	S	22 ± 2
3	Bw	9.8	S	15 ± 2
4	Jp	7.8	S	20 ± 2
5				
6				

Jp - Jackpine
Sb - Black Spruce
Po - Trembling Aspen
Bw - White Birch
La - Larch
Fb - Balsam Fir

ii) Stem Counts:

Species	No. of stems	Species	No. of stems
Bw	20	Sb	3
Po	12		
Jp	2		

2 cores (min) from main canopy:

2 cores from dominant species and

1 core for other species in canopy

2 cores (max) from subcanopy:

1 core/species or 2 cores from single species in subcanopy

Canopy status
D - Dominant
C - Co-dominant
S - Subcanopy

Notes:

Thick understorey of Dogwood and Honeysuckle. Large snags in plot, but none with cavities.

Plot is sloped with NW aspect.

SHRUB DATA (Understorey) (5m x 5m)

Photo No. 19, 20

Species (Check if collected)	No. of stems
Cornus stolonifera	28
Alnus crispa	19
Rubus idaeus	5
Picea mariana	1
Prunus pensylvanica	1
Populus tremuloides	4

Notes:

Sorbus decora present in 200m^2 plot

ESRA Vegetation Survey - Tree and Shrub Data (Project 7A)

Plot No.: 3

Surveyors: C. Higgs, T. Jordan, Colin Owens

Productivity Code and Cover Type: 44 (Jack pine 51%: 2nd maj. species hardwood)

Date: Sept 22, 2013

Time: 9:44 am

Waypoint Name/No. : 007

TREE DATA (Overstorey) (10m x 20m)

V-type (FEC): V24

S-Type (FEC): SS6

Species Comp.: Jp6,Bw3,Po1 (Overstorey species)

(ie. Jp6,Po3,Sb1 - Jack pine 60%, Aspen 30%, Black Spruce 10%)

i) Tree Cores:

Tree No.	Species	Diameter (cm)	Canopy Status	Age
1	Jp	11.9	D	23 ± 2
2	Jp	11.6	D	21 ± 2
3	Bw	10.8	C	19 ± 2
4	Jp	6.4	S	19 ± 2
5	Po	7.0	S	27 ± 2
6				

Jp - Jackpine
Sb - Black Spruce
Po - Trembling Aspen
Bw - White Birch
La - Larch
Fb - Balsam Fir

ii) Stem Counts:

Species	No. of stems	Species	No. of stems
Jp	37		
Bw	6		
Po	9		

2 cores (min) from main canopy:

2 cores from dominant species and

1 core for other species in canopy

2 cores (max) from subcanopy:

1 core/species or 2 cores from single species in subcanopy

Canopy status

D - Dominant
C - Co-dominant
S - Subcanopy

Notes:

Original plot 3 location was in Jp100, so new location for plot approx. 60-75m S in a more representative stand. Woodpecker feeding holes in old snags, good moose habitat, and trees relatively short (10-12m). Some Sb in area.

SHRUB DATA (Understorey) (5m x 5m)

Species (Check if collected)	No. of stems
Alnus crispa	31
Populus tremuloides	4
Prunus pensylvanica	5
Betula papyrifera	2
Salix bebbiana	3
Pinus banksiana	1

Photo Nos.: 21, 22

Notes:

ESRA Vegetation Survey - Tree and Shrub Data (Project 7A)

Plot No.: 4 | Date: Sept 22, 2013

Surveyors: C. Higgs, T. Jordan, Colin Owens | Time: 11:30 am

Productivity Code and Cover Type: 4 (Jack pine 71 - 100%) | Waypoint Name/No. : 010

TREE DATA (Overstorey) (10m x 20m)

V-type (FEC): V16 | S-Type (FEC): S10

Species Comp.: Jp9,Po1 (ie. Jp6,Po3,Sb1 - Jack pine 60%, Aspen 30%, Black Spruce 10%)

(Overstorey species)

i) Tree Cores:

Tree No.	Species	Diameter (cm)	Canopy Status	Age
1	Jp	32.8	D	65 ± 2
2	Jp	26.5	D	58 ± 2
3	Po	26.2	C	47 ± 2
4	Jp	19.0	S	50 ± 2
5	Fb	9.3	S	41 ± 2
6				

Jp - Jackpine
Sb - Black Spruce
Po - Trembling Aspen
Bw - White Birch
La - Larch
Fb - Balsam Fir

ii) Stem Counts:

Species	No. of stems	Species	No. of stems
Jp	19*		
Po	2		
Fb	1		

2 cores (min) from main canopy:
2 cores from dominant species and
1 core for other species in canopy
2 cores (max) from subcanopy:
1 core/species or 2 cores from single species in subcanopy

Canopy status
D - Dominant
C - Co-dominant
S - Subcanopy

Notes:

* 2 of stems dead.

SHRUB DATA (Understorey) (5m x 5m)

Photo Nos.: 28, 29

Species (Check if collected)	No. of stems
Populus tremuloides	4
Prunus pensylvanica	1
Alnus crispa	13
Picea mariana	1

Notes:

Mountain ash (*Sorbus decora*) and white birch in 200m2 plot.

Northern Goshawk observed on plot. A sticknest in nearby Jp about three-quarter's up the 25-27m height of tree. Tree had a diameter of 32.5 cm.

ESRA Vegetation Survey - Tree and Shrub Data (Project 7A)

Plot No.: 4b

Surveyors: C. Higgs, T. Jordan, Colin Owens

Productivity Code and Cover Type: 81 (Trembling aspen: 2nd major species Jack Pine)

Date: Sept 23, 2013

Time: 11:30 am

Waypoint Name/No. : 024

TREE DATA (Overstorey) (10m x 20m)

V-type (FEC): V9

S-Type (FEC): S4

Species Comp.: Po5, Jp2, Bw2, Fb1 (Overstorey species)

(ie. Jp6,Po3,Sb1 - Jack pine 60%, Aspen 30%, Black Spruce 10%)

i) Tree Cores:

Tree No.	Species	Diameter (cm)	Canopy Status	Age
1	Po*	18.6	D	50 ± 2
2	Po	8.2	C	31 ± 2
3	Jp	12.6	C	29 ± 2
4	Bw	7.0	S	22 ± 2
5	Fb	7.1	S	21 ± 2
6				

Jp - Jackpine
Sb - Black Spruce
Po - Trembling Aspen
Bw - White Birch
La - Larch
Fb - Balsam Fir

ii) Stem Counts:

Species	No. of stems	Species	No. of stems
Po	62	Jp	2
Fb	10	Sb	1
Bw	26		

2 cores (min) from main canopy:

2 cores from dominant species and

1 core for other species in canopy

2 cores (max) from subcanopy:

1 core/species or 2 cores from single species in subcanopy

Canopy status

D - Dominant
C - Co-dominant
S - Subcanopy

Notes:

* tree nearly twice the height of others in plot. Trees in general are between 10-15m high. A few Po are considerably taller than the rest. Other species heights include balsam fir (5-8m) and white birch (8-10m).

SHRUB DATA (Understorey) (5m x 5m)

Species (Check if collected)	No. of stems
Alnus crispa	46
salix bebbiana	2
Picea mariana	3
Populus tremuloides	2

Photo Nos.: 46 - 51

Notes:

Shrub layer predominanatly green alder and Lowbush cranberry (*Viburnum edule*) scattered throughout. Plot is relatively flat and rock outcrops in vicinity of 30 - 100m away. All 3 species of Lycopodium in plot. PIWO excavation/feeding activity in snag in plot.

ESRA Vegetation Survey - Tree and Shrub Data (Project 7A)

Plot No.: 5*

Surveyors: C. Higgs, T. Jordan, Colin Owens

Productivity Code and Cover Type: 701 (Black Spruce treed muskeg)

Date: Sept 22, 2013

Time: 4:04 pm

Waypoint Name/No. : 013

TREE DATA (Overstorey) (10m x 20m)

V-type (FEC): V33

S-Type (FEC): S12S

Species Comp.: Sb10 (Overstorey species)

(ie. Jp6,Po3,Sb1 - Jack pine 60%, Aspen 30%, Black Spruce 10%)

i) Tree Cores:

Tree No.	Species	Diameter (cm)	Canopy Status	Age
1	Sb	15.5	D	89 ± 2
2	Sb	16.9	D	86 ± 2
3	La	13.9	C	101 ± 2
4	Sb	8.0	S	48 ± 2
5				
6				

Jp - Jackpine
Sb - Black Spruce
Po - Trembling Aspen
Bw - White Birch
La - Larch
Fb - Balsam Fir

ii) Stem Counts:

Species	No. of stems	Species	No. of stems
Sb	40		
La	1		

2 cores (min) from main canopy:

2 cores from dominant species and

1 core for other species in canopy

2 cores (max) from subcanopy:

1 core/species or 2 cores from single species in subcanopy

Canopy status

D - Dominant
C - Co-dominant
S - Subcanopy

Notes:

* New location in a Sb treed muskeg.

SHRUB DATA (Understorey) (5m x 5m)

Photo Nos.: 38, 39

Species (Check if collected)	No. of stems
Chamaedaphne calyculata	53
Betula papyrifera	4
Ledum groenalndicum	31
Picea mariana	2

Notes:

ESRA Vegetation Survey - Tree and Shrub Data (Project 7A)

Plot No.: 6

Surveyors: C. Higgs, T. Jordan, Paul Duck

Productivity Code and Cover Type: 81 (Trembling Aspen: 2nd major species Jack Pine)

Date: Sept 24, 2013

Time: 2:07 pm

Waypoint Name/No. : 009

TREE DATA (Overstorey) (10m x 20m)

V-type (FEC): V10

S-Type (FEC): S6

Species Comp.: Po7, Jp2, Sb1 (Overstorey species)

(ie. Jp6,Po3,Sb1 - Jack pine 60%, Aspen 30%, Black Spruce 10%)

i) Tree Cores:

Tree No.	Species	Diameter (cm)	Canopy Status	Age
1	Po	27.0	D	75 ± 2
2	Po	26.2	D	71 ± 2
3	Jp	29.0	C	66 ± 2
4	Sb	21.4	S	62 ± 2
5				
6				

Jp - Jackpine
Sb - Black Spruce
Po - Trembling Aspen
Bw - White Birch
La - Larch
Fb - Balsam Fir

ii) Stem Counts:

Species	No. of stems	Species	No. of stems
Po	7	Fb	1
Jp	3		
Sb	6		

2 cores (min) from main canopy:

2 cores from dominant species and

1 core for other species in canopy

2 cores (max) from subcanopy:

1 core/species or 2 cores from single species in subcanopy

Canopy status

D - Dominant
C - Co-dominant
S - Subcanopy

Notes:

Two Po and 3 Jack Pine snags in plot. Stand is mature to overmature, some fallen Sb trees and good Pine Marten habtat. Plot

mmediately N. of rock outcrop and sloping down in north direction (North aspect).

SHRUB DATA (Understorey) (5m x 5m)

Species (Check if collected)	No. of stems
Betula papyrifera	3
Alnus crispa	55
Populus tremuloides	2

Photo Nos.: 62 - 64

Notes:

Understorey strata is open to semi-open dominated by green alder with a minor component of pincherry and white birch.

Moose rubbed tree in plot and a resident red squirrel excavating holes in ground

ESRA Vegetation Survey - Tree and Shrub Data (Project 7A)

Plot No.: 7

Surveyors: C. Higgs, T. Jordan, Paul Duck

Productivity Code and Cover Type: 711 (Jack pine treed rock)

Date: Sept 24, 2013

Time: pm

Waypoint Name/No. : 012

TREE DATA (Overstorey) (10m x 20m)

V-type (FEC): V26

S-Type (FEC): SS1

Species Comp.: Jp9, Po1 (Overstorey species)

(ie. Jp6,Po3,Sb1 - Jack pine 60%, Aspen 30%, Black Spruce 10%)

i) Tree Cores:

Tree No.	Species	Diameter (cm)	Canopy Status	Age
1	Jp	23.1	D	68 ± 2
2	Jp	22.8	D	64 ± 2
3	Sb	17.7	C	51 ± 2
4	Jp	7.9	S	26 ± 2
5				
6				

Jp - Jackpine
Sb - Black Spruce
Po - Trembling Aspen
Bw - White Birch
La - Larch
Fb - Balsam Fir

ii) Stem Counts:

Species	No. of stems	Species	No. of stems
No Data			

2 cores (min) from main canopy:

2 cores from dominant species and

1 core for other species in canopy

2 cores (max) from subcanopy:

1 core/species or 2 cores from single species in subcanopy

Canopy status

D - Dominant
C - Co-dominant
S - Subcanopy

Notes:

SHRUB DATA (Understorey) (5m x 5m)

Species (Check if collected)	No. of stems
Alnus crispa	7
Picea mariana	8
Salix discolor	2

Photo Nos.: 74 - 76

Notes:

ESRA Vegetation Survey - Tree and Shrub Data (Project 7A)

Plot No.: 8 | Date: Sept 26, 2013

Surveyors: C. Higgs, T. Jordan, Colin Owens | Time: 10:20 am

Productivity Code and Cover Type: 14 (Black spruce 40-70%: 2nd major species Jack pine) | Waypoint Name/No. : 001

TREE DATA (Overstorey) (10m x 20m)

V-type (FEC): V18 | S-Type (FEC): S1

Species Comp.: Sb6, Jp4 (ie. Jp6,Po3,Sb1 - Jack pine 60%, Aspen 30%, Black Spruce 10%)

(Overstorey species)

i) Tree Cores:

Tree No.	Species	Diameter (cm)	Canopy Status	Age
1	Sb	17.5	D	64 ± 2
2	Sb	17.0	D	62 ± 2
3	Jp	23.1	C	69 ± 2
4	Sb	10.2	S	47 ± 2
5	Bw	13.5	C	31 ± 2
6				

Jp - Jackpine
Sb - Black Spruce
Po - Trembling Aspen
Bw - White Birch
La - Larch
Fb - Balsam Fir

ii) Stem Counts:

Species	No. of stems	Species	No. of stems
Sb	41	Po	1
Jp	7	Bw	2
Fb	1		

2 cores (min) from main canopy:
2 cores from dominant species and
1 core for other species in canopy
2 cores (max) from subcanopy:
1 core/species or 2 cores from
single species in subcanopy

Canopy status
D - Dominant
C - Co-dominant
S - Subcanopy

Notes:

Plot has S aspect. Plot has an open understorey, moss cover on 85-100% of forest floor and a few fallen trees and old logs in plot.

Higher density of Po trees south of plot. One snag in plot has feeding holes in it and charcoal covered stump present indicating

forest fire influence on stand.

SHRUB DATA (Understorey) (5m x 5m)

Species (Check if collected)	No. of stems
NO SHRUBS	

Photo Nos.: 121 - 124

Notes:

Plot is on site that is herb poor and moss rich. There is some low-bush cranberry in the 200m2 plot. Several squirrel middens throughout the plot.

ESRA Vegetation Survey - Tree and Shrub Data (Project 7A)

Plot No.: 9

Surveyors: C. Higgs, T. Jordan, Paul Duck

Productivity Code and Cover Type: 4 (Jack pine 71 - 100%)

Date: Sept 26, 2013

Time: am

Waypoint Name/No. : 005

TREE DATA (Overstorey) (10m x 20m)

V-type (FEC): V16

S-Type (FEC): S2

Species Comp.: Jp9, Sb1 (Overstorey species)

(ie. Jp6,Po3,Sb1 - Jack pine 60%, Aspen 30%, Black Spruce 10%)

i) Tree Cores:

Tree No.	Species	Diameter (cm)	Canopy Status	Age
1	Jp	32.2	D	71 ± 2
2	Jp	26.7	D	78 ± 2
3	Sb	18.0	S	61 ± 2
4	Jp	12.1	S	46 ± 2
5				
6				

Jp - Jackpine
Sb - Black Spruce
Po - Trembling Aspen
Bw - White Birch
La - Larch
Fb - Balsam Fir

ii) Stem Counts:

Species	No. of stems	Species	No. of stems
Jp	15		
Sb	5		
		Jp Snag	1

2 cores (min) from main canopy:

2 cores from dominant species and 1 core for other species in canopy

2 cores (max) from subcanopy:

1 core/species or 2 cores from single species in subcanopy

Canopy status

D - Dominant
C - Co-dominant
S - Subcanopy

Notes:

Mature stand of Jp, rock outcrops N of plot and slope about 10%. Stand of trees has a crown closure of 30-40%.

SHRUB DATA (Understorey) (5m x 5m)

Species (Check if collected)	No. of stems
Abies balsamea	1
Betula papyrifera	1
Picea mariana	1
Populus tremuloides	5
Ledum groenlandicum	11

Photo Nos.: 127 - 128

Notes:

Extensive patches of blueberry in area dominated by sandy soil. Scattered white birch shrubs in general area with green alder present in southern part of plot.

ESRA Vegetation Survey - Tree and Shrub Data (Project 7A)

Plot No.: 10 | Date: Sept 25, 2013

Surveyors: C. Higgs, T. Jordan, Paul Duck | Time:

Productivity Code and Cover Type: 6 (Jack pine 40-70%: 2nd maj. Species Spruce) | Waypoint Name/No. : 004

TREE DATA (Overstorey) (10m x 20m)

V-type (FEC): V28 | S-Type (FEC): S4

Species Comp.: Jp5, Sb5 (ie. Jp6,Po3,Sb1 - Jack pine 60%, Aspen 30%, Black Spruce 10%)

(Overstorey species)

i) Tree Cores:

Tree No.	Species	Diameter (cm)	Canopy Status	Age
1	Jp	25.4	D	82 ± 2
2	Jp	26.1	D	81 ± 2
3	Sb	21.4	C	76 ± 2
4	Sb	20.0	S	74 ± 2
5				
6				

Jp - Jackpine
Sb - Black Spruce
Po - Trembling Aspen
Bw - White Birch
La - Larch
Fb - Balsam Fir

ii) Stem Counts:

Species	No. of stems	Species	No. of stems
Sb	23		
Jp	14		

2 cores (min) from main canopy:

2 cores from dominant species and

1 core for other species in canopy

2 cores (max) from subcanopy:

1 core/species or 2 cores from single species in subcanopy

Canopy status
D - Dominant
C - Co-dominant
S - Subcanopy

Notes:

Generally, forest stand was not uniformly mixed as jack pine was dominant in places and black spruce in others. Mature to overmature stand with some of older jack pine blowdown. Very open understorey.

SHRUB DATA (Understorey) (5m x 5m)

Species (Check if collected)	No. of stems
Picea mariana	2
Ledum groenlandicum	3
Betula papyrifera	3

Photo Nos.: 95 - 98

Notes:

PIWO observed on plot. Slope about 10%, south aspect.

ESRA Vegetation Survey - Tree and Shrub Data (Project 7A)

Plot No.: 11 | Date: Sept 25, 2013

Surveyors: C. Higgs, T. Jordan, Paul Duck | Time: 10:30 am

Productivity Code and Cover Type: 702 (Tamarack Treed Muskeg)) | Waypoint Name/No. : 003

TREE DATA (Overstorey) (10m x 20m)

V-type (FEC): V33 | S-Type (FEC): S12S

Species Comp.: Sb9, La1 (ie. Jp6,Po3,Sb1 - Jack pine 60%, Aspen 30%, Black Spruce 10%)

(Overstorey species)

i) Tree Cores:

Tree No.	Species	Diameter (cm)	Canopy Status	Age
1	La	12.5	C	52 ± 2
2	La	11.2	C	61 ± 2
3	Sb	11.4	D	58 ± 2
4	Sb	10.9	D	46 ± 2
5	Sb	6.5	S	39 ± 2
6				

Jp - Jackpine
Sb - Black Spruce
Po - Trembling Aspen
Bw - White Birch
La - Larch
Fb - Balsam Fir

ii) Stem Counts:

Species	No. of stems	Species	No. of stems
Sb	146		
La	7		

2 cores (min) from main canopy:

2 cores from dominant species and

1 core for other species in canopy

2 cores (max) from subcanopy:

1 core/species or 2 cores from single species in subcanopy

Canopy status

D - Dominant
C - Co-dominant

S - Subcanopy

Notes:

Stand cover type 702 at this location is black spruce dominant. Tamarack is a very minor component in the stand but most of tamarack are 5 - 8m taller than the tallest black spruce trees. There is natural regeneration of black spruce occurring in the stand.

SHRUB DATA (Understorey) (5m x 5m)

Species (Check if collected)	No. of stems
Ledum groenlandicum	25
Picea mariana	18
Spiraea alba	11

Photo Nos.: 92 - 94

Notes:

ESRA Vegetation Survey - Tree and Shrub Data (Project 7A)

Plot No.: 12 | Date: Sept 26, 2013

Surveyors: C. Higgs, T. Jordan, Paul Duck | Time: 2:27 pm

Productivity Code and Cover Type: 82 (Trembling Aspen:2nd major species Spruce or Balsam Fir) | Waypoint Name/No. : 008

TREE DATA (Overstorey) (10m x 20m)

V-type (FEC): V9 | S-Type (FEC): S4

Species Comp.: Po5, Fb2, Sb2, Bw1 (ie. Jp6,Po3,Sb1 - Jack pine 60%, Aspen 30%, Black Spruce 10%)

(Overstorey species)

i) Tree Cores:

Tree No.	Species	Diameter (cm)	Canopy Status	Age
1	Po	9.9	D	19 ± 2
2	Po	7.0	D	16 ± 2
3	Sb	15.3	D	57 ± 2
4	Fb		S	26 ± 2
5	Bw	14.2	D	23 ± 2
6	Sb	8	S	25 ± 2

Jp - Jackpine
Sb - Black Spruce
Po - Trembling Aspen
Bw - White Birch
La - Larch
Fb - Balsam Fir

ii) Stem Counts:

Species	No. of stems	Species	No. of stems
Po	36	Bw	9
Sb	19		
Fb	6		

2 cores (min) from main canopy:

2 cores from dominant species and

1 core for other species in canopy

2 cores (max) from subcanopy:

1 core/species or 2 cores from single species in subcanopy

Canopy status

D - Dominant
C - Co-dominant

S - Subcanopy

Notes:

This is a relatively young stand. Po is dominant with an understorey of Sb and Fb approx. 4 - 5m in height. Very dense stand, many small diameter stems, and scattered blowdown. Some very tall Po scattered throughout plot and in surrounding area.

SHRUB DATA (Understorey) (5m x 5m)

Species (Check if collected)	No. of stems
Abies balsamea	14
Pice mariana	6

Photo Nos.: 138 - 140

Notes:

Plot on south aspect and sparsely vegetated.

ESRA Vegetation Survey - Tree and Shrub Data (Project 7A)

Plot No.: 13

Surveyors: C. Higgs, T. Jordan, Paul Duck

Productivity Code and Cover Type: 13 (Black Spruce 71 - 100%)

Date: Sept 25, 2013

Time: 3:42 pm

Waypoint Name/No. : 008

TREE DATA (Overstorey) (10m x 20m)

V-type (FEC): V17

S-Type (FEC): S6

Species Comp.: Sb6, Fb2, Po1, Bw1 (Overstorey species)

(ie. Jp6,Po3,Sb1 - Jack pine 60%, Aspen 30%, Black Spruce 10%)

i) Tree Cores:

Tree No.	Species	Diameter (cm)	Canopy Status	Age
1	Sb	19.7	D	102 ± 2
2	Sb	20.6	D	105 ± 2
3	Fb	15.2	C	56 ± 2
4	La	16.6	C	28 ± 2
5	Bw	7.1	S	15 ± 2
6				

Jp - Jackpine
Sb - Black Spruce
Po - Trembling Aspen
Bw - White Birch
La - Larch
Fb - Balsam Fir
Pb - Balsam Poplar

ii) Stem Counts:

Species	No. of stems	Species	No. of stems
Fb	14	*Sb*	4
Bw	6	*La*	4
Pb	5	*Po*	3

2 cores (min) from main canopy:

2 cores from dominant species and

1 core for other species in canopy

2 cores (max) from subcanopy:

1 core/species or 2 cores from single species in subcanopy

Canopy status

D - Dominant
C - Co-dominant
S - Subcanopy

Notes:

Plot in narrow band of conifer along woodland swamp. Rusty blackbird observed and singing in swamp.

There were some active nesting cavities used by WBNU and BCCH.

SHRUB DATA (Understorey) (5m x 5m)

Species (Check if collected)	No. of stems
Abies balsamea	16
Picea mariana	7
Cornus stolonifera	10
Rosa woodsia	2
Ribes sp	1
Ledum groenlandicum	15
Vaccinium myrtilloides	2

Photo Nos.: 101 - 103

Notes:

Shrubs in patches throughout plot, not evenly distributed.

ESRA Vegetation Survey - Tree and Shrub Data (Project 7A)

Plot No.: 14

Surveyors: C. Higgs, T. Jordan, Paul Duck

Productivity Code and Cover Type: 46 (Pj<50%: 2nd maj. Sp Spruce:3rd maj. Sp Hdwd)

Date: Sept 25, 2013

Time: 5:32 pm

Waypoint Name/No. : 011

TREE DATA (Overstorey) (10m x 20m)

V-type (FEC): V15

S-Type (FEC): S10

Species Comp.: Jp4, Po3, Sb2, Bw1 (ie. Jp6,Po3,Sb1 - Jack pine 60%, Aspen 30%, Black Spruce 10%)

(Overstorey species)

i) Tree Cores:

Tree No.	Species	Diameter (cm)	Canopy Status	Age
1	Sb	24.6	D	50 ± 2
2	Sb	14.5	D	42 ± 2
3	Jp	15.3	C	30 ± 2
4	Po	9.4	S	28 ± 2
5	Jp	9.4	S	28 ± 2
6				

Jp - Jackpine
Sb - Black Spruce
Po - Trembling Aspen
Bw - White Birch
La - Larch
Fb - Balsam Fir

ii) Stem Counts:

Species	No. of stems	Species	No. of stems
Jp	30	Fb	3
Po	45	Bw	1
Sb	13		

2 cores (min) from main canopy:

2 cores from dominant species and

1 core for other species in canopy

2 cores (max) from subcanopy:

1 core/species or 2 cores from single species in subcanopy

Canopy status

D - Dominant
C - Co-dominant
S - Subcanopy

Notes:

Some Po snags in plot. Much of Po in subcanopy.

Dryopteris austriaca, Cryptogramma crispa in 200m^2 plot

SHRUB DATA (Understorey) (5m x 5m)

Species (Check if collected)	No. of stems
Betula papyrifera	9
Alnus crispa	15
Picea mariana	2
Abies balsamea	1

Photo Nos.: 105 - 107

Notes:

APPENDIX VII
GROUND COVER DATA SHEETS

ESRA Vegetation Survey - Ground Cover Data (Project 7A)

Plot No.: 1

Date: Sept 21, 2013

Surveyors: C. Higgs, T. Jordan and Colin Owens

Time: 11:30am

Productivity Code and Cover Type: 6 (JP 40-70%, 2nd major species Spruce)

Waypoint Name/No. : 001

	Quadrats						
Species	1	2	3	4	5	6	quadrats
Vaccinium myrtilloides	●	●	O	●	●	●	5
Ledum groenlandicum	O	●	●	●	O	O	3
Picea mariana (shrub)	O	●	O	●	●	O	3
Viburnum edule	O	O	●	O	O	O	1
Chamaedaphne calyculata	O	O	●	●	O	O	2
Corydalis sempervirens	O	O	O	O	O	●	1
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
Lichen sp. "greyish white"	O	O	O	O	O	●	1
Lichen sp. "British soldier"	O	O	O	O	O	●	1
Lichen sp. "circular" on rock	O	O	O	●	O	O	1
	O	O	O	O	O	O	O
Moss (very small feather moss like)	O	O	O	O	●	O	1
Moss (very small)	●	O	O	O	O	O	1
Moss (sphagnum in appearance)	●	O	O	O	O	O	1
	O	O	O	O	O	O	O
Cladonia sp.	●	O	O	O	●	O	2
Cladina mitis	●	O	O	O	O	●	2
Cladina rangiferina	●	O	●	●	●	O	4
Cladina stellaris	●	O	O	●	●	O	3
Sphagnum sp.	O	O	●	O	O	O	1
Dicranum sp.	●	●	●	●	●	●	6
Hylocomium splendens	O	O	●	O	O	O	1
Pleurozium schreberi	●	●	●	●	●	O	5
Ptilium crista-castrensis	O	O	●	O	O	O	1
Litter (% cover)	5	0	0	0	0	5	1.67
Rock (% cover)	15	0	0	10	5	40	11.67
Bare mineral soil (% cover)	O	O	O	O	O	O	0.00
Water (% cover)	O	O	O	O	O	O	0.00

ESRA Vegetation Survey - Ground Cover Data (Project 7A)

Plot No.: 2 | Date: Sept 21, 2013

Surveyors: C. Higgs, T. Jordan and Colin Owens | Time: 3:40pm

Productivity Code and Cover Type: 81 (Po: 2nd major species Pj) | Waypoint Name/No. : 002

Plant codes: (t) - tree (s) - shrub

	Quadrats						
Species	1	2	3	4	5	6	No of quadrats
Aralia nudicaulus	●	O	O	O	O	●	2
Alnus crispa	●	O	O	●	O	O	2
Epilobium angustifolium	●	●	O	●	●	O	4
Fragaria virginiana	●	●	O	O	O	●	3
Diervilla lonicera	●	O	O	O	O	●	2
Pyrola asarifloia	●	●	●	O	O	O	3
Spirea alba (shrub)	●	O	O	O	O	O	1
Linnaea borealis	●	●	●	O	●	O	4
Maianthemum canadensis	●	●	O	●	O	O	3
Rubus ideaus	O	●	●	O	●	●	4
Lycopodium complanantum	O	●	O	O	O	O	1
Rubus pubescens	O	●	O	●	●	O	3
Calamagrostis sp	O	●	O	●	●	O	3
Populus tremuloides (s)	O	●	●	O	O	O	2
Cornus canadensis	O	O	●	O	●	●	3
Viburnum edule	O	O	●	O	●	●	3
Cornus stolonifera	O	O	O	●	●	O	2
Ribes oxyacanthoides	O	O	O	●	O	●	2
Equisetum sylvaticum	O	O	O	●	O	O	1
Petasites palmatus	O	O	O	●	O	O	1
Trientalis borealis	O	O	O	●	O	O	1
Viola canadensis	O	O	O	●	O	O	1
Amelanchier alnifolia (s)	O	O	O	O	●	●	2
Vaccinium myrtilloides	O	O	O	O	O	●	1
Clintonia borealis	O	O	O	O	O	●	1
Galium triflorum	O	O	O	O	O	●	1
Pyrola sp.	O	O	O	O	O	●	1
Aster sp.	O	O	O	O	O	●	1
Moss sp. 1	O	●	O	O	O	O	1
Moss sp. 2	●	O	O	O	O	O	1
Cladina mitis	O	O	O	O	O	O	O
Cladina rangiferina	O	O	O	O	O	O	O
Cladina stellaris	O	O	O	O	O	O	O
Hylocomium splendens	O	O	●	O	O	O	1
Pleurozium schreberi	O	●	●	O	O	●	3
Ptilium crista-castrensis	O	O	O	O	O	O	O
Litter (% cover)	60	5	45	30	50	15	34.17
Rock (% cover)	0	0	0	0	0	0	0.00
Bare mineral soil (% cover)	0	0	0	0	0	0	0.00
Water (% cover)	0	0	0	0	0	0	0.00

ESRA Vegetation Survey - Ground Cover Data (Project 7A)

Plot No.: 3 | Date: Sept 22, 2013

Surveyors: C. Higgs, T. Jordan and Colin Owens | Time: 9:44 am

Productivity Code and Cover Type: 44 (JP > 51%: 2nd major species Hardwood) | Waypoint Name/No. : 007

Plant codes: (t) - tree (s) - shrub

	Quadrats						
Species	1	2	3	4	5	6	No of quadrats
Alnus crispa	●	●	●	●	●	O	5
Aralia nudicaulus	●	O	O	O	O	●	2
Rubus ideaus	●	O	O	O	O	O	1
Betula papyrifera (t)	●	O	O	O	O	O	1
Salix bebbiana	●	●	O	●	O	O	3
Equisetum sylvaticum	O	●	●	O	O	O	2
Vaccinium myrtilloides	O	●	●	●	O	●	4
Fragaria virginiana	O	●	O	O	O	O	1
Populus tremuloides (s)	O	O	●	O	O	O	1
Chimaphila umbellata	O	O	●	●	●	●	4
Sibbaldiopsis tridentata	O	O	O	●	O	O	1
Rubus pubescens	O	O	O	●	O	O	1
Linnaea borealis	O	O	O	O	●	●	2
Piptatherum pungens	O	O	O	O	●	●	2
Carex trisperma	O	O	O	●	O	O	1
Diphasium complanatum	O	O	O	O	●	●	2
Pinus banksiana (t)	O	O	O	O	●	●	2
Epilobium angustifolium	O	O	O	O	O	●	1
Maianthemum canadense	O	O	O	O	O	●	1
Pyrola secunda	O	O	O	O	O	●	1
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
Lichen "brown-topped"	O	O	O	O	O	O	O
Cladonia borealis	O	O	O	●	●	O	2
Moss sp.	●	O	●	O	O	O	2
Cladonia sp.	O	O	O	O	O	O	O
Cladina mitis	O	O	O	O	O	O	O
Cladina rangiferina	O	O	O	O	●	O	1
Cladina stellaris	O	O	O	●	●	O	2
Sphagnum sp.	O	O	O	O	O	O	O
Dicranum sp.	●	●	●	●	●	●	6
Hylocomium splendens	O	O	O	O	O	●	1
Pleurozium schreberi	●	●	●	O	●	●	5
Ptilium crista-castrensis	O	O	O	O	O	O	O
Litter (% cover)	95	90	30	30	5	0	41.67
Rock (% cover)	0	0	0	0	0	0	0.00
Bare mineral soil (% cover)	0	0	0	0	0	0	0.00
Water (% cover)	0	0	0	0	0	0	0.00
Woody Debris (% cover)	0	0	0	0	0	0	0.00

ESRA Vegetation Survey - Ground Cover Data (Project 7A)

Plot No.: 4 | Date: Sept 22, 2013

Surveyors: C. Higgs, T. Jordan and Colin Owens | Time: 12:38 pm

Productivity Code and Cover Type: 4 (JP 71 - 100%) | Waypoint Name/No. : 010

Plant codes: (t) - tree (s) - shrub

	Quadrats						
Species	1	2	3	4	5	6	No of quadrats
Lycopodium annotatum	●	●	O	●	●	O	4
Linnaea borealis	●	●	O	●	O	●	4
Pyrola virens	●	O	O	O	O	O	1
Chimaphila umbellata	●	O	O	O	O	O	1
Pinus banksiana (t)	●	O	O	O	O	●	2
Alnus crispa	O	●	O	●	●	O	3
Equisetum sylvaticum	O	●	O	O	●	O	2
Ledum groenlandicum	O	O	●	O	O	O	1
Diphasium complanatum	O	O	●	●	O	O	2
Trientalis borealis	O	O	●	●	O	●	3
Cornus canadensis	O	O	●	●	●	●	4
Maianthemum canadense	O	O	●	O	O	O	1
Cystopteris fragilis	O	O	O	●	O	O	1
Rubus pubsecens	O	O	O	●	●	O	2
Aralia nudicaulus	O	O	O	●	●	●	3
Clintonia borealis	O	O	O	O	O	●	1
Vaccinium myrtilloides	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
Cladonia borealis	O	O	O	●	O	O	1
Moss sp.	●	O	O	O	O	O	1
Snag (Po)	O	O	●	O	O	O	1
Cladonia sp.	O	O	O	O	O	O	O
Cladina mitis	O	O	O	O	O	O	O
Cladina rangiferina	O	O	O	O	O	O	O
Cladina stellaris	O	O	O	O	O	O	O
Sphagnum sp.	O	O	O	O	O	O	O
Dicranum sp.	O	O	O	O	O	O	O
Hylocomium splendens	O	O	O	O	O	O	O
Pleurozium schreberi	●	●	●	●	●	●	6
Ptilium crista-castrensis	O	O	●	●	O	O	2
Litter (% cover)	0	50	15	5	0	0	11.67
Rock (% cover)	0	0	0	0	0	0	0.00
Bare mineral soil (% cover)	0	0	0	0	0	0	0.00
Water (% cover)	0	0	0	0	0	0	0.00

ESRA Vegetation Survey - Ground Cover Data (Project 7A)

Plot No.: 4b

Date: Sept 23, 2013

Surveyors: C. Higgs, T. Jordan and Colin Owens

Time: 11:07 am

Productivity Code and Cover Type: 81 (Trembling Aspen: 2nd major species JP)

Waypoint Name/No. : 024

Plant codes: (t) - tree (s) - shrub

	Quadrats						
Species	1	2	3	4	5	6	No of quadrats
Betula payrifera (t)	●	O	O	O	O	O	1
Populus tremuloides (t)	●	O	O	O	●	●	3
Abies balsamea (t)	●	O	O	O	O	O	1
Trientalis borealis	●	●	O	●	O	O	3
Betula payrifera (s)	●	O	O	O	O	O	1
Linnaea borealis	●	●	O	●	●	●	5
Diphasium complanantum	●	●	●	O	O	O	3
Viola sp.	●	●	O	O	●	O	3
Cornus canadensis	●	●	O	O	●	O	3
Abies balsamea (s)	●	O	O	O	O	O	1
Maianthemum canadensis	O	O	O	●	●	●	3
Lycopodium ??	O	●	●	O	O	O	2
Alnus crispa	O	●	●	●	O	O	3
Ledum groenlandicum	O	●	●	O	●	O	3
Salix discolor	O	●	O	O	O	O	1
Rubus pubescens	O	O	●	●	●	●	4
Carex sp.	O	O	●	●	●	O	3
Amelanchier alnifolia	O	O	O	●	O	O	1
Petasites palmatus	O	O	O	O	●	●	2
Fragaria virginiana	O	O	O	O	●	O	1
Lycopodium annotatum	O	O	O	O	●	O	1
Epilobium angustifolium	O	O	O	O	●	●	2
Equisetum sylvaticum	O	O	O	O	O	●	1
Pyrola elliptica	O	O	O	O	O	●	1
Piptatherum pungens	O	O	O	O	O	●	1
Vaccinium myrtilloides	O	O	O	O	O	●	1
Lichen "pixie cup like"	O	O	O	O	O	●	1
Peltigera sp.	O	O	O	●	O	●	2
Moss sp. "close to ground'	●	O	O	●	●	O	3
Cladina mitis	O	O	O	O	O	O	O
Cladina rangiferina	O	O	O	O	O	O	O
Cladina stellaris	O	O	O	O	O	O	O
Dicranum sp.	●	●	O	O	O	●	3
Hylocomium splendens	O	O	O	O	O	O	O
Pleurozium schreberi	O	O	O	●	O	●	2
Ptilium crista-castrensis	O	O	O	O	O	●	1
Litter (% cover)	45	25	15	30	0	30	0.00
Rock (% cover)	0	0	0	0	0	0	0.00
Bare mineral soil (% cover)	0	0	0	0	0	0	0.00
Woody debris (% cover)	0	0	0	60	0	30	0.00

ESRA Vegetation Survey - Ground Cover Data (Project 7A)

Plot No.: 5 | **Date**: Sept 22, 2013

Surveyors: C. Higgs, T. Jordan and Colin Owens | **Time**: 4:04 pm

Productivity Code and Cover Type: 701 (Black Spruce Treed Muskeg) | **Waypoint Name/No.** : 013

Plant codes: (t) - tree (s) - shrub

	Quadrats						
Species	1	2	3	4	5	6	No of quadrats
Chamaedaphne calyculata	●	●	●	●	●	●	6
Rubus chamaemorus	●	●	O	●	●	O	4
Kalmia polifolia	●	●	O	●	O	●	4
Ledum groenlandicum	●	●	●	●	●	●	6
Vaccinium oxycoccus	●	●	●	O	●	●	5
Maianthemum trifolium	●	●	O	●	O	●	4
Lycopodium annotatum	●	O	O	O	O	●	2
Carex sp 1	●	●	●	O	O	●	4
Picea mariana (t)	O	●	●	O	O	O	2
Maianthemum canadense	O	O	●	O	O	O	1
Monotropa uniflora	O	O	O	●	O	O	1
Carex disperma	O	O	O	●	●	●	3
Betula pumila	O	O	O	●	O	O	1
Picea mariana (s)	O	O	O	O	●	O	1
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
Lichen "spike like"	O	O	●	O	O	O	1
Cladonia borealis	O	O	●	O	O	O	1
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
Cladonia sp.	O	O	O	O	O	O	O
Cladina mitis	O	O	O	O	O	O	O
Cladina rangiferina	O	O	O	O	O	O	O
Cladina stellaris	O	O	O	O	O	O	O
Sphagnum sp.	●	●	●	●	●	●	6
Dicranum sp.	O	●	O	O	O	O	1
Hylocomium splendens	O	O	O	O	O	O	O
Pleurozium schreberi	O	O	O	O	O	O	O
Ptilium crista-castrensis	O	O	O	O	O	O	O
Sphagnum sp. (cover %)	95	95	80	99	99	99	94.50
Litter (% cove	0	0	0	0	0	0	0.00
Rock (% cover	0	0	0	0	0	0	0.00
Bare mineral soil (% cove	0	0	0	0	0	0	0.00
Water (% cove	0	0	0	0	0	0	0.00

ESRA Vegetation Survey - Ground Cover Data (Project 7A)

Plot No.: 6 | **Date**: Sept 24, 2013

Surveyors: C. Higgs, T. Jordan and Paul Duck | **Time**: 12:40 pm

Productivity Code and Cover Type: 81 (Trembling Aspen: 2nd major sp. Jp) | **Waypoint Name/No.** : 009

Plant codes: (t) - tree (s) - shrub

	Quadrats						
Species	1	2	3	4	5	6	quadrats
Alnus crispa	●	●	●	O	O	●	4
Ledum groenlandicum	●	O	O	O	O	O	1
Lycopodium annotinum	●	●	O	●	●	O	4
Clintonia borealis	●	●	O	●	O	O	3
Maianthemum canadense	●	O	O	O	O	●	2
Grass sp 1	●	O	O	O	O	●	2
Petasites palmatus	●	O	O	O	O	O	1
Rubus ideaus	●	O	O	O	O	O	1
Diphasium complanatum	O	●	O	O	O	O	1
Pyrola elliptica	O	●	O	O	O	O	1
Trientalis borealis	O	●	●	●	●	O	4
Viola sp.	O	●	O	O	O	O	1
Vaccinium myrtilloides	O	●	●	●	O	O	3
Linnaea borealis	O	O	●	●	●	●	4
Cornus canadensis	O	O	O	●	●	●	3
Picea mariana (s)	O	O	O	●	O	O	1
Epilobium angustifolium	O	O	O	O	●	●	2
Diervilla lonicera	O	O	O	O	O	●	1
Lycopodium dendroideum	O	O	O	O	O	●	1
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
Moss	O	O	●	●	●	O	3
Moss sp (prostrate)	O	●	O	O	O	O	1
Cladonia sp.	O	O	O	O	O	O	O
Cladina mitis	O	O	O	O	O	O	O
Cladina rangiferina	O	O	O	O	O	O	O
Cladina stellaris	O	O	O	O	O	O	O
Sphagnum sp.	O	O	O	O	O	O	O
Dicranum sp.	●	O	O	O	O	O	1
Hylocomium splendens	●	O	●	●	●	●	5
Pleurozium schreberi	●	●	●	●	●	●	6
Ptilium crista-castrensis	●	●	O	●	O	●	4
Litter (% cover)	5	10	20	0	0	5	6.67
Rock (% cover)	0	0	0	0	0	0	0.00
Bare mineral soil (% cover)	0	0	0	0	0	0	0.00
Water (% cover)	0	0	0	0	0	0	0.00
Woody debris (% cover)	0	0	0	0	0	5	0.83

ESRA Vegetation Survey - Ground Cover Data (Project 7A)

Plot No.: 7 | **Date**: Sept 24, 2013

Surveyors: C. Higgs, T. Jordan and Paul Duck | **Time**: 3:37 pm

Productivity Code and Cover Type: 711 (Jack Pine treed rock) | **Waypoint Name/No.** : 012

Plant codes: (t) - tree (s) - shrub

	Quadrats						
Species	1	2	3	4	5	6	quadrats
Vaccinium myrtilloides	●	●	O	●	●	●	5
Picea mariana (s)	O	O	●	●	O	●	3
Alnus crispa	O	O	O	●	O	O	1
Oryzopsis pungens	O	O	●	O	●	O	2
Sibbaldiopsis tridentata	O	O	O	O	O	●	1
Apocynum androsaemifolium	O	O	O	O	O	●	1
Maianthemum canadense	O	O	O	O	O	●	1
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
Lichen "brown-topped'	O	O	O	●	●	O	2
Lichen "spike-like"	●	O	O	O	O	O	1
Moss sp.	●	O	O	●	●	O	3
Cladonia sp.	O	O	O	O	O	O	O
Cladina mitis	●	O	O	●	●	●	4
Cladina rangiferina	●	●	O	O	●	O	3
Cladina stellaris	●	●	●	●	O	O	4
Sphagnum sp.	O	O	O	O	O	O	O
Dicranum sp.	O	O	O	●	O	●	2
Hylocomium splendens	O	O	O	O	O	O	O
Pleurozium schreberi	●	O	O	●	●	●	4
Ptilium crista-castrensis	O	O	O	O	O	O	O
Litter (% cover)	5	0	0	0	0	0	0.83
Rock (% cover)	0	0	0	0	0	0	0.00
Bare mineral soil (% cover)	0	0	0	0	0	0	0.00
Woody debris (% cover)	0	0	0	30	0	0	5.00
Moss (% cover)	75	100	0	0	80	95	58.33

ESRA Vegetation Survey - Ground Cover Data (Project 7A)

Plot No.: 8 | **Date**: Sept 26, 2013

Surveyors: C. Higgs, T. Jordan and Paul Duck | **Time**: 9:56 am

Productivity Code and Cover Type: 14 (Black Spruce 40-70%: 2nd maj. Sp. Jack pine) | **Waypoint Name/No.** : 001

Plant codes: (t) - tree (s) - shrub

	Quadrats						
Species	1	2	3	4	5	6	quadrats
Populus tremuloides (s)	●	O	O	O	O	O	1
Abies balsamea (s)	O	●	O	O	O	O	1
Goodyera repens	O	●	O	●	O	O	2
Linnaea borealis	O	O	●	O	O	O	1
Aralia nudicaulis	O	O	●	O	O	O	1
Picea mariana (s)	O	O	●	O	O	●	2
Picea mariana (t)	O	O	O	O	●	O	1
Lycopodium annotinum	O	O	O	O	●	O	1
Gaultheria hispidula	O	O	O	O	O	●	1
Vaccinium myrtilloides	O	O	O	O	O	●	1
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
Feathermoss sp "other"	O	●	●	●	●	●	5
Moss sp.	●	●	O	●	●	●	5
Lichen "greyish, spike-like"	●	O	O	O	O	O	1
Cladonia sp.	O	O	O	O	O	O	O
Cladina mitis	O	O	O	O	O	O	O
Cladina rangiferina	O	O	O	O	O	O	O
Cladina stellaris	O	O	O	O	O	O	O
Sphagnum sp.	O	O	O	O	O	O	O
Dicranum sp.	●	O	●	O	O	O	2
Hylocomium splendens	●	O	O	O	O	O	1
Pleurozium schreberi	●	●	●	●	●	O	5
Ptilium crista-castrensis	O	O	O	●	●	O	2
Litter (% cover)	0	5	10	0	50	0	10.83
Rock (% cover)	0	0	0	0	0	0	0.00
Bare mineral soil (% cover)	0	0	0	0	0	0	0.00
Woody debris (% cover)	5	5	15	5	15	0	7.50
Moss (% cover)	0	0	0	99	15	100	35.67
Water (% cover)	0	0	0	0	0	0	0.00

ESRA Vegetation Survey - Ground Cover Data (Project 7A)

Plot No.: 9 | **Date**: Sept 26, 2013

Surveyors: C. Higgs, T. Jordan and Paul Duck | **Time**: 11:41 am

Productivity Code and Cover Type: 4 (Jack Pine 71 - 100%) | **Waypoint Name/No.** : 005

Plant codes: (t) - tree (s) - shrub

	Quadrats						
Species	1	2	3	4	5	6	quadrats
Vaccinium myrtilloides	●	O	●	●	●	O	4
Gaultheria hispidula	●	●	●	O	●	●	5
Linnaea borealis	●	O	●	●	●	O	4
Chimaphila umbellata	●	●	O	O	O	●	3
Pinus banksiana (t)	O	●	O	O	O	O	1
Ledum groenlandicum	O	●	●	O	O	●	3
Maianthemum canadense	O	O	●	O	●	O	2
Pyrola secunda	O	O	O	●	O	O	1
Picea mariana (s)	O	O	O	●	O	O	1
Aralia nudicaulis	O	O	O	●	●	O	2
Populus tremuloides (s)	O	O	O	O	●	O	1
Epilobium angustifolium	O	O	O	O	●	O	1
Lycopodium annotinum	O	O	O	O	●	O	1
Cornus canadensis	O	O	O	O	●	●	2
Arctostaphylos uva-ursi	O	O	O	O	●	O	1
Diphasium complanatum	O	O	O	O	O	●	1
Vaccinium vitis-idaea	O	O	O	O	O	●	1
Polypodium virginianum	O	O	O	O	O	●	1
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
Moss "carpet-like"	O	O	●	O	O	O	1
Feathermoss "other"	●	●	●	●	●	●	6
Moss "just moss"	●	●	●	●	●	O	5
Lichen 'prostrate"	●	O	O	O	O	O	1
Cladonia sp.	O	O	O	O	O	O	O
Cladina mitis	●	O	●	O	O	O	2
Cladina rangiferina	O	O	O	O	O	O	O
Cladina stellaris	O	O	O	O	O	O	O
Sphagnum sp.	O	O	O	O	O	O	O
Dicranum sp.	O	●	O	O	O	O	1
Hylocomium splendens	O	O	O	O	O	O	O
Pleurozium schreberi	●	O	O	O	●	●	3
Ptilium crista-castrensis	O	O	O	O	O	O	O
Litter (% cover)	90	0	20	25	0	0	22.50
Rock (% cover)	0	0	0	0	0	0	0.00
Bare mineral soil (% cover)	0	0	0	0	0	0	0.00
Woody debris (% cover)	0	0	5	25	0	0	5.00
Water (% cover)	0	0	0	0	0	0	0.00

ESRA Vegetation Survey - Ground Cover Data (Project 7A)

Plot No.: 10 | **Date**: Sept 25, 2013

Surveyors: C. Higgs, T. Jordan and Paul Duck | **Time**: 11:55 am

Productivity Code and Cover Type: 6 (Jack Pine 41-70%: 2nd major species Sb) | **Waypoint Name/No.** : 004

Plant codes: (t) - tree (s) - shrub (sd) - seedling

	Quadrats						
Species	1	2	3	4	5	6	quadrats
Pinus banksiana (t)	●	O	O	O	O	O	1
Shrub	O	●	●	O	O	O	2
Picea mariana (sd)	O	●	O	O	O	O	1
Vaccinium myrtilloides	O	●	●	O	O	●	3
Ledum groenlandicum	O	O	O	●	●	O	2
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
Moss sp.	●	O	●	O	●	●	4
Cladonia sp.	O	O	O	O	O	O	O
Cladina mitis	O	O	O	O	O	O	O
Cladina rangiferina	O	O	O	O	O	O	O
Cladina stellaris	O	O	O	O	O	O	O
Sphagnum sp.	O	O	O	O	O	O	O
Dicranum sp.	O	O	O	O	O	O	O
Hylocomium splendens	●	O	O	●	O	O	2
Pleurozium schreberi	●	●	●	●	●	●	6
Ptilium crista-castrensis	●	●	●	O	●	●	5
Litter (% cover)	5	0	0	0	0	0	0.83
Rock (% cover)	0	0	0	0	0	0	0.00
Bare mineral soil (% cover)	0	0	0	0	0	0	0.00
Woody debris (% cover)	5	5	5	0	0	5	3.33
Moss (% cover)	85	99	95	99	0	0	63.00

ESRA Vegetation Survey - Ground Cover Data (Project 7A)

Plot No.: 11 | **Date**: Sept 25, 2013

Surveyors: C. Higgs, T. Jordan and Paul Duck | **Time**: 9:52 am

Productivity Code and Cover Type: 702 (Tamarack/Larch Treed Muskeg) | **Waypoint Name/No.** : 003

Plant codes: (t) - tree (s) - shrub (sd) - seedling

	Quadrats						
Species	1	2	3	4	5	6	quadrats
Picea mariana (t)	●	●	O	O	O	●	3
Picea mariana (s)	●	●	O	●	O	●	4
Ledum groenlandicum	●	●	●	●	●	O	5
Maianthemum canadense	●	O	●	O	O	●	3
Vaccinium oxycoccus	●	O	O	●	●	O	3
Chamaedaphne calyculata	●	O	●	O	O	O	2
Picea mariana (sd)	O	O	O	●	O	O	1
Vaccinium vitis-idaea	O	O	O	O	●	●	2
Spiraea alba	O	O	O	O	●	●	2
Rubus chamaemorus	O	O	O	O	O	●	1
Maianthemum trifolium	O	O	O	O	O	●	1
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
Moss sp.	●	●	O	●	●	●	5
Cladonia sp.	O	O	O	O	O	O	O
Cladina mitis	O	O	O	O	O	O	O
Cladina rangiferina	O	O	O	O	O	O	O
Cladina stellaris	O	O	O	O	O	O	O
Sphagnum spp.	●	●	●	●	O	O	4
Dicranum sp.	O	O	O	●	O	●	2
Hylocomium splendens	O	●	O	O	●	O	2
Pleurozium schreberi	●	●	●	●	●	●	6
Ptilium crista-castrensis	O	O	●	O	O	O	1
Litter *(% cover)*	0	0	0	0	0	0	0.00
Moss *(% cover)*	99	99	99	99	100	99	99.17
Bare mineral soil *(% cover)*	0	0	0	0	0	0	0.00
Water *(% cover)*	0	0	0	0	0	0	0.00

ESRA Vegetation Survey - Ground Cover Data (Project 7A)

Plot No.: 12 | **Date**: Sept 26, 2013

Surveyors: C. Higgs, T. Jordan and Paul Duck | **Time**: 1:57 pm

Productivity Code and Cover Type: 82 (Trembling aspen: 2nd maj. Sp. Spruce or Balsam Fir) | **Waypoint Name/No.** : 008

Plant codes: (t) - tree (s) - shrub (sd) - seedling

	Quadrats						
Species	1	2	3	4	5	6	quadrats
Picea mariana (t)	●	●	●	O	O	O	3
Vaccinium myrtilloides	●	●	●	O	●	O	4
Cornus canadensis	●	●	O	O	O	O	2
Picea mariana (s)	●	●	O	●	O	O	3
Betula papyrifera (s)	O	●	O	O	O	O	1
Populus tremuloides (t)	O	O	●	O	O	O	1
Abies balsamea (t)	O	O	●	O	O	O	1
Abies balsamea (s)	O	O	●	O	●	●	3
Pyrola sp.	O	O	●	O	O	O	1
Lycopodium annotinum	O	O	O	●	●	●	3
Shrub "prostrate"	O	O	O	●	O	O	1
Picea mariana (sd)	O	O	O	●	O	O	1
Populus tremuloides (sd)	O	O	O	O	●	O	1
Diphasium complanatum	O	O	O	O	●	O	1
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
Peltigera sp.	O	●	●	O	O	O	2
Feather moss "other'	●	●	O	●	●	●	5
Moss "very prostrate"	O	●	O	O	O	O	1
Moss " just a moss"	O	●	O	●	●	●	4
Lichen sp. "spike-like greyish"	O	O	●	O	O	O	1
Cladonia sp.	O	O	O	O	O	O	O
Cladina mitis	O	O	O	O	O	O	O
Cladina rangiferina	O	O	O	O	O	O	O
Cladina stellaris	O	O	O	O	O	O	O
Sphagnum sp.	O	O	O	O	O	O	O
Dicranum sp.	O	O	O	O	O	O	O
Hylocomium splendens	●	O	O	●	●	●	4
Pleurozium schreberi	O	O	O	●	O	O	1
Ptilium crista-castrensis	●	●	O	O	●	O	3
Litter (% cover)	80	70	80	10	5	60	50.83
Rock (% cover)	0	0	0	0	0	0	0.00
Bare mineral soil (% cover)	0	0	0	0	0	0	0.00
Woody debris (% cover)	0	15	10	5	5	0	5.83

ESRA Vegetation Survey - Ground Cover Data (Project 7A)

Plot No.: 13 | **Date**: Sept 25, 2013

Surveyors: C. Higgs, T. Jordan and Paul Duck | **Time**: 3:12 pm

Productivity Code and Cover Type: 13 (Black Spruce 71 - 100%) | **Waypoint Name/No.** : 008

Plant codes: (t) - tree (s) - shrub (sd) - seedling

	Quadrats						
Species	1	2	3	4	5	6	quadrats
Picea mariana (T)	●	●	O	O	O	O	2
Picea mariana (s)	●	O	O	O	O	O	1
Picea mariana (sd)	●	O	O	O	O	O	1
Abies balsamea (s)	●	O	●	●	O	O	3
Betula papyrifera (sd)	●	O	●	O	O	O	2
Cornus canadensis	●	●	●	O	O	O	3
Petasites palmatus	●	●	O	O	O	O	2
Rubus pubescens	●	O	●	●	O	●	4
Mitella nuda	●	O	O	O	O	●	2
Gaultheria hispidula	●	●	●	O	O	●	4
Carex disperma	●	O	O	O	O	O	1
Equisetum scirpoides	●	O	O	●	O	O	2
Pyrola virens	●	O	O	O	O	O	1
Carex sp. 2 (large)	●	●	O	O	O	O	2
Abies balsamea (t)	O	●	O	O	O	O	1
Equisetum pratense	O	●	O	O	●	O	2
Abies balsamea (sd)	O	●	O	●	●	●	4
Goodyera repens	O	●	O	O	O	O	1
Ledum groenlandicum	O	O	●	O	O	●	2
Cornus stolonifera	O	O	O	●	O	O	1
Pyrola secunda	O	O	O	O	●	O	1
Linnaea borealis	O	O	O	O	●	●	2
Forb sp.	O	O	O	O	●	O	1
Monotropa uniflora	O	O	O	O	●	O	1
Viola sp.	O	O	O	O	●	O	1
Chimaphila umbellata	O	O	O	O	●	O	1
Rosa acicularis	O	O	O	O	O	●	1
Moss sp.	●	O	O	O	●	O	2
Moss "thick carpet-like"	●	O	O	O	O	●	2
Cladina mitis	O	O	O	O	O	O	O
Cladina rangiferina	O	O	O	O	O	O	O
Cladina stellaris	O	O	O	O	O	O	O
Hylocomium splendens	●	●	●	O	O	O	3
Pleurozium schreberi	●	●	O	O	●	●	4
Ptilium crista-castrensis	●	O	O	O	●	O	2
Litter (% cover)	0	15	65	90	40	90	50.00
Rock (% cover)	0	0	0	0	0	0	0.00
Bare mineral soil (% cover)	0	0	0	0	0	0	0.00
Woody debris (% cover)	0	0	0	0	0	10	1.67

ESRA Vegetation Survey - Ground Cover Data (Project 7A)

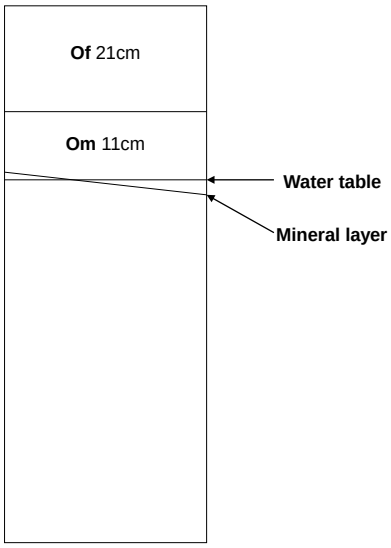
Plot No.: 14 | Date: Sept 25, 2013

Surveyors: C. Higgs, T. Jordan and Paul Duck | Time: 5:00 pm

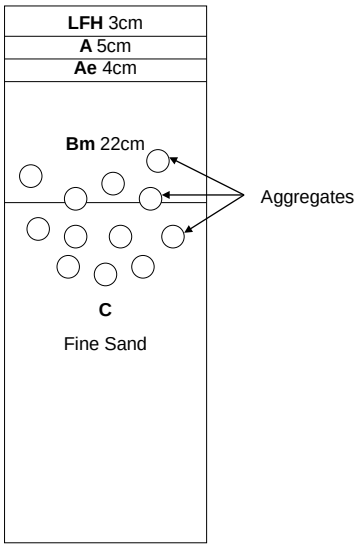
Productivity Code and Cover Type: 46 (Pj<50%: 2nd maj. Sp. Spruce: 3rd maj. Sp. Hardwood) | Waypoint Name/No. : 011

Plant codes: (t) - tree (s) - shrub (sd) - seedling

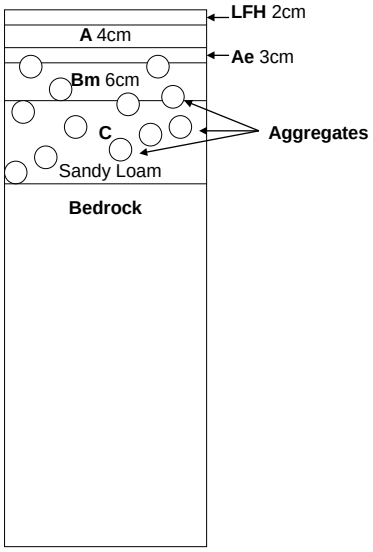
	Quadrats						
Species	1	2	3	4	5	6	quadrats
Vaccinium myrtilloides	●	O	●	O	O	O	2
Shrub "prostrate"	●	●	O	O	O	●	3
Betula papyrifera (s)	O	O	●	O	O	O	1
Betula papyrifera (sd)	O	O	●	O	●	O	2
Picea mariana (s)	O	O	●	O	O	O	1
Rubus pubescens	O	O	●	O	O	O	1
Cornus canadensis	O	O	O	●	●	O	2
Linnaea borealis	O	O	O	●	O	O	1
Aralia nudicaulis	O	O	O	●	O	O	1
Pyrola asarifolia	O	O	O	●	O	O	1
Rosa sp.	O	O	O	●	O	O	1
Abies balsamea (t)	O	O	O	O	●	O	1
Populus tremuloides (t)	O	O	O	O	●	O	1
Abies balsamea (sd)	O	O	O	O	●	●	2
Picea mariana (sd)	O	O	O	O	O	●	1
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
	O	O	O	O	O	O	O
Moss sp. "just a moss'	O	O	O	O	O	●	1
Lichen sp.	O	O	O	O	●	O	1
Moss sp.	●	●	O	O	O	O	2
Moss sp. "mat - like"	O	O	O	●	●	O	2
Peltigera sp. "greenish - grey"	O	O	O	●	●	O	2
Cladonia sp. "brown pixie-cups"	O	O	●	O	O	O	1
Cladina mitis	O	O	●	O	O	O	1
Cladina rangiferina	O	O	O	O	O	O	O
Cladina stellaris	O	O	O	O	O	O	O
Sphagnum sp.	O	O	O	O	O	O	O
Dicranum sp.	O	●	●	O	O	O	2
Hylocomium splendens	O	O	O	●	●	●	3
Pleurozium schreberi	O	●	O	O	O	●	2
Ptilium crista-castrensis	O	O	O	O	O	O	O
Litter (% cover)	80	95	95	40	90	30	71.67
Rock (% cover)	0	0	0	0	0	0	0.00
Bare mineral soil (% cover)	0	0	0	0	0	0	0.00
Woody debris (% cover)	10	5	5	5	5	20	8.33



Plot No.: 1
S-type (FEC): S12F
Soil Description: Wet/Organic (Feather Moss)



Plot No.: 2
S-type (FEC): S4
Soil Description: Fresh/Silty-Loamy



Plot No.: 3
S-type (FEC): SS6
Soil Description: Shallow-Moderately Deep/Coarse Loamy

▫

LFH 8cm

Ah 5cm
Ae 3cm

Bt 7cm

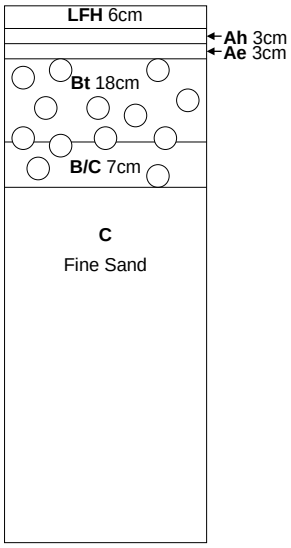
Bg 35cm

B/C 4cm

Cg

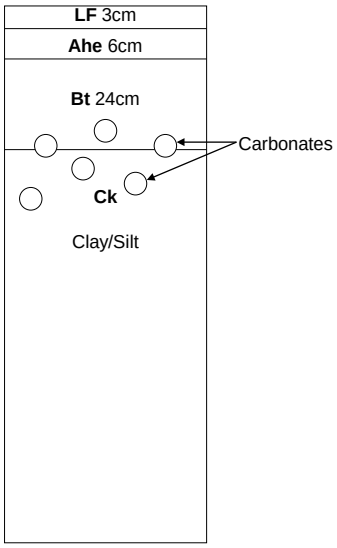
Sandy Clay Loam

Plot No.: 4
S-type (FEC): S10
Soil Description: Very Moist/Fine Loamy-Clayey



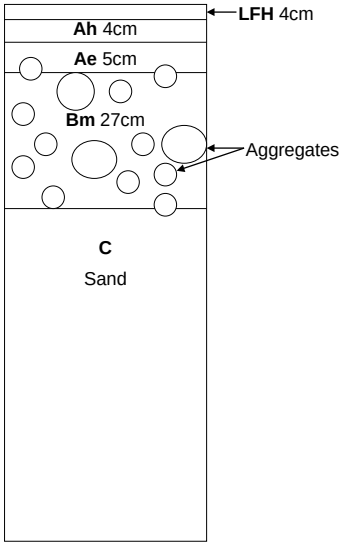
Plot No.: 4b
S-type (FEC): S4
Soil Description: Fresh/Silty-Loamy

Plot No.: 5
S-type (FEC): S12S
Soil Description: Wet/Organic (Sphagnum)

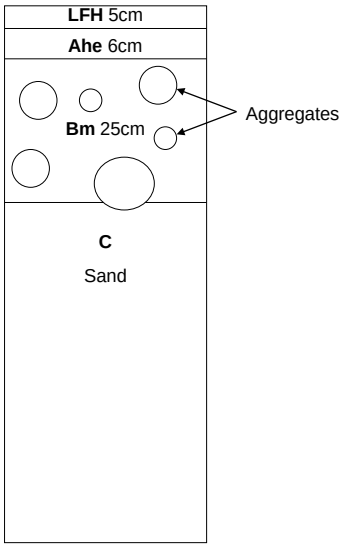


Plot No.: 6
S-type (FEC): S6
Soil Description: Fresh/Clayey

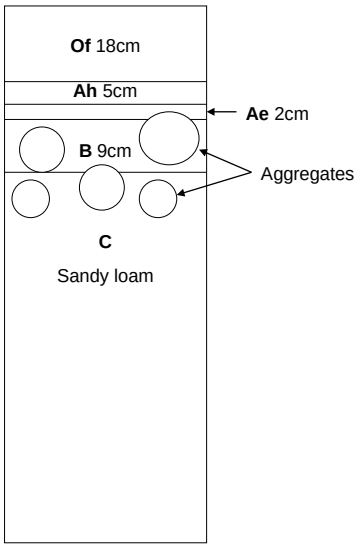
Plot No.: 7
S-type (FEC): S7
Soil Description: Moist/Sandy



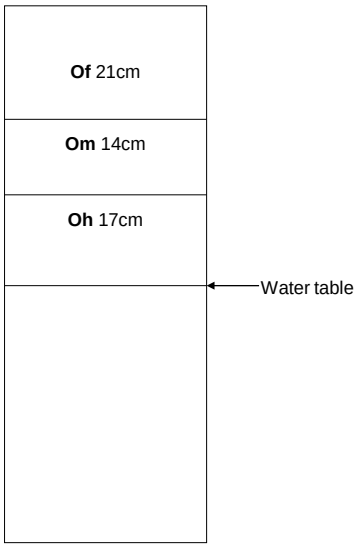
Plot No.: 8
S-type (FEC): S1
Soil Description: Moderately Dry/Sandy



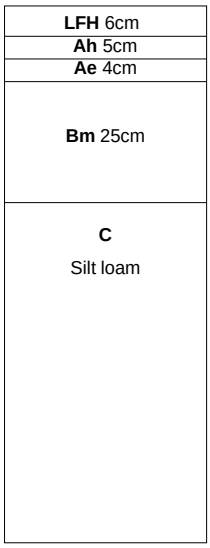
Plot No.: 9
S-type (FEC): S2
Soil Description: Fresh/Fine Sandy



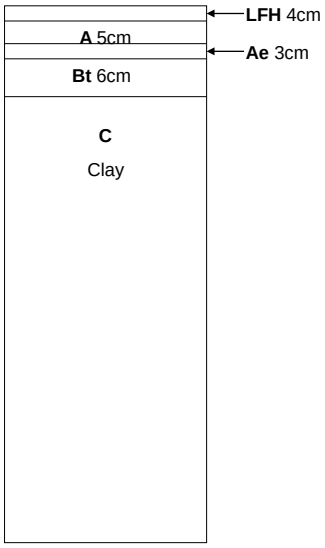
Plot No.: 10
S-type (FEC): S4
Soil Description: Fresh/Silty-Loamy



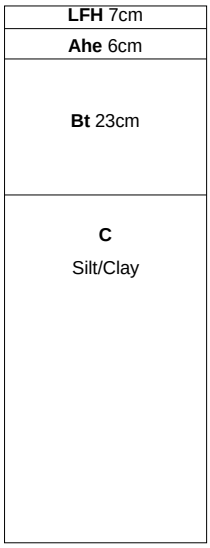
Plot No.: 11
S-type (FEC): S12S
Soil Description: Wet/Organic (Sphagnum)



Plot No.: 12
S-type (FEC): S4
Soil Description: Fresh/Silty-Loamy



Plot No.: 13
S-type (FEC): S6
Soil Description: Fresh/Clayey



Plot No.: 14
S-type (FEC): S10
Soil Description: Very Moist/Fine Loamy-Clayey

APPENDIX VIII

SOILS DATA

APPENDIX IX

LIST OF PLANT SPECIES, RANK STATUS AND DISTRIBUTION AMONG FOREST COVER SUBTYPES

List of Plant Species, Rank Status, and Distribution among Forest Cover Subtypes - Project 7A													
			Forest Cover Subtypes										
Species		Rank	4 (2)	*6(2)	13	14	44	46	81 (3)	82	701	702	711
Alnus crispa	Green alder	S5	●	O	O	O	●	●	●	O	O	O	●
Abies balsamea	Balsam fir	S5	●	O	●	●	O	●	●	●	O	O	O
Amelanchier alnifolia	Saskatoon	S5	O	O	O	O	O	O	●	O	O	O	O
Apocynum androsaemifolium	Spreading dogbane	S5	O	O	O	O	O	O	O	O	O	O	●
Aralia nudicaulis	Sarsaparilla	S5	●	O	O	●	●	●	●	O	O	O	O
Arctostaphylos uva-ursi	Bearberry	S5	●	O	O	O	O	O	O	O	O	O	O
Betula papyrifera	White birch	S5	●	●	●	●	●	●	●	●	●	O	O
Betula pumila	Swamp birch	S5	O	O	O	O	O	O	O	O	●	O	O
Calamagrostis sp.	Reed grass		O	O	O	O	O	O	●	O	O	O	O
Carex disperma	Two-seeded Sedge	S5	O	O	●	O	O	O	O	O	●	O	O
Carex trisperma	Three-seeded Sedge	S5	O	O	O	O	●	O	O	O	O	O	O
Carex sp.	Sedge		O	O	O	O	O	O	●	O	●	O	O
Chamaedaphne calyculata	Leatherleaf	S5	O	●	O	O	O	O	O	O	●	●	O
Chimaphila umbellata	Prince's-pine	S3-S5	●	O	●	O	●	O	O	O	O	O	O
Cladina mitis	Green reindeer lichen		●	●	O	●	O	●	O	O	O	O	●
Cladina rangiferina	Grey reindeer lichen		O	●	O	O	●	O	O	O	O	O	●
Cladina stellaris	Northern reindeer lichen		O	●	O	O	●	O	O	O	O	O	●
Cladonia borealis	Red pixie-cup		●	●	O	O	●	O	O	O	●	O	O
Cladonia sp.	Club lichen		O	●	O	O	O	●	●	O	O	O	O
Clintonia borealis	Bluebead lily	S4?	●	O	O	O	O	O	●	O	O	O	O
Cornus canadensis	Bunchberry	S5	●	O	●	●	O	●	●	●	O	O	O
Cornus stolonifera	Red-osier dogwood	S5	O	O	●	O	O	O	●	O	O	O	O
Corydalis sempervirens	Pink corydalis	S5	O	●	O	O	O	O	O	O	O	O	O
Cystopteris fragilis	Fragile fern	S5	●	O	O	O	O	O	O	O	O	O	O
Dicranum sp.	Fork moss		●	●	O	●	●	●	●	O	●	●	●
Diervilla lonicera	Bush-honeysuckle	S5	O	O	O	O	O	O	●	O	O	O	O
Diphasium complanatun	Trailing club-moss	S3S4	●	O	O	O	●	O	●	●	O	O	O
Epilobium angustifolium	Fireweed	S5	●	O	O	O	●	O	●	O	O	O	O
Equisetum pratense	Meadow Horsetail	S4S5	O	O	●	O	O	O	O	O	O	O	O
Equisetum scirpoides	Dwarf scouring-rush	S5	O	O	●	O	O	O	O	O	O	O	O
Equisetum sylvaticum	Woodland horsetail	S5	●	O	O	O	●	O	●	O	O	O	O
Fragaria virginiana	Smooth wild strawberry	S5	O	O	O	O	●	O	●	O	O	O	O
Galium triflorum	Sweet-scented bedstraw	S5	O	O	O	O	O	O	●	O	O	O	O
Gaultheria hispidula	Creeping Snowberry	S5	●	O	●	●	O	O	O	O	O	O	O
Goodyera repens	Lesser rattlesnake-plantain	S5	O	O	●	O	O	O	O	O	O	O	O
Goodyera sp.	Rattlesnake-plantain		O	O	O	●	O	O	O	O	O	O	O
Hylocomium splendens	Stair-step moss		●	●	●	●	●	●	●	●	O	●	O
Kalmia polifolia	Bog laurel	S5	O	O	O	O	O	O	O	O	●	O	O

Species		Rank	4 (2)	*6(2)	13	14	44	46	81 (3)	82	701	702	711
Larix laricina	Larch/tamarack	S5	O	O	●	O	O	O	O	O	●	●	O
Ledum groenlandicum	Labrador tea	S5	●	●	●	O	O	O	●	O	●	●	O
Linnaea borealis	Twinflower	S5	●	O	●	●	●	●	●	O	O	O	O
Lycopodium annotinum	Stiff club-moss	S5	●	O	O	●	O	O	●	●	●	O	O
Lycopodium dendroideum	Ground Pine	S3S4	O	O	O	O	O	O	●	O	O	O	O
Maianthemum canadense	Wild lily-of-the-valley	S5	●	O	O	O	●	O	●	O	●	●	●
Maianthemum trifolium	Three-leaved Solomon's seal	S5	●	O	O	O	O	O	O	O	●	●	O
Mitella nuda	Bishop's cap	S5	O	O	●	O	O	O	O	O	O	O	O
Monotropa uniflora	Indian pipe	S4	O	O	●	O	O	O	O	O	●	O	O
Peltigera sp.	Felt lichen		O	O	O	●	O	●	●	●	O	O	O
Petasites palmatus	Palmate-leaved colt's-foot	S5	O	O	●	O	O	O	●	O	O	O	O
Phragmites communis	Common reed grass	S5	O	O	O	O	●	O	O	O	O	O	O
Picea mariana	Black spruce	S5	●	●	●	●	O	●	●	●	●	●	●
Pinus banksiana	Jack pine	S5	●	●	O	●	●	●	●	O	O	O	●
Piptatherum pungens	Northern rice grass	S5	O	O	O	O	●	O	●	O	O	O	●
Pleurozium schreberi	Schreber's moss		●	●	●	●	●	●	●	●	O	●	●
Polypodium virginianum	Rock polypody	S5	●	O	O	O	O	O	O	O	O	O	O
Populus balsamifera	Balsam poplar	S5	O	O	●	O	O	O	O	O	O	O	O
Populus tremuloides	Trembling aspen	S5	●	O	●	●	●	●	●	●	O	O	O
Prunus pensylvanica	Pincherry	S5	●	O	O	O	●	O	●	O	O	O	O
Ptilium crista-castrensis	Knight's plume		●	●	●	●	O	O	●	●	O	●	O
Pyrola asarifolia	Pink wintergreen	S5	O	O	O	●	O	●	●	O	O	O	O
Pyrola elliptica	White wintergreen	S5	O	O	O	O	O	O	●	O	O	O	O
Pyrola secunda	One-sided wintergreen	S5	●	O	●	O	●	O	O	O	O	O	O
Pyrola virens	Greenish-flowered wintergreen	S5	●	O	●	O	O	O	O	O	O	O	O
Ribes oxyacanthoides	Northern gooseberry	S5	O	O	O	O	O	O	●	O	O	O	O
Rosa acicularis	Prickly rose	S5	O	O	●	O	O	O	O	O	O	O	O
Rosa woodsia	Wood's rose	S4	O	O	●	O	O	O	O	O	O	O	O
Rubus chamaemorus	Cloudberry	S5	O	O	O	O	O	O	O	O	●	●	O
Rubus ideaus	Wild red raspberry	S5	O	O	O	O	●	O	●	O	O	O	O
Rubus pubescens	Dewberry	S5	●	O	●	●	●	●	●	O	O	O	O
Salix bebbiana	Bebb's willow	S5	O	O	O	O	●	O	●	O	O	O	O
Salix discolor	Pussy willow	S5	O	O	O	O	O	O	●	O	O	O	●
Sibbaldiopsis tridentata	Three-toothed cinquefoil	S5	O	O	O	O	●	O	O	O	O	O	●
Sphagnum sp(p).	Sphagnum moss		O	●	O	O	●	O	O	O	●	●	O
Spiraea alba	Narrow-leaved meadowsweet	S5	O	O	O	O	O	O	●	O	O	●	O
Trientalis borealis	Northern starflower	S5	●	O	O	O	O	O	●	O	O	O	O
Vaccinium myrtilloides	Blueberry	S5	●	●	●	●	●	●	●	●	O	O	●
Vaccinium oxycoccus	Bog cranberry	S5	O	O	O	O	O	O	O	O	●	●	O
V. vitis-idaea	Ground cranberry	S5	●	O	O	O	O	O	O	O	O	●	O
Viburnum edule	Low bush-cranberry	S5	O	●	O	O	O	O	●	O	O	O	O

Species		Rank	4 (2)	6(2)	13	14	44	46	81 (3)	82	701	702	711
Viola canadensis	Canada violet	S5	O	O	O	O	O	O	●	O	O	O	O
Viola sp.	Violet		O	O	O	O	O	O	●	O	O	O	O
		Number of species	35	18	28	20	29	18	46	12	18	15	14
**6 (2) Forest Cover Subtype (# plots in subtype)*													

APPENDIX X

LIST OF PROTECTED SPECIES (PROVINCIALLY & FEDERALLY) OCCURRING IN MANITOBA

Species Ranking Chart - Manitoba

Legend:

COSEWIC: Committee On The Status of Endangered Wildlife In Canada
ESA: *Endangered Species Act* (Manitoba Government)
SARA: Government of Canada *Species At Risk Act*

As of January 2014

**Asterisks indicate that the status has changed from previous Species Ranking Chart (dated Feruary 2011)*

Listed Species - Manitoba	COSEWIC	ESA	SARA
Plants			
Agnalis, Rough (Agalinis aspera)	Endangered	Endangered*	Endangered
Aster, Western Silvery (Symphyotrichum sericeum)	Threatened	Threatened	Threatened
Buffalograss (Bouteloua dactyloides)	Special Concern*	Threatened	Threatened
Culver's-root (Veronicastrum virginicum)	Not Listed	Threatened	Not Listed
Fringed Orchid, Western Prairie (Platanthera praeclara)	Endangered	Endangered	Endangered
Goldenrod, Riddell's (Solidago riddellii)	Special Concern	Threatened	Special Concern
Goosefoot, Smooth (Chenopodium subglabrum)	Threatened	Endangered*	Threatened
Great Plains Ladies' Tresses (Spiranthes magnicamporum)	Not Listed	Endangered	Not Listed
Hackberry (Celtis occidentalis)	Not Listed	Threatened	Not Listed
Lady's Slipper, Small White (Cypripedium candidum)	Endangered	Endangered	Endangered
Prairie Clover, Hairy (Dalea villosa var. villosa)	Special Concern*	Threatened	Threatened
Spiderwort, Western (Tradescantia occidentalis)	Threatened	Threatened	Threatened
Lichens			
Jellyskin, Flooded (Leptogium rivulare)	Threatened	Not Listed	Threatened

Sources:

- Government of Canada Species At Risk Public Registry (as per Schedule 1)
- Government of Manitoba Species at Risk web site
- The COSEWIC web site
- Government of Manitoba Manitoba Species list

APPENDIX XI

PLANT SPECIES ON FIRST NATIONS LAND

Plant Species on First Nations Reserve Land

Species		Rank	12 (82)	13 (13)	14 (46)
Abies balsamea	Balsam fir	S5	●	●	●
Aralia nudicaulis	Sarsaparilla	S5	O	O	●
Betula papyrifera	White birch	S5	●	●	●
Carex disperma	Two-seeded sedge	S5	O	●	O
Chimaphila umbellata	Prince's-pine	S3-S5	O	●	O
Cladina mitis	Green reindeer lichen		O	O	●
Cornus canadensis	Bunchberry	S5	●	●	●
Cornus stolonifera	Red-osier dogwood	S5	O	●	O
Dicranum sp.	Fork moss sp.		O	O	●
Diphasium complanatun	Trailing club-moss	S3S4	●	O	O
Equisetum scirpoides	Dwarf scouring-rush	S5	O	●	O
Equisetum pratense	Meadow horsetail	S5	O	●	O
Gaultheria hispidula	Creeping Snowberry	S5	O	●	●
Goodyera sp.	Rattlesnake-plantain		O	O	●
Goodyera repens	Lesser rattlesnake-plantain	S5	O	●	O
Hylocomium splendens	Stair-step moss		●	●	●
Larix laricina	Larch/tamarack	S5	O	●	O
Ledum groenlandicum	Labrador tea	S5	O	●	O
Linnaea borealis	Twinflower	S5	O	●	●
Lycopodium annotinum	Stiff club-moss	S5	●	O	●
Mitella nuda	Bishop's cap	S5	O	●	O
Monotropa uniflora	Indian pipe	S4	O	●	O
Peltigera sp.	Felt lichen sp.		●	O	●
Petasites palmatus	Palmate-leaved colt's-foot	S5	O	●	O
Picea mariana	Black spruce	S5	●	●	●
Pinus banksiana	Jack pine	S5	O	O	●
Pleurozium schreberi	Schreber's moss		●	●	●
Populus balsamifera	Balsam poplar	S5	O	●	O
Populus tremuloides	Trembling aspen	S5	●	●	●
Ptilium crista-castrensis	Knight's plume		●	●	●
Pyrola asarifolia	Pink wintergreen	S5	O	O	●
Pyrola secunda	One-sided wintergreen	S5	O	●	O
Pyrola virens	Greenish-flowered wintergreen	S5	O	●	O
Rosa acicularis	Prickly rose	S5	O	●	O
Rosa woodsia	Wood's rose	S4	O	●	O
Rubus pubescens	Dewberry	S5	O	●	●
Vaccinium myrtilloides	Blueberry	S5	●	●	●
	Number of species		12	28	20

CHARACTERIZATION OF VEGETATION ENVIRONMENT AND EFFECTS ASSESSMENT – PROJECT 7A

RFP Reference #: P7a-EL-36

BASELINE VEGETATION DATA – REVISED ROUTE (2014)

(Addendum to June 10, 2014 Report)

Submitted to:

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Manitoba Floodway East Side Road Authority (MFESRA)
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October 28, 2014

EXECUTIVE SUMMARY

The alignment for the All-Season Road (ASR) between Paungassi First Nation and Little Grand Rapids First Nation (LGRFN) and to Little Grand Rapids Airport surveyed in 2013 has been revised. Consequently, additional vegetation surveys were required in the Project Assessment Area. Information contained in this addendum is intended to supplement the original report submitted on June 10, 2014.

A vegetation survey was conducted along the revised portions of the ASR on September 10 and 11, 2014. Similar to the Baseline Vegetation Data – Final Report (June 10, 2014), existing forest inventory data at Manitoba Land Initiative (MLI) was accessed to help determine a sampling strategy. Eight forest cover subtypes occurring along the revised route were selected for the survey. From the 8 sample plots and off plot occurrences, an additional 23 species of vascular plants, lichens and mosses were documented in the 2014 survey. The principle references cited in June 10, 2014 original report including Punter (1993), Zoladeski et al (1995) and MLI (2013) provided useful guidance for the 2014 vegetation survey.

No species protected under the Federal Species at Risk Act (SARA) or Manitoba Endangered Species Act (MBESA) were found in the study area. One "Species of Conservation Concern", Running Club-moss (*Lycopodium clavatum*) which is a species defined as rare, disjunct, or at risk throughout their range or in Manitoba and in need of further research was observed in 2014. No additional "Plant Species of Interest" which are traditonally used by Aboriginal people for medicinal, subsistence and/or cultural purposes were found during the survey. However, stands of old growth white spruce (*Picea glauca*) surveyed near LGRFN contained trees up to 189 years of age and over 50cm in diameter.

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1.0 INTRODUCTION

The originally proposed road alignment between Paungassi First Nation and Little Grand Rapids First Nation and to Little Grand Rapids Airport has been revised. To support Manitoba Floodway East Side Road's (MFESRA) preparation for an Environmental Impact Assessment (EIA) under new road development, additional vegetation surveys were required. The broad objective of the survey was to characterize the plant communities, but the priority was to document the presence of species listed under the federal Species at Risk Act (SARA) and the Manitoba Endangered Species Act (MBESA). Information contained in this addendum is intended to supplement the original report issued on June 10, 2014 that reported on a field survey conducted in September 2013.

The vegetation survey took place on September 10 and 11, 2014. Baseline vegetation data collection activities included the identification and description of the various plant communities as well as associated soils. In addition, a continual search for "Species of Conservation Concern" ie. any rare or endangered plant species, "Plant Species of Interest", as well as unique vegetation occurrences was undertaken and documented when observed.

Most of the general descriptive material included in the original report will not be presented in this report, including the description of Lac Seul Upland Ecoregion's natural history and First Nations communities. The applied survey design, plot sizes and methods for field data collection and analysis protocol were the same as those in 2013 and therefore excluded. Any reference in this report to topics above will be to address specific circumstances pertaining to the 2014 field survey. A results and discussion section will be presented for the 2014 data.

Figure 1. Refinements to All-Season Road (ASR) between Pauingassi First Nation and Little Grand Rapids First Nation and Little Grand Rapids Airport. (September, 2014)

2.0 Study Area

The new alignment of the All-Season Road between Pauingassi First Nation and Little Grand Rapids First Nation is presented in Figure 1. In 2013/14, approximately 17km of new road was selected along the ASR alignment. Modifications to the route occurred principally along sections near the southwest shore of Fishing Lake, LGR Airport access road and south of Little Grand Rapids First Nation Reserve. The 2014 plot locations along the route are presented in Figures 2 and 3.

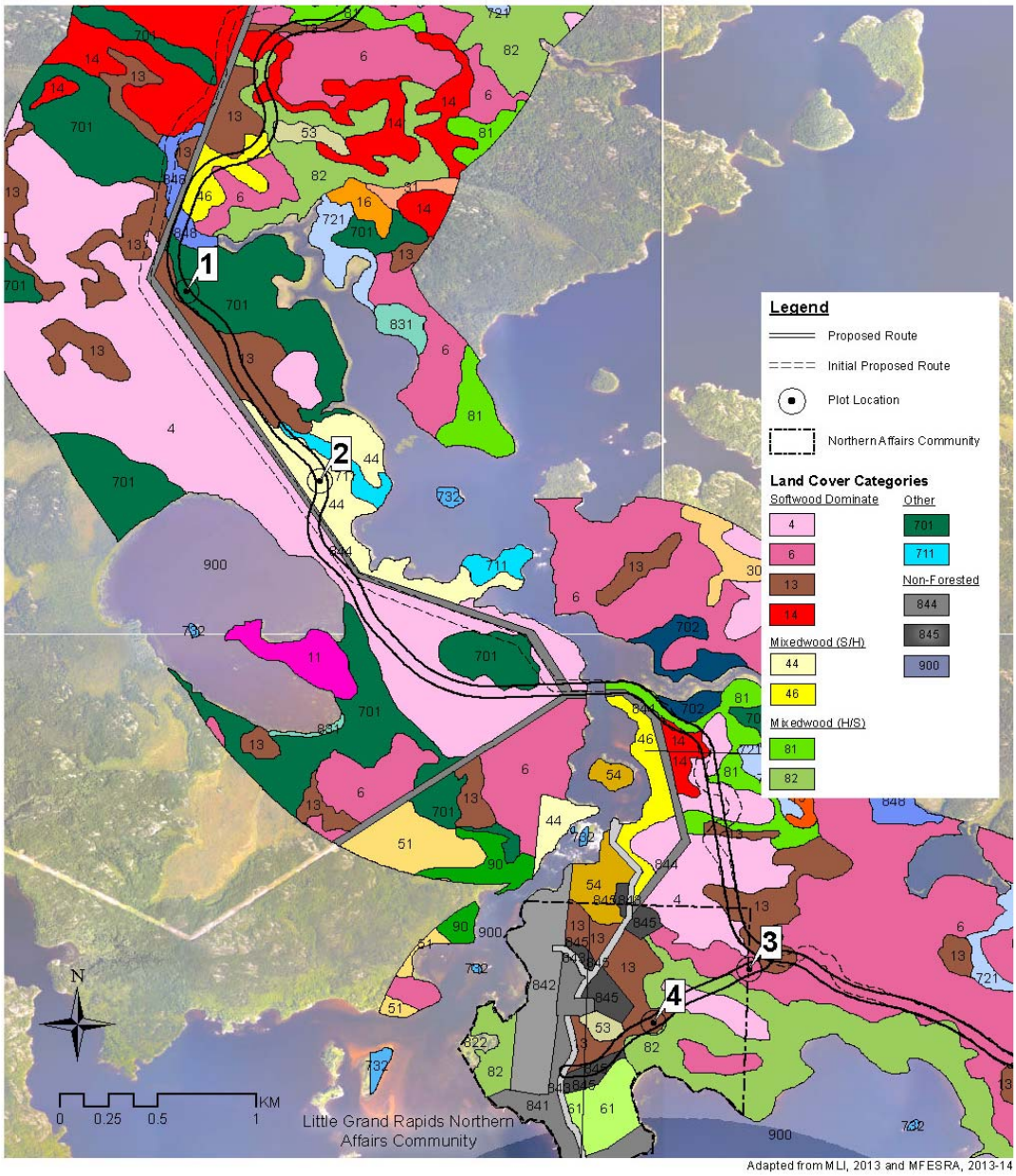


Figure 2. Plot locations and Forest Cover Subtypes in area of Fishing Lake and Airport Access Road. (September, 2014)

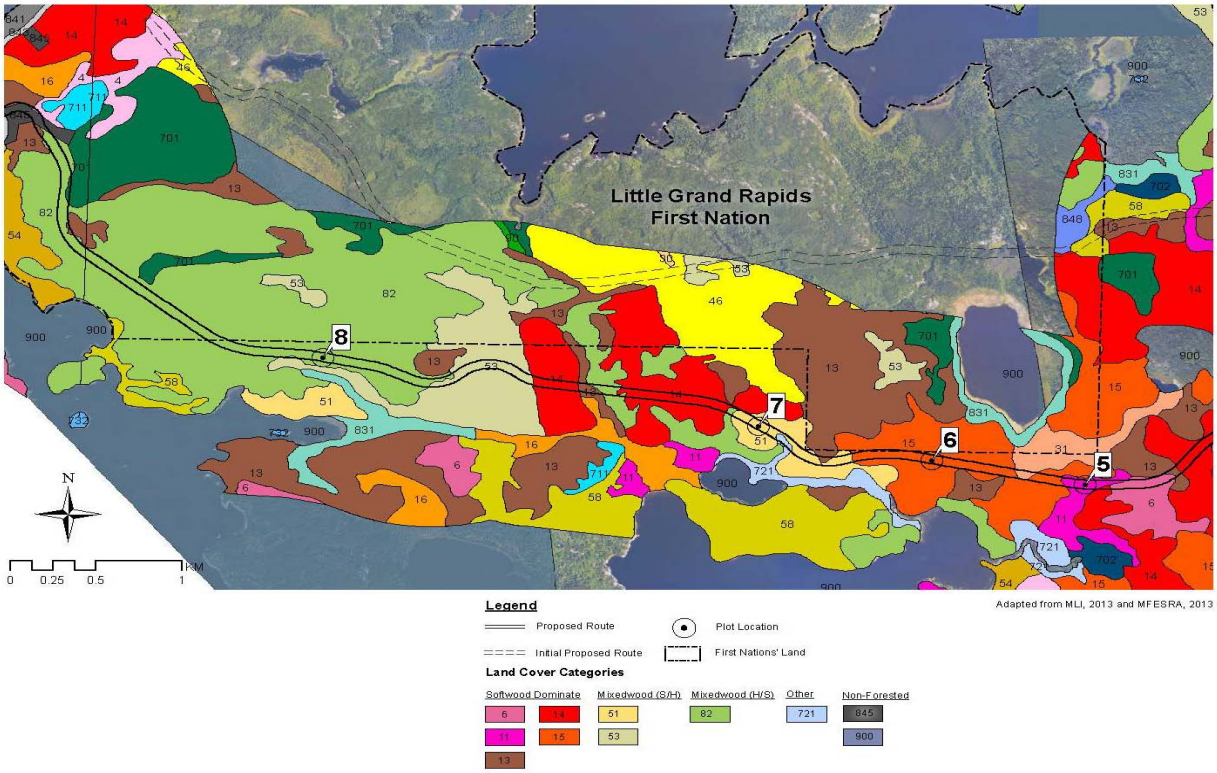


Figure 3. Plot locations and Forest Cover Subtypes in area south of Little Grand Rapids First Nation Reserve. (September, 2014)

3.0 METHODS

The survey design, plot sizes and methods for field data collection and analysis protocol were the same as those in 2013.

3.1 Plot Selection

The plot selection process for 2014 took into account several factors including change (+/-) in area of each forest cover type, presence of new cover types in the overall composition of forest cover types, as well as, the likelihood of encountering rare and/or endangered species in unique habitats along the route. Forest cover subtypes previously surveyed that had a greater area due to re-alignment included 6, 13, 44, 82 and 701 (Table1). The area of two forest subtypes 11 and 15 increased in 2014, but neither were surveyed in 2013. One forest subtype (51), not occurring in original proposed route in 2013 was surveyed this year. Forest cover subtypes 31, 53 and 90 were not sampled in 2014. Forest cover subtype 31 (Tamarack 40-70%: 2nd major species Spruce) favours poorly drained, organic deposits similar to 701 and 702 which were well-represented in the survey. Black spruce dominant forest subtypes were well-represented in 2013/14

survey, so that precluded sampling Forest Cover Subtype 53 (Black Spruce 51% +: 2nd major species Hdwd). Aspen dominant stands in subtypes 81 and 82 were thoroughly sampled in 2013 and, since

Table 1. Forest Cover Subtypes and plots/subtype for 60m buffer along original and revised All-Season Road routes in 2013 and 2014 Surveys.

		2013		2014	
Code	Cover Sub-type Description	Area (ha)	# of plots	Area (ha)	# of plots
4	Jack Pine 71-100%	37.70	2	29.70	0
6	Jack Pine 40-70%: 2nd major species Spruce	44.20	2	48.30	1
11	White Spruce 40-70%: 2nd major species Jack	0.59	0	2.06	1
13	Black Spruce 71-100%	20.10	1	24.00	1
14	Black Spruce 40-70%: 2nd major species Jack Pine	7.39	1	13.55	0
15	Black Spruce 40-70%: 2nd major species Balsam	2.01	0	6.90	1
16	Black Spruce 40-70%: 2nd major species Larch	1.95	0	N/A	
31	Tamarack 40-70%: 2nd major species Spruce	N/A		0.50	0
44	Jack Pine 51%; 2nd major species Hardwood	20.60	1	22.80	1
46	Jack Pine 50% or less: 2nd major species Spruce; 3rd major species Hardwood	13.50	1	5.80	0
51	White Spruce 50% or less: 2nd major species softwood	N/A		4.10	1
53	Black Spruce 51%+: 2nd major species Hardwood	7.50	0	4.40	0
58	Black Spruce 50% or less; 2nd major species White spruce; 3rd major species Hdwd	1.90	0	N/A	
81	Trembling Aspen: 2nd major species Jack Pine	33.40	3	33.10	0
82	Trembling Aspen: 2nd major species Spruce or Balsam Fir	12.40	1	30.27	1
90	Trembling Aspen	1.00	0	0.90	0
701	Black Spruce Treed Muskeg	5.87	1	7.10	1
702	Tamarack Larch Treed Muskeg	1.30	1	1.30	0
711	Jack Pine Treed Rock	3.10	1	3.00	0
		Totals	15		8

Cover types in bold were not present along original alignment

Forest Cover Subtype 90 (Trembling Aspen) occupied <1% of route, further sampling was not warranted. Among 14 forest cover types occurring along the proposed All-Season Road (ASR), a total of 23 plots were sampled in 2013 and 2014 representing 94.33% of the forest communities along the route (Table 2).

Table 2. Number of plots established in Forest Cover Types along proposed All-Season Road (ASR) routes, 2013-2014.

Code	Cover Type	% of Revised 2014 Route	# of plots	Description
6	*softwood*	19.63	3	Jack Pine 40-70%: 2nd major species Spruce
4	*softwood*	12.07	2	Jack Pine 71-100%
13	*softwood*	9.76	2	Black Spruce 71-100%
14	*softwood*	5.50	1	Black Spruce 40-70%: 2nd major species Jack Pine
15	*softwood*	2.83	1	Black Spruce 40-70%: 2nd major species Balsam Fir, White Spruce
711	*softwood*	1.23	1	Jack Pine treed rock
11	*softwood*	0.84	1	White Spruce 40-70%:2nd major species Jack Pine
44	*mixedwood (s/h)*	9.28	2	Jack Pine 51%: 2nd major species Hardwood
46	*mixedwood (s/h)*	2.38	1	Jp <50%: 2nd major species Spruce: 3rd major species Hardwood
51	*mixedwood (s/h)*	1.67	1	White Spruce 50% or less: 2nd major species Fb, Jp or Sb
81	*mixedwood (h/s)*	13.45	3	Trembling Aspen: 2nd major species Jack Pine
82	*mixedwood (h/s)*	12.30	2	Trembling Aspen: 2nd major species Spruce or Balsam Fir
701	*Other*	2.87	2	Black Spruce Treed Muskeg
702	*Other*	0.52	1	Tamarack/Larch Treed Muskeg
	Total	94.33	23	

s – softwood h – hardwood Codes and cover types from Manitoba Foresty Branch

3.2 Field Survey Protocol

Ground cover vegetation, shrubs and trees were again sampled in all eight plots in same manner as in 2013. Tree and shrub data, including plot UTM coordinates are presented in Appendix I and ground cover data is presented in Appendix II. Tree heights were estimated at 1 metre increments. The only difference in the field survey protocol in 2014 was that a soil pit was dug in forest cover subtypes not previously surveyed. Soil profiles were examined in forest subtypes 11, 15 and 51 in 2014. The soils field data sheets were scanned and presented in Appendix III.

4.0 RESULTS AND DISCUSSION

4.1 Forest Cover Subtype No. 11 (*White spruce 40-70%: 2nd major species Jp, Fb or Sb*)

The Forest Cover Subtype in plot B005 is best described as a mature to overmature (old growth), uneven-aged forest. There was a considerable amount of large woody debris including fallen trees throughout the stand. Two white spruce (*Picea glauca*) with diameter's 53.2 and 38.5 cm respectively, were significantly larger than all others in the plot (Appendix I). Very large diameter trees were scattered throughout the adjacent stand well beyond the 200m^2 plot. Twenty three balsam fir (*Abies balsamea*) saplings were recorded in shrub category forming a dense understorey in the plot (Appendix VI – Image 1). Common herb species included woodland horsetail (*Equisetum arvense*), Bishop's cap (*Mitella nuda*) and twinflower (*Linnae borealis)* were present (Appendix II) (Table 3). Site conditions ranged widely from fresh to wet prevailed throughout the plot as represented by fireweed (*Epilobium angustifolium*), palmate-leaved colt's foot (*Petasites palmatus*) and marsh marigold (*Caltha palustris*). The S10 – Very moist/Fine Loamy-Clayey soil complex had a 15-16 cm layer of organic (Of, Om, and Oh) horizons (Appendix III). The water table was reached at a depth of 36cm.

Table 3. Vegetation and soil characteristics of Forest Cover Subtype 11. (September 10, 2014)

Species composition: Sw8 Sb1 Fb1	V-type(s) (FEC): V13
Tree Species: *white spruce, balsam fir, larch*	
Shrub species: *none present*	
Herb species: *woodland horsetail, Bishop's cap, twinflower*	
Moss and Lichen species: *stairstep moss, Knight's plume, Schreber's moss*	
Soil-type(s) (FEC): S10 • *Very moist/Fine Loamy - Clayey*	

4.2 Forest Cover Subtype No. 15 (*Black spruce 40-70%: 2nd major species Fb, Sw*)

This forest community has a herb and shrub rich understorey and is identified as V17 – Black Spruce Mixedwood/Shrub- and Herb-Rich (FEC, 1995) (Table 4). The semi-open forest canopy created an abundance of diverse habitats in the understory resulting in 31 herb and shrub species documented in the herb and shrub plots and at least 5 species of mosses and lichens (Appendix II). Based on comparable tree sizes in nearby stands, the diameters (max = 24.5cm) and heights in range of 17-18 m of black spruce (*Picea mariana*) and aspen (*Populus tremuloides*) trees, this stand is successionally unstable as reflected in the heavy presence of balsam fir in the understorey (Appendix VI – Image 2). Balsam fir will eventually give way to more shade tolerant and competitive species such as white and black spruce. The predominantly clay – silty soil (S10) identified at this plot (Appendix III) is common in the boreal forest and typically supports a wide range of forest communities and plant species (FEC, 1995).

Table 4. Vegetation and soil characteristics of Forest Cover Subtype 15. (September 10, 2014)

Species composition: *Sb6 Po2 Fb1 Bw1*	V-type(s) (FEC): V17
Tree Species: *black spruce, trembling aspen, white birch and balsam fir*	
Shrub species: *Labrador tea, red osier dogwood, skunk currant*	
Herb species: *woodland horsetail, bunchberry, Bishop's cap, stiff clubmoss, dewberry*	
Moss and Lichen species: *Schreber's moss, Knight's plume, stairstep moss*	
Soil-type(s) (FEC): S10 • *Very moist/Fine Loamy - Clayey*	

4.3 Forest Cover Subtype No. 51 (White spruce 50% or less: 2nd major species Fb,Jp or Sb)

In plot B007, there were a few, extremely large diameter (43.2 cm) and tall (25-26m) trees present. A thorough search was conducted at the base of these large trees for cones which is a very dependable diagnostic feature for distinguishing between white and black spruce. No cones were found at base of trees. Though the diameter and heights listed above are typical of mature white spruce, other diagnostic features such as inner bark colour (olive) and needle length (1cm) were observed and characteristic of black spruce. Further to add, some of the physiognomic features expressed by the large trees are mutually exclusive. However, the combination of site conditions, height, diameter, stand dynamics, associated species, growth form and that the Forest Cover Subtype is identified as White Spruce ≤ 50%, would point in the direction of white spruce.

Similar to Subtype 15, the forest canopy was broken, thus creating ideal growing conditions for balsam fir and other shade intolerant species such as white birch (Table 5) (Appendix VI – Image 3). This forest community has a moderately rich shrub layer with 2-3 species of currant and gooseberry (*Ribes spp*.), wild raspberry (*Rubus ideaus*) and red osier dogwood (*Cornus stolonifera*)(Appendix I). Among seven quadrats, 27 ground cover species were recorded (Appendix II). The lacustrine deposited, deep, mineral soil (S6) occurring in plot B007 (Appendix III) is associated with several forest stands dominated by black spruce, aspen or Jack pine (*Pinus banksiana*)(FEC, 1995).

Table 5. Vegetation and soil characteristics of Forest Cover Subtype 51. (September 11, 2014)

Species composition: *Fb5 Sw2 Sb2 Bw1*	V-type(s) (FEC): V13
Tree Species: *white/black spruce, black spruce, white birch*	
Shrub species: *wild raspberry, skunk currant, red osier dogwood*	
Herb species: *woodland horsetail, Bishop's cap, twinflower, dewberry*	
Moss and Lichen species: *Schreber's moss, stairstep moss, Knight's plume and Cladina sp.*	
Soil-type(s) (FEC): S6 • *Fresh/Clayey*	

5.0 Rare and Endangered Species

During the 2014 vegetation survey, twenty-three additional plant species were documented in the field. There were twenty vascular plants and three mosses and lichens. The global rank status was checked and the results are presented in Appendix V. One Species of Conservation Concern was on the list, Running Club-moss (Lycopodium clavatum) had an S3 status and defined by Conservation Data Centres (CDC) as "Uncommon throughout its range or in the province (21-100 occurrences)". This particular specimen occurred in Plot B003 along the Little Grand Rapids Airport Access Road. No new "Species of Interest" were documented in the plots or during our travels between the plots and helicopter.

6.0 Areas of Interest

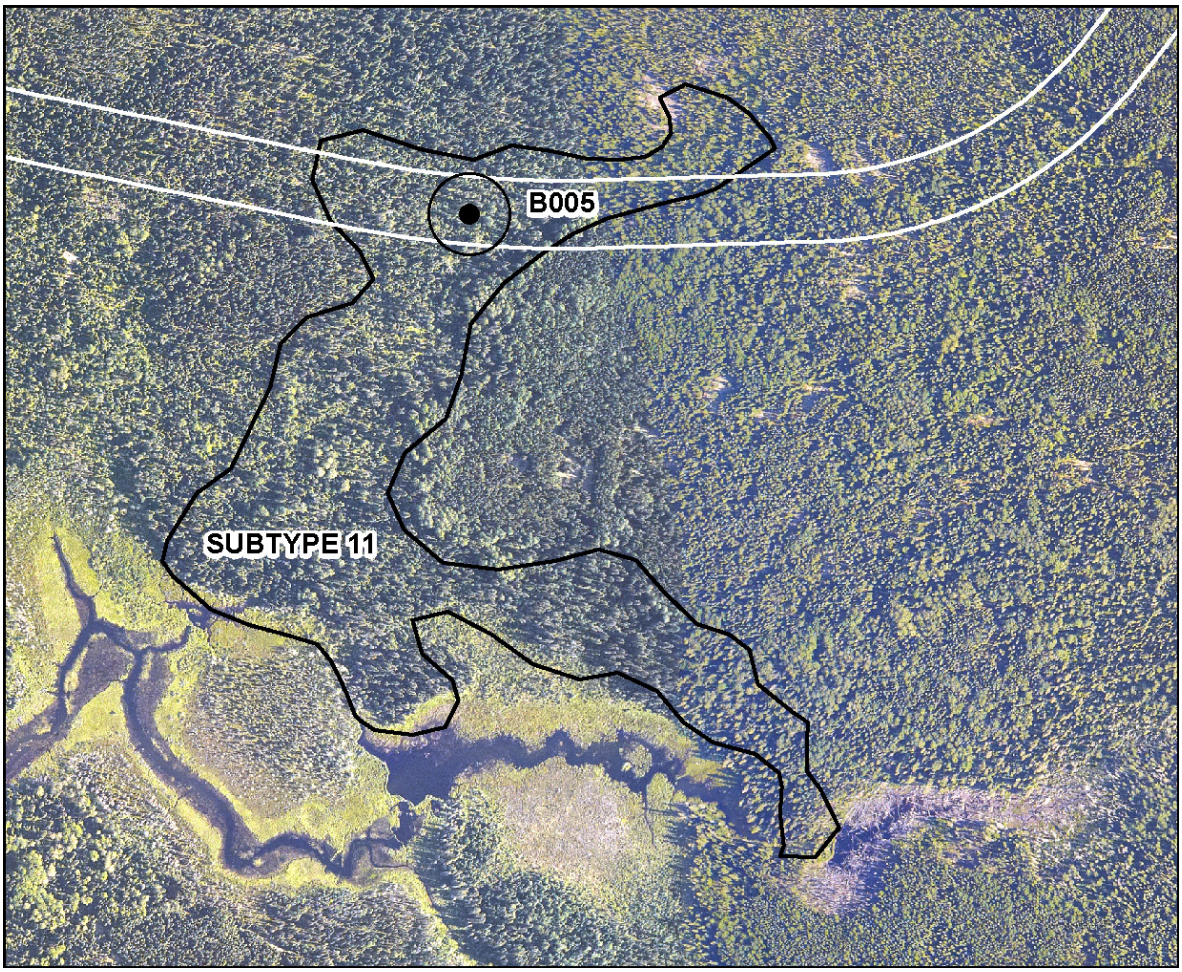
Forest plant communities sampled in B005 (Forest Subtype 11) and B007 (Forest Subtype 51) are areas of interest to the project. White spruce dominate these two forest types and any of the following conifer species such as jack pine, balsam fir and black spruce are minor components. What makes these two forest subtypes unique is the size and age of the white spruce trees in particular and their limited distribution along the route.

Three white spruce trees with diameters of 53.2cm, 38.5cm and 43.2 cm and 189, 143 and 128 years respectively were encountered in the plots. Combined, subtypes 11 and 51 occupy approximately 6.5ha or 3.0% of the proposed route based on a 60m wide ROW. Within 1km of the proposed route, forest subtypes 11 and 51 occupy approximately 85ha or 1.2% of the forested area.

Plot number B005 was set up in Forest Subtype 11 and delineated by black line in Figure 4. Using Figures 3 and 4 as a reference, the white spruce stand (Forest Subtype 11) extends further south from Plot B005 to the creek edge then continues about 500m east. Other locations where this forest type occurs is approximately 2km NW of LGR Airport (Figure 2), at location where the 2013 alignment headed west into LGR FN reserve land, and two stands SW of Plot B007 (Figure 3). Plot number B007 was set up in Forest Subtype 51 and is delineated on Figure 3. The proposed location of the road is situated on most of the entire length of the stand. In Figure 5, the white spruce stand (delineated by black line) parallels the northern edge of a creek for approximately 1 km. Two other stands of subtype 51 are located further west along the proposed route, directly south of Plot B008 and 1km west of airport (Figure 2).

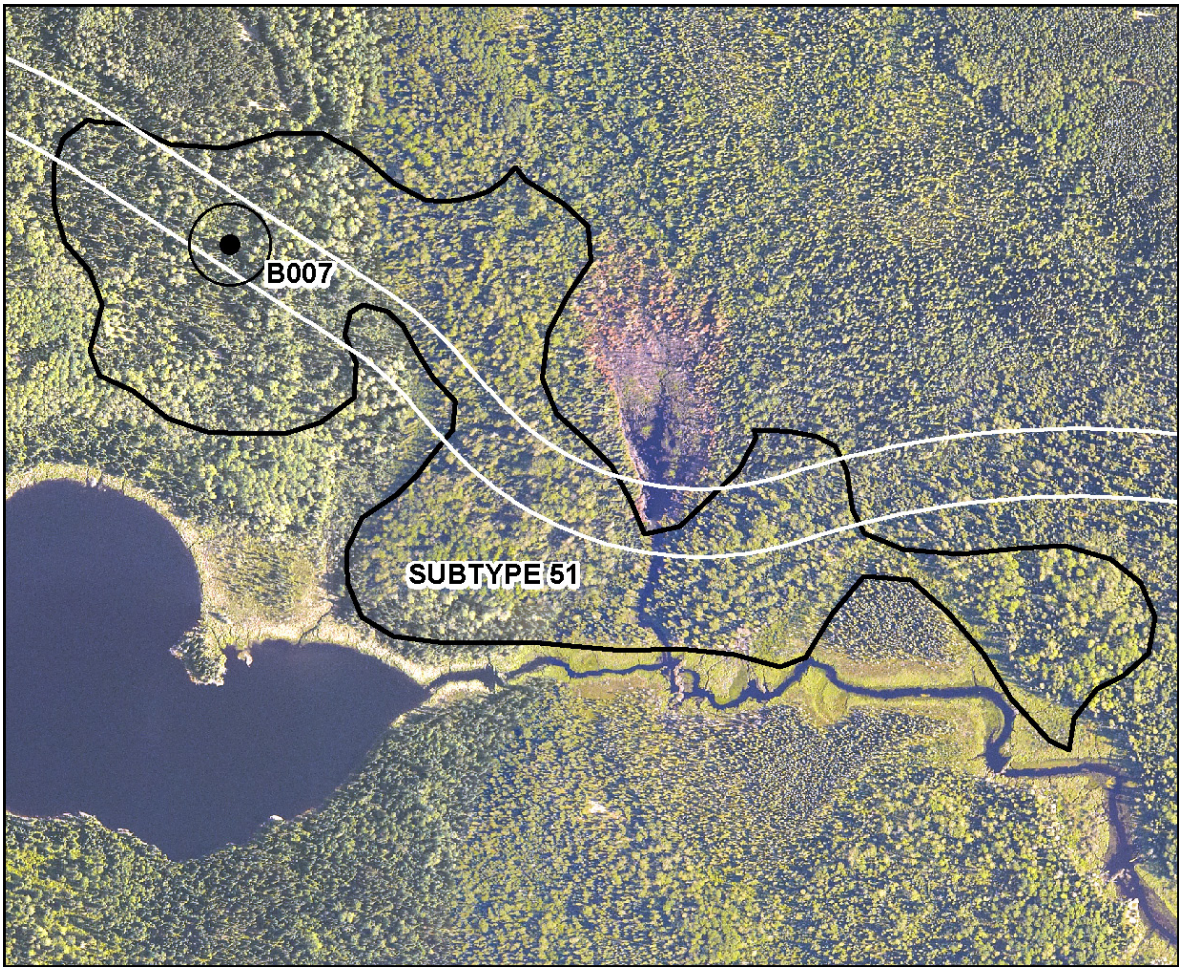
Fire does not appear to be a factor in stand development or maintenance, at least within the last 40 - 50 years. Fire scarred boles, stumps and woody debris went undetected at both plots, in addition to plot B006. White spruce is easily killed by fire and has nonserotinous cones (doesn't open with extreme and sudden heat) but opens with age. The prevailing fresh to wet site conditions in the vicinity of Plot B005 for example, typically deters forest fires. These factors, plus limited competition from other conifers has allowed this species to persist for nearly 200 years.

Both plots (B005 and B007) are in forest stands that are easily discerned in Figures 4 and 5. These stands are best characterized on the aerial images as large, triangular shaped spots which are shadows laid down by the white spruce. It is estimated that some of these white spruce would have germinated in 1825 or earlier.



(Adapted from MLI, 2014)

Figure 4. Plot B005 in Forest Cover Subtype 11 (White Spruce 40-70%: 2nd major species Jp,Fb,Sb).



(Adapted from MLI, 2014)

Figure 5. Plot B007 in Forest Cover Subtype 51 (White Spruce 50% or less: 2nd major species Fb,Jp or Sb).

7.0 RECOMMENDATIONS

1. Recognize the old growth, white spruce forest stands between and including Plots B005 to B007. They are areas of interest because of their old age, forest stand composition and structure, and limited distribution along the proposed route.

2. Recognize sensitive habitat such as that in vicinity of Plot B001. Two common species of orchid including Round-Leaved Rein Orchid (S3) and Lesser Rattlesnake-Plantain (S5) were observed along narrow transition habitat between Black Spruce Treed Muskeg (701) and Black Spruce 71-100% (13). Elevational gradients adjacent to mossy, coniferous forest stands results in a discrete set of site conditions which are uncommon along the proposed route. These conditions create habitat that is favoured by some species of orchids and other plants whose site requirements occur on a limited basis.

APPENDIX I
TREE AND SHRUB DATA SHEETS

ESRA Vegetation Survey - Tree and Shrub Data (Project 7A) **(2014)**

Plot No. B001 **Date:** September 11, 2014

Surveyors: Jarvis Keeper, Chris Higgs **Time:** 9:00 am

Productivity Code and Cover Type: 701 - Black Spruce Treed Muskeg **Waypoint No. :** 002

UTM Coordinates: 15 U 329056 5772534

TREE DATA (Overstorey) 10mx20m

V-type (FEC): V30 **S-Type (FEC):** N/A

Species Comp.: No data

(Overstorey species) (ie. Jp6,Po3,Sb1) (Jack pine 60%, Aspen 30%, Black Spruce 10%)

i) Tree Cores

Tree No.	Species	Diameter (cm)	Canopy Status	Age[1]	Height (m)
1	Sb	16.0	C	76 ± 2	14
2	Sb	15.0	D	70 ± 2	18
3	Sb	8.0	S	73 ± 2	12
4	Sb	14.0	C	77 ± 2	17
5	Sb	15.3	D	69 ± 2	18
6					

Bw - *White birch*
Fb - *Balsam fir*
Jp - *Jack Pine*
La - *Larch/Tamarack*
Po - *Trembling Aspen*
Sb - *Black spruce*
Sw - *White spruce*

ii) Stem Counts

Species	No. of stems	Species	No. of stems
Sb	62		

2 cores (min) from main canopy:
2 cores from dominant species and
1 core for other species in canopy
2 cores (max) from subcanopy:
1 core/species or 2 cores from
single species in subcanopy

Canopy status

D - Dominant

C - Co-dominant

S - Subcanopy

Notes:

[1] *age (+/- 2 yrs)*

[2] tree heights estimated

Forest stand primarily co-dominant trees

SHRUB DATA (Understorey) (5m x 5m)

Species (Check if collected)	No. of stems
Picea mariana	29
Salix sp.	1
Ledum groenlandicum	20

Photo Nos. 022 N, 023 W

Notes:

ESRA Vegetation Survey - Tree and Shrub Data (Project 7A) **(2014)**

Plot No. B002

Date: September 11, 2014

Surveyors: J. Keeper, Chris Higgs

Time: 10:17

Productivity Code and Cover Type: 44 - Jack Pine 51%: 2nd major species Hdwd

Waypoint No. : 005

UTM Coordinates: 15 U 329745 5771550

TREE DATA
(Overstorey) (10m x 20m)

V-type (FEC): V28 **S-Type (FEC):** N/A

Species Comp.: Jp10

(Overstorey species) (ie. Jp6,Po3,Sb1) (Jack pine 60%, Aspen 30%, Black Spruce 10%)

i) Tree Cores:

Tree No.	Species	Diameter (cm)	Canopy Status	Age[1]	Height (m)[2]
1	Jp	20.3	D	85 ± 2	20
2	Jp	24.9	D	90 ± 2	21
3	Jp	20.5	C	87 ± 2	17
4	Jp	10	S	50 ± 2	8
5	Jp	21.8	C	88 ± 2	17
6					

Bw - *White birch*
Fb - *Balsam fir*
Jp - *Jack Pine*
La - *Larch/Tamarack*
Po - *Trembling Aspen*
Sb - *Black spruce*
Sw - *White spruce*

*ii) Stem Counts (*Species, Diameter*):*

Species	No. of stems	Species	No. of stems
Jp	30		
Fb	2		
Sb	5		

2 cores (min) from main canopy:
2 cores from dominant species and
1 core for other species in canopy
2 cores (max) from subcanopy:
1 core/species or 2 cores from single species in subcanopy

Canopy status
D - Dominant
C - Co-dominant
S - Subcanopy

Notes:

[1] *age (+/- 2 yrs)*

[2] *tree heights estimated*

SHRUB DATA **(Understorey) (**5m x 5m**)**

Species (Check if collected)	No. of stems
Abies balsamifera	10
Populus balsamifera	1
Vacinium myrtilloides	2
Populus tremuloides	1
Ledum groenlandicum	2

Photo Nos. 31N, 32W, 33E

Notes:

ESRA Vegetation Survey - Tree and Shrub Data (Project 7A) **(2014)**

Plot No. B003

Date: September 11, 2014

Surveyors: Chris Higgs, Jarvis Keeper

Time: 11:35 am

Productivity Code and Cover Type: 6 - Jack Pine 40-70%, 2nd major species Spruce

Waypoint No. : 007*

UTM Coordinates: 15 U 334838 5762701

TREE DATA
(Overstorey) (10m x 20m)

V-type (FEC): V18 **S-Type (FEC):**

Species Comp.: Jp7Sb2Fb1

(Overstorey species) (ie. Jp6,Po3,Sb1) (Jack pine 60%, Aspen 30%, Black Spruce 10%)

i) Tree Cores:

Tree No.	Species	Diameter (cm)	Canopy Status	Age[1]	Height (m)[2]
1	Jp	23.7	D	77 ± 2	20
2	Jp	24.5	D	88 ± 2	18
3	Sb**	20.6	C	no data	n/a
4	Sb	10.5	S	35 ± 2	no data
5	Jp	17.8	C	79 ± 2	16
6	Fb	13.1	S	40 ± 2	10

Bw - *White birch*
Fb - *Balsam fir*
Jp - *Jack Pine*
La - *Larch/Tamarack*
Po - *Trembling Aspen*
Sb - *Black spruce*
Sw - *White spruce*

*ii) Stem Counts (*Species, Diameter*):*

Species	No. of stems	Species	No. of stems
Jp	10		
Fb	2		
Sb	1		

2 cores (min) from main canopy:
2 cores from dominant species and
1 core for other species in canopy
2 cores (max) from subcanopy:
1 core/species or 2 cores from
single species in subcanopy

Canopy status
D - Dominant
C - Co-dominant
S - Subcanopy

Notes:

** This tree had heart rot, so couldn't be aged

[1] *age (+/- 2 yrs)*

[2] tree heights estimated

SHRUB DATA **(Understorey) (**5m x 5m**)**

Species (Check if collected)	No. of stems
Picea mariana	2
Betula papyrifera	3
Vaccinium myrtilloides	29

Photo Nos. 38N, 39W

Notes:

* Plot location approx. 50m to SE of original location

ESRA Vegetation Survey - Tree and Shrub Data (Project 7A) **(2014)**

Plot No. B004

Date: September 11, 2014

Surveyors: Chris Higgs, Jarvis Keeper

Time: 1:15 pm

Productivity Code and Cover Type: 13 - Black Spruce 71-100%

Waypoint No. : 008*

UTM Coordinates: 15 U 331442 5768721

TREE DATA
(Overstorey) (10m x 20m)

V-type (FEC): V17 **S-Type (FEC):** n/a

Species Comp.: Sb8 Fb1 Bw1

(Overstorey species) (ie. Jp6,Po3,Sb1) (Jack pine 60%, Aspen 30%, Black Spruce 10%)

i) Tree Cores:

Tree No.	Species	Diameter (cm)	Canopy Status	Age[1]	Height (m)[2]
1	Sb**	24.0	D	90 ± 2	16
2	Sb**	26.2	C	83 ± 2	15
3	Sb	28.0	D	90 ± 2	20
4	Sb	14.0	S	100 ± 2	12
5	Fb	9.1	S	52 ± 2	11
6					

Bw - *White birch*
Fb - *Balsam fir*
Jp - *Jack Pine*
La - *Larch/Tamarack*
Po - *Trembling Aspen*
Sb - *Black spruce*
Sw - *White spruce*

*ii) Stem Counts (*Species, Diameter*):*

Species	No. of stems	Species	No. of stems
Sb	8	Bw	2
Fb	12		
Snag	2		

2 cores (min) from main canopy:
2 cores from dominant species and
1 core for other species in canopy
2 cores (max) from subcanopy:
1 core/species or 2 cores from
single species in subcanopy

Canopy status
D - Dominant
C - Co-dominant
S - Subcanopy

Notes:

[1] *age (+/- 2 yrs)*

[2] tree heights estimated

** tree cored at 1.3m height due to heart rot, so age adjusted accordingly.

Most of Fb in subcanopy and not part of canopy, where species comp. is determined

SHRUB DATA **(Understorey) (**5m x 5m**)**

Species (Check if collected)	No. of stems
Alnus crispa	20
Abies balsamifera	10
Ribes	4

Photo Nos. 41N, 42W

Notes:

Plot in low-lying spot with small pools of water, Spahgnum moss and Green alder

* more representative location 30-35m to NW

ESRA Vegetation Survey - Tree and Shrub Data (Project 7A) **(2014)**

Plot No. B005

Date: September 10, 2014

Surveyors: Chris Higgs, Jarvis Keeper

Time: 1:55 pm

Productivity Code and Cover Type: 11 - White spruce 40-70%, 2nd major species Jp,Fb or Sb

Waypoint No. : 004

UTM Coordinates: 15 U 336765 5762254

TREE DATA **(Overstorey)** (10mx20m)

V-type (FEC): V13 **S-Type (FEC):** S10

Species Comp.: Sw8 Sb1 Fb1

(Overstorey species) (ie. Jp6,Po3,Sb1) (Jack pine 60%, Aspen 30%, Black Spruce 10%)

i) Tree Cores:

Tree No.	Species	Diameter (cm)	Canopy Status	Age[1]	Height (m)[2]
1	Sw	53.2	D	189 ± 2	no data
2	Sw	38.5	C	143 ± 2	no data
3	Fb	15.5	S	77 ± 2	8
4	Fb	19.2	S	92 ± 2	12
5					
6					

Bw - *White birch*
Fb - *Balsam fir*
Jp - *Jack Pine*
La - *Larch/Tamarack*
Po - *Trembling Aspen*
Sb - *Black spruce*
Sw - *White spruce*

*ii) Stem Counts (*Species, Diameter*):*

Species	No. of stems	Species	No. of stems
Fb	5		
Sw	2		
La	1		

2 cores (min) from main canopy:
2 cores from dominant species and
1 core for other species in canopy
2 cores (max) from subcanopy:
1 core/species or 2 cores from
single species in subcanopy

Canopy status

D - Dominant
C - Co-dominant
S - Subcanopy

Notes:

[1] *age (+/- 2 yrs)*

[2] tree heights estimated

This is an old-growth forest (overmature), 2 large white spruce and blowdown throughout.

Balsam fir is revegetating forest floor openings.

SHRUB DATA **(Understorey) (**5m x 5m**)**

Species (Check if collected)	No. of stems
Populus balsamifera	1
Abies balsamifera	23
Populus tremuloides	1

Photo Nos. 006, 007

Jarvis coring balsam fir tree

Notes:

ESRA Vegetation Survey - Tree and Shrub Data (Project 7A) **(2014)**

Plot No. B006

Date: September 10, 2014

Surveyors: Chris Higgs, Jarvis Keeper

Time: 3:

Productivity Code and Cover Type: 15 - Black spruce 40-70%: 2nd major species Fb, Sw

Waypoint No. : 008

UTM Coordinates: 15 U 335866 5762479

TREE DATA **(Overstorey)** (10m x 20m)

V-type (FEC): V10 **S-Type (FEC):** S10

Species Comp.: Sb6 Po2 Fb1 Bw1

(Overstorey species) (ie. Jp6,Po3,Sb1) (Jack pine 60%, Aspen 30%, Black Spruce 10%)

i) Tree Cores:

Tree No.	Species	Diameter (cm)	Canopy Status	Age[1]	Height (m)[2]
1	Sb	24.5	D	88 ± 2	18
2	Po	22.7	C	*no data*	17
3	Sb	18.2	S	87 ± 2	14
4	Bw	14.4	S	74 ± 2	13
5					
6					

Bw - *White birch*
Fb - *Balsam fir*
Jp - *Jack Pine*
La - *Larch/Tamarack*
Po - *Trembling Aspen*
Sb - *Black spruce*
Sw - *White spruce*

*ii) Stem Counts (*Species, Diameter*):*

Species	No. of stems	Species	No. of stems
Sb	3	Fb	1
Bw	1		
Po	2		

2 cores (min) from main canopy:
2 cores from dominant species and
1 core for other species in canopy
2 cores (max) from subcanopy:
1 core/species or 2 cores from single species in subcanopy

Canopy status

D - Dominant

C - Co-dominant

S - Subcanopy

Notes:

[1] age *(+/- 2 yrs)*

[2] tree heights estimated

Semi-open, mature forest with Fb occupying forest openings. Snags present. Trembling aspen comprising subcanopy.

Good moose browse habitat.

SHRUB DATA **(Understorey) (**5m x 5m**)**

Species (Check if collected)	No. of stems
Populus tremuloides	2
Abies balsamifera	13
Sorbus decora	1
Ribes sp.	2
Rosa acicularis	2
Viburnum opulus	1
Betula papyrifera	3
Cornus stolonifera	6
Ledum groenlandicum	8

Photo Nos. 12N, 13W, 14S

Notes:

ESRA Vegetation Survey - Tree and Shrub Data (Project 7A) **(2014)**

Plot No. B007

Date: September 11, 2014

Surveyors: Chris Higgs, Jarvis Keeper

Time: 3:45 pm

Productivity Code and Cover Type: 51 - White spruce 50% or less: 2nd maj. species Fb,Jp,Sb

Waypoint No. : 009

UTM Coordinates: 15 U 334838 5762701

TREE DATA **(Overstorey)** (10m x 20m)

V-type (FEC): V13 **S-Type (FEC):** S6

Species Comp.:

(Overstorey species) (ie. Jp6,Po3,Sb1) (Jack pine 60%, Aspen 30%, Black Spruce 10%)

i) Tree Cores:

Tree No.	Species	Diameter (cm)	Canopy Status	Age[1]	Height (m)[2]
1	Sw*	43.2	D	128 ± 2	26
2	Sb	34.4	D	130 ± 2	25
3	Sb	23.2	C	137 ± 2	17
4	Fb	12.0	S	62 ± 2	10
5					
6					

Bw - *White birch*
Fb - *Balsam fir*
Jp - *Jack Pine*
La - *Larch/Tamarack*
Po - *Trembling Aspen*
Sb - *Black spruce*
Sw - *White spruce*

ii) Stem Counts

Species	No. of stems	Species	No. of stems
Fb	15	Sb	3
Po	1	Spruce sp.	5
Bw	1		

2 cores (min) from main canopy:
2 cores from dominant species and
1 core for other species in canopy
2 cores (max) from subcanopy:
1 core/species or 2 cores from single species in subcanopy

Canopy status

D - Dominant

C - Co-dominant

S - Subcanopy

Notes:

[1] age *(+/- 2 yrs)*

[2] tree heights estimated

*** No white spruce cones on ground at base of tree.**

SHRUB DATA **(Understorey) (**5m x 5m**)**

Species (Check if collected)	No. of stems
Betula papyrifera	14
Populus tremuloides	5
Abies balsamifera	5
Ribes glandulosum	1

Photo Nos. 43N, 44W, 45

Notes:

ESRA Vegetation Survey - Tree and Shrub Data (Project 7A) **(2014)**

Plot No. B008

Date: September 10, 2014

Surveyors: Chris Higgs, Jarvis Keeper

Time:

Productivity Code and Cover Type: 82 - Trembling aspen: 2nd major species spruce or Fb

Waypoint No. :

UTM Coordinates: 15 U 332350 5763220

TREE DATA **(Overstorey)** (10m x 20m)

V-type (FEC): V7 **S-Type (FEC):** n/a

Species Comp.: no data

(Overstorey species) (ie. Jp6,Po3,Sb1) (Jack pine 60%, Aspen 30%, Black Spruce 10%)

i) Tree Cores:

Tree No.	Species	Diameter (cm)	Canopy Status	Age[1]	Height (m)[2]
1	Po	19.3	C	34 ± 2	no data
2	Bw	16.5	C	41 ± 2	no data
3	Fb	8.3	S	38 ± 2	no data
4	Po	22.9	D	35 ± 2	no data
5					
6					

Bw - *White birch*
Fb - *Balsam fir*
Jp - *Jack Pine*
La - *Larch/Tamarack*
Po - *Trembling Aspen*
Sb - *Black spruce*
Sw - *White spruce*

ii) Stem Counts:

Species	No. of stems	Species	No. of stems
Fb	29	Bw	5
Po	5		
Salix sp.	1		

2 cores (min) from main canopy:
2 cores from dominant species and
1 core for other species in canopy
2 cores (max) from subcanopy:
1 core/species or 2 cores from single species in subcanopy

Canopy status
D - Dominant
C - Co-dominant
S - Subcanopy

Notes:

[1] age *(+/- 2 yrs)*

[2] tree heights estimated

SHRUB DATA **(Understorey) (**5m x 5m**)**

Species (Check if collected)	No. of stems
Amelanchier alnifolia	2
Acer spicatum	20
Lonicera dioica	8
Cornus stolonifera	1
Abies balsamifera	2

Photo Nos. _____

Notes:

APPENDIX II

GROUND COVER DATA SHEETS

ESRA Vegetation Survey - Ground Cover Data (Project 7A) (**2014**)

Plot No. B001 | Date: September 11, 2014

Surveyors: C.P | Time: 9 AM

Productivity Code and Cover Type: 701 - Black Spruce Muskeg | Waypoint Name/No. : 002

Plant codes: (t) - tree (s) - shrub (sd) - seedling

	Quadrats							
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
Ledum groenlandicum	●	●	O	●	●	●	O	5
Vaccinium vitis-idaea	●	O	O	●	●	●	O	4
Equisetum sylvaticum	●	●	O	●	●	●	O	5
Picea mariana (s)	O	●	O	O	●	●	O	3
Picea mariana (t)	O	O	●	O	O	O	O	1
Rubus chamaemorus	O	O	O	O	●	O	O	1
Vaccinium oxycoccus	O	O	O	O	●	O	O	1
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
Polytrychium sp.	O	O	O	●	O	O	O	1
Cladonia sp.	O	●	O	O	O	O	O	1
Cladina	O	O	O	O	O	O	O	
Sphagnum sp.	●	●	O	O	●	●	O	4
Dicranum sp.	O	●	●	●	O	O	O	3
Hylocomium splendens	O	●	O	●	O	O	O	2
Pleurozium schreberi	●	●	●	●	●	●	O	6
Ptilium crista-castrensis	●	●	●	O	O	O	O	3
Litter (% cover)								
Rock (% cover)								
Water (% cover)								
Total # of Species	6	9	4	7	8	7		**14**

ESRA Vegetation Survey - Ground Cover Data (Project 7A) (**2014**)

Plot No. B002 | Date: September 11, 2014

Surveyors: C.P | Time: 10:17 am

Productivity Code and Cover Type: 44 - Jack Pine 51%: 2nd major species Hardwood | Waypoint Name/No. : 005

Plant codes: (t) - tree (s) - shrub (sd) - seedling

	Quadrats							
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
Chimaphila umbellata	●	●	O	●	●	O	O	4
Moneses uniflora	●	O	O	O	O	O	O	1
Linnaea borealis	●	●	●	O	O	O	O	3
Pyrola virens	●	O	O	O	O	O	O	1
Platanthera obtusata	●	O	O	O	O	O	O	1
Gaultheria hispidula	O	O	O	●	●	O	O	2
Vaccinium vitis-idaea	O	O	O	●	●	O	O	2
Pyrola secunda	O	O	O	●	●	O	O	2
Vaccinium myrtilloides	O	O	O	●	O	●	O	2
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
Cladonia sp.	O	O	O	O	O	O	O	
Cladina	O	O	O	O	O	O	O	
Sphagnum sp.	O	O	O	O	O	O	O	
Dicranum sp.	●	●	O	O	O	●	O	3
Hylocomium splendens	O	O	●	O	O	O	O	1
Pleurozium schreberi	●	●	●	●	●	●	O	6
Ptilium crista-castrensis	●	●	●	O	O	O	O	3
Litter (% cover)								
Rock (% cover)								
Water (% cover)								
Total # of Species	8	5	4	6	5	3	n/a	**13**

ESRA Vegetation Survey - Ground Cover Data (Project 7A) (**2014**)

Plot No. B003 | Date: September 11, 2014

Surveyors: C.P | Time: 11:35 am

Productivity Code and Cover Type: 6 - Jack pine 40-70%: 2nd major species Spruce | Waypoint Name/No. : 007

Plant codes: (t) - tree (s) - shrub (sd) - seedling

	Quadrats							
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
Chimaphila umbellata	●	O	●	O	O	O	O	2
Vaccinium myrtilloides	●	●	●	●	●	●	O	6
Maianthemum canadense	●	O	O	O	O	●	O	3
Clintonia borealis	O	●	O	O	O	O	O	1
Cornus canadensis	O	●	O	O	O	O	O	1
Linnaea borealis	O	O	●	O	O	O	O	1
Vaccinium vitis-idaea	O	O	●	●	O	●	O	3
Lycopodium clavatum	O	O	●	O	●	●	O	3
Carex sp.	O	O	●	O	O	O	O	1
Betula papyrifera (s)	O	O	O	●	O	O	O	1
Aralia nudicaulis	O	O	O	O	●	●	O	2
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
Cladonia sp.	O	O	O	O	O	O	O	
Cladina	●	●	O	O	●	●	O	4
Sphagnum sp.	O	O	O	O	O	O	O	
Dicranum sp.	●	●	●	●	O	●	O	5
Hylocomium splendens	O	O	O	O	O	O	O	
Pleurozium schreberi	●	●	●	●	●	O	O	5
Ptilium crista-castrensis	O	●	O	O	O	O	O	1
Litter (% cover)								
Rock (% cover)								
Water (% cover)								
Total # of Species	6	7	8	5	6	7	n/a	**15**

ESRA Vegetation Survey - Ground Cover Data (Project 7A) (**2014**)

Plot No. B004 | Date: September 11, 2014

Surveyors: C.P | Time: 1:15 pm

Productivity Code and Cover Type: 13 - Black Spruce 71-100% | Waypoint Name/No. : 008

Plant codes: (t) - tree (s) - shrub (sd) - seedling

	Quadrats							
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
Alnus rugosa	●	●	●	●	●	O	O	5
Picea mariana	●	O	O	O	O	O	O	1
Maianthemum trifolium	●	●	●	O	●	●	O	5
Moneses uniflora	●	O	O	O	O	O	O	1
Gaultheria hispidula	●	O	O	O	O	O	O	2
Calamagrostis canadensis	●	●	●	O	●	O	O	4
Carex disperma	●	●	●	●	O	●	O	5
Equisetum scirpoides	●	O	O	O	O	●	O	2
Ledum groenlandicum	●	●	O	O	O	●	O	3
Rubus pubescens	●	●	●	●	O	O	O	4
Carex sp.	O	●	●	●	O	●	O	4
Circaea alpina	O	●	O	O	O	O	O	1
Cornus canadensis	O	●	O	O	O	O	O	1
Ribes glandulosum	O	●	●	O	O	O	O	2
Pyrola secunda	O	●	O	●	O	O	O	2
Trientalis borealis	O	●	O	O	O	O	O	1
Ranunculus lapponicus	O	●	O	O	O	●	O	2
Abies balsamifera (s)	O	●	●	O	O	●	O	3
Monotropa uniflora	O	●	O	O	O	O	O	1
Lycopus americana	O	●	O	O	O	O	O	1
Caltha palustris	O	●	O	●	●	O	O	3
Dryopteris carthusiana	O	O	●	O	O	O	O	1
Lysimachia thyrsiflora	O	O	●	O	O	●	O	2
Menyanthes trifoliata	O	O	O	●	O	O	O	1
Calla palustris	O	O	O	O	●	O	O	1
Potentilla palustris	O	O	O	O	●	O	O	1
Viola sp.	O	O	O	O	O	●	O	1
	O	O	O	O	O	O	O	
Mnium/Plyglomnium	O	O	O	O	●	O	O	1
Cladonia sp.	O	O	O	O	O	O	O	
Cladina	O	O	O	O	O	O	O	
Sphagnum sp.	●	●	●	●	●	●	O	6
Dicranum sp.	O	O	O	O	O	O	O	
Hylocomium splendens	●	O	O	O	O	O	O	1
Pleurozium schreberi	●	O	O	O	O	O	O	1
Ptilium crista-castrensis	●	O	●	O	O	●	O	3
Litter (% cover)								
Rock (% cover)								
Water (% cover)		15	65	10	70			
Total # of Species	14	18	12	8	8	11	n/a	**32**

ESRA Vegetation Survey - Ground Cover Data (Project 7A) (**2014**)

Plot No. B005 | Date: September 10, 2014

Surveyors: C. Higgs, Jarvis Keeper | Time: 1:13 pm

Productivity Code and Cover Type: 11 - White spruce 40-70%: 2nd major species Jp,Fb or Sb | Waypoint Name/No. : 004

Plant codes: (t) - tree (s) - shrub (sd) - seedling

	Quadrats							
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
Abies balsamea(s)	●	●	●	O	O	O	O	3
Linnaea borealis	●	O	O	O	O	●	O	2
Mitella nuda	O	●	O	●	●	O	O	3
Equisetum sylvaticum	O	●	●	O	●	●	O	4
Cornus stolonifera	O	O	●	O	O	O	O	1
Rubus pubescens	O	O	●	O	O	O	O	1
Cornus canadensis	O	O	●	O	O	O	O	1
Ranunculus sp.	O	O	●	●	O	O	O	2
Picea mariana (sd)	O	O	O	●	O	O	O	1
Caltha palustris	O	O	O	●	O	O	O	1
Carex sp.	O	O	O	●	●	O	O	2
Grass sp.	O	O	O	●	●	O	O	2
Pyrola sp.	O	O	O	●	O	O	O	1
Forb sp.	O	O	O	●	O	O	O	1
Petasites palmatus	O	O	O	O	●	●	O	2
Maianthemum canadensis	O	O	O	O	●	O	O	1
Epilobium angustifolium	O	O	O	O	●	O	O	1
Abies balsamifera (t)	O	O	O	O	●	●	O	2
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
Peltigera aphthosa	O	O	●	O	O	O	O	1
Moss sp.	●	O	O	O	O	O	O	1
Cladonia sp.	O	O	O	O	O	O	O	
Cladina	O	O	O	O	O	O	O	
Sphagnum sp.	O	O	O	O	●	O	O	1
Dicranum sp.	O	O	O	O	O	O	O	
Hylocomium splendens	O	●	●	●	●	●	O	5
Pleurozium schreberi	●	●	●	●	●	●	O	6
Ptilium crista-castrensis	●	●	●	●	●	●	O	6
Woody debris (% cover)	65	50		5		80		
Rock (% cover)						10		
Water (% cover)				40				
Total # of Species	5	6	10	11	12	7	n/a	**24**

ESRA Vegetation Survey - Ground Cover Data (Project 7A) (**2014**)

Plot No. B006 | Date: September 10, 2014

Surveyors: Chris Higgs, Jarvis Keeper | Time: 3:20pm

Productivity Code and Cover Type: 15 - Black spruce 40-70%: 2nd major species Fb, or Sw | Waypoint Name/No. : 008

Plant codes: (t) - tree (s) - shrub (sd) - seedling

	Quadrats							
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
Ledum groenldnicum	●	O	O	O	O	O	O	1
Sorbus decora (s)	●	O	O	O	O	O	O	1
Viburnum opulus	●	O	O	O	O	O	O	1
Picea mariana (t)	●	O	O	O	O	O	O	1
Populus tremuloides (s)	●	●	●	O	O	O	O	3
Forb sp 3-leaved	●	●	●	●	O	●	O	5
Mitella nuda	●	●	●	O	O	●	●	5
Lycopodium annotinum	●	●	●	●	O	●	O	5
Cornus canadensis	●	●	●	●	O	●	O	5
Abies balsamifera (s)	O	●	●	●	●	O	O	4
Equisetum sylvaticum	O	●	●	●	●	●	●	6
Rubus pubescens	O	●	O	●	O	●	●	4
Trientalis borealis	O	●	O	O	O	O	O	1
Clintonis borealis	O	●	●	O	O	O	O	2
Petasites palmatus	O	●	●	O	O	O	O	2
Viols sp.	O	●	O	O	O	O	O	1
Amelanchier alnifolia	O	O	●	O	O	O	O	1
Forb sp.	O	O	O	●	O	O	O	1
Viburnum opulus	O	O	O	O	●	O	O	1
Rosa acicularis	O	O	O	O	●	●	O	2
Vaccinium vitis-idaea	O	O	O	O	●	●	O	2
Linnaea borealis	O	O	O	O	●	O	O	1
Grass sp.	O	O	O	O	O	●	O	1
Ribes sp.	O	O	O	O	O	●	O	1
Fern sp.	O	O	O	O	O	●	●	2
Fragaria virginiana	O	O	O	O	O	●	O	1
Betula papyrifera (s)	O	O	O	O	O	●	O	1
Carex sp.	O	O	O	O	O	●	O	1
Campanula sp.	O	O	O	O	O	O	●	1
Alnus crispa	O	O	O	O	O	O	●	1
	O	O	O	O	O	O	O	
Moss sp.	●	●	O	O	●	●	O	4
Cladonia sp.	O	●	O	O	O	O	O	1
Cladina	O	O	O	O	O	O	O	
Sphagnum sp.	O	O	O	O	O	O	O	
Hylocomium splendens	O	O	●	●	O	●	O	3
Pleurozium schreberi	O	●	●	●	●	O	●	5
Ptilium crista-castrensis	O	O	O	●	●	●	●	4
Litter (% cover)	10							
Woody debris (% cover)					25		35	
Water (% cover)								
Total # of Species	10	15	12	10	9	17	8	35

ESRA Vegetation Survey - Ground Cover Data (Project 7A) (**2014**)

Plot No. B007 | Date: September 11, 2014
Surveyors: Chris Higgs, Jarvis Keeper | Time: 3:10 pm
Productivity Code and Cover Type: 51 - White spruce 50% or less: 2nd maj species Fb,Jp or Sb | Waypoint Name/No. : 009
Plant codes: (t) - tree (s) - shrub (sd) - seedling

	Quadrats							
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
Equisetum sylvaticum	●	●	●	●	●	O	●	6
Ribes sp.	●	O	O	O	O	O	O	1
Ribes sp.	●	O	O	O	O	O	O	1
Rubus idaeus	●	●	O	O	O	●	●	4
Viola sp.	●	●	O	O	O	●	O	3
Forb 3-leaved	●	O	●	O	O	O	O	2
Mitella nuda	●	O	O	●	O	●	●	4
Betula papyrifera (sd)	●	O	O	O	●	O	●	3
Trientalis borealis	●	●	O	O	O	●	●	4
Abies balsamifera	O	●	O	O	O	O	●	2
Aralia nudicaulis	O	●	●	O	O	O	●	2
Bidens cernua	O	●	O	O	O	●	O	2
Linnaea borealis	O	●	●	O	●	O	●	4
Cornus canadensis	O	●	●	O	O	●	O	3
Lycopodium annotinum	O	O	●	●	●	O	O	3
Petasites palmatus	O	O	●	O	O	O	O	1
Clintonia borealis	O	O	●	O	O	●	O	2
Carex sp.	O	O	●	O	O	O	O	1
Rubus pubescens	O	O	●	●	O	●	●	4
Fern sp.	O	O	O	●	O	O	O	1
Vaccinum sp.	O	O	O	O	●	O	O	1
Monotropa uniflora	O	O	O	O	●	O	O	1
Cornus stolonifera	O	O	O	O	O	●	O	1
Ribes sp.	O	O	O	O	O	●	O	1
Populus tremuloides (s)	O	O	O	O	O	●	O	1
Fern sp.	O	O	O	O	O	●	O	1
Abies balsamifera (sd)	O	O	O	O	O	O	●	1
Moss sp.	O	●	●	O	O	O	O	2
Cladonia sp.	O	O	O	O	O	O	O	
Cladina	●	●	O	O	O	O	O	2
Sphagnum sp.	O	O	O	O	O	O	O	
Hylocomium splendens	●	●	●	●	O	●	●	6
Pleurozium schreberi	●	●	●	●	●	●	●	7
Ptilium crista-castrensis	O	O	O	●	●	●	●	4
Litter (% cover)			15					
Woody debris (% cover)	5	25				10		
Water (% cover)								
Total # of Species	12	13	13	8	8	15	13	**32**

ESRA Vegetation Survey - Ground Cover Data (Project 7A) (**2014**)

Plot No. B008 | Date: September 10, 2014

Surveyors: C.P | Time: 2:30pm

Productivity Code and Cover Type: 82 - Trembling aspen: 2nd major species Spruce or Fb | Waypoint Name/No. :

Plant codes: (t) - tree (s) - shrub (sd) - seedling

	Quadrats							
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
Lysimachia thrysiflora	●	O	●	O	O	●	O	3
Diervilla lonicera	●	O	O	O	O	●	O	2
Mitella nuda	●	O	●	●	O	O	O	3
Aralia nudicaulis	●	O	O	O	O	O	O	1
Rubus pubescens	●	●	●	O	●	●	O	5
Ribes triste	O	O	O	●	O	O	O	1
Abies balsamifera	O	O	O	O	●	O	O	1
Acer spicatum	O	O	O	●	●	●	O	3
Linnaea borealis	O	O	O	O	●	O	O	1
Circaea alpina	O	O	O	O	●	●	O	2
Galium triflorum	O	O	O	O	O	●	O	1
Trientalis borealis	O	O	O	O	O	●	O	1
Viola sp.	O	O	O	O	O	●	O	1
Viola renifolia	O	O	O	O	O	●	O	1
Cinna latifolia	O	O	O	O	O	●	O	1
Dryopteris carthusiana	O	O	O	O	O	●	O	1
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
	O	O	O	O	O	O	O	
Eurhynchium sp.	●	●	●	●	●	●	O	6
Cladonia sp.	O	O	O	O	O	O	O	
Cladina	O	O	O	O	O	O	O	
Sphagnum sp.	O	O	O	O	O	O	O	
Dicranum sp.	●	O	O	O	O	O	O	1
Hylocomium splendens	O	O	●	O	O	●	O	2
Pleurozium schreberi	●	O	●	O	O	●	O	3
Ptilium crista-castrensis	●	O	O	O	O	●	O	2
Litter (% cover)								
Rock (% cover)								
Water (% cover)								
Total # of Species	9	2	6	4	6	15		**21**

APPENDIX III

SOILS DATA SHEETS

ESRA Vegetation Survey - Soil Data (Project 7A)

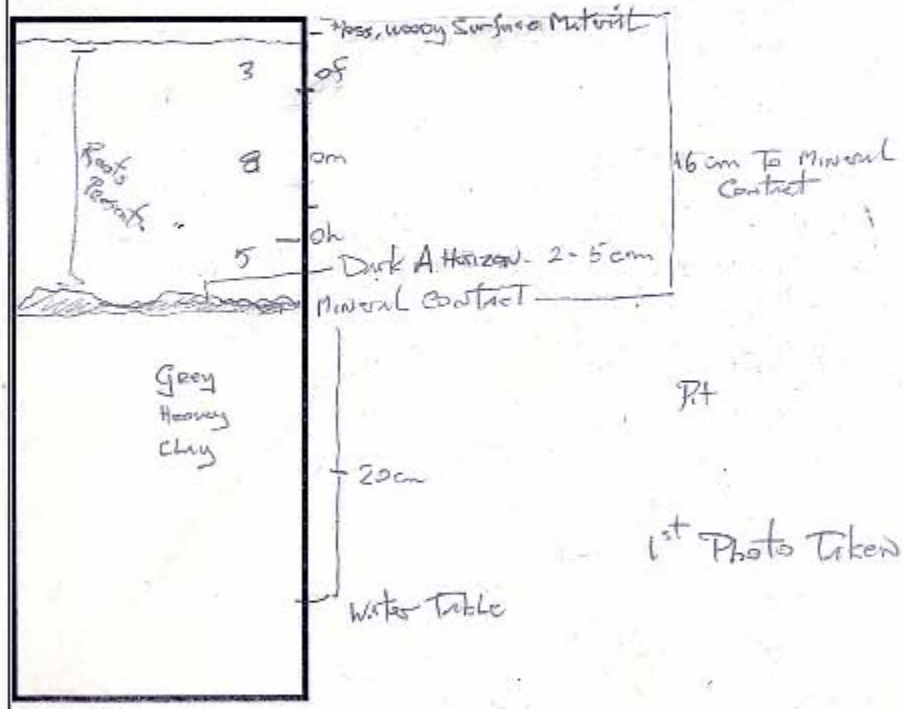
Plot # 13005 Date: Sept 10/14
Surveyors:
Weather: Time:

Mineral / Organic (circle one): _____ cm V-Type V13 cm

Moisture regime (1-7): 4 cm C texture: Clay cm

S-Type: 510

Soil Profile



Notes:

Pit Situated among balsam fir + Pacific alder
Next to Flowing water

Forbs Mainly Rubus pubescens, Petasites palmatus,
Feather Moss

ESRA Vegetation Survey - Soil Data (Project 7A)

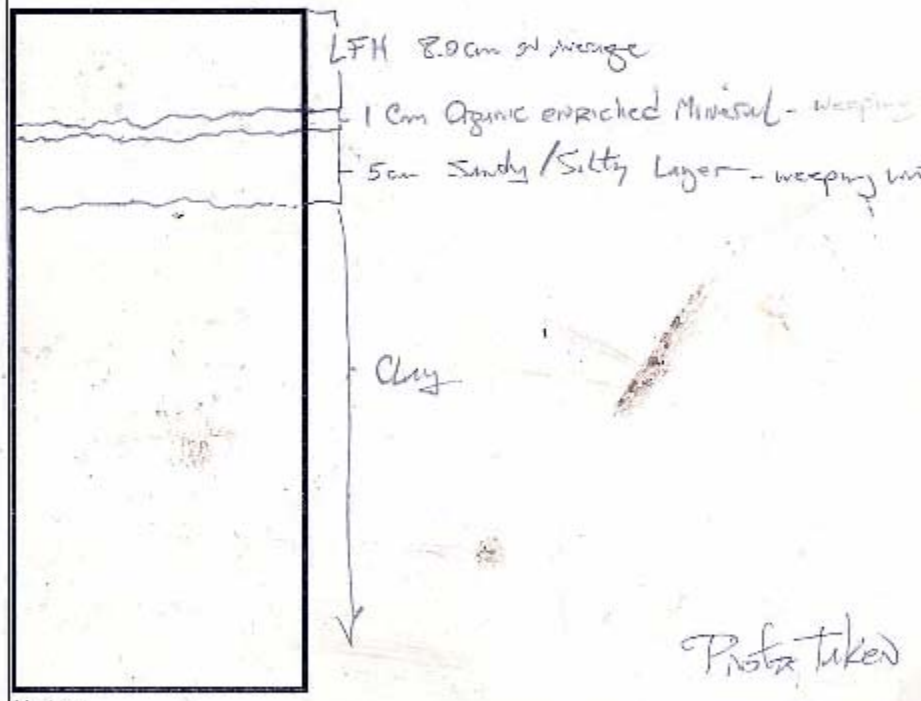
Plot # B006 | Date: Sept 10/14
Surveyors:
Weather: | Time:

Mineral / Organic (circle one): ≥100 cm | V-Type 10 cm

Moisture regime (1-7): 4 cm | C texture: Sandy Silt - 50 cm
Clay Below 5cm mineral layer

S-Type: S10

Soil Profile



Notes:

~~Lodgepole pine~~ ~~star foam~~

Balsam Fir, Trembling Aspen

ESRA Vegetation Survey - Soil Data (Project 7A)

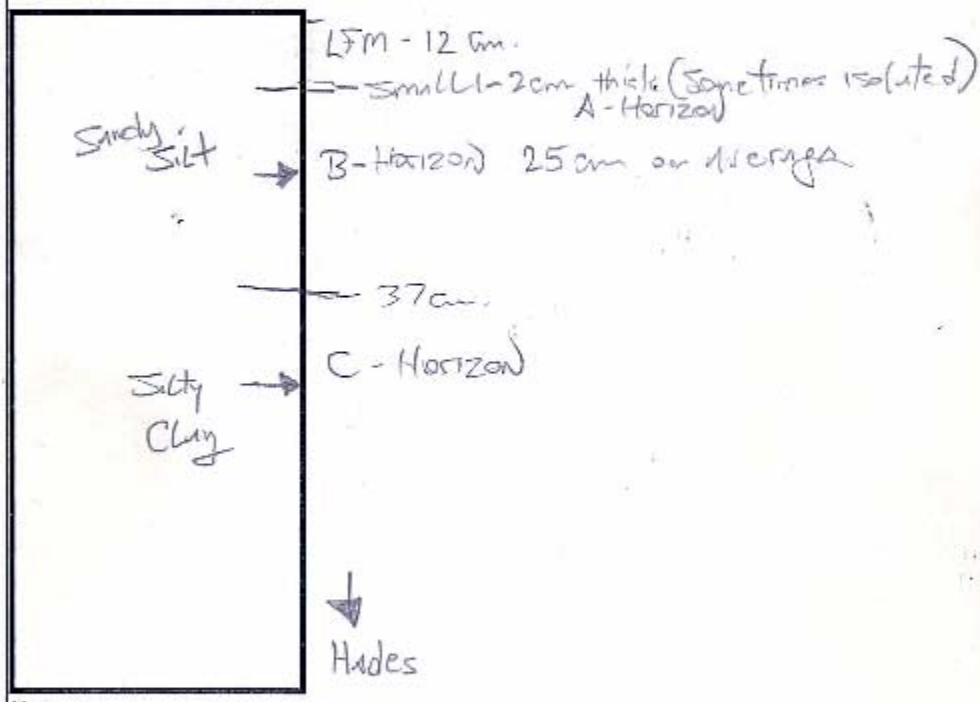
Plot # 1507 Date: Sept 11/14
Surveyors:
Weather: Time:

Mineral / Organic (circle one): _____ cm V-Type 13 cm

Moisture regime (1-7): 4 cm C texture: _____ cm

S-Type: S6

Soil Profile



Notes:

SCATLIFF + MILLER + MURRAY

LIST OF VASCULAR PLANTS, LICHENS AND MOSSES - Project 7a (2013-2014)

Family and Scientific Names	Common Name	Plots[1]
VASCULAR PLANTS		
ACERACEA (Maple Family)		
Acer spicatum Lam.	**Moose Maple**	**B008**
APOCYNACEAE (Dogbane family)		
Apocynum androsaemifolium L.	Spreading Dogbane	7
ARACEAE (Arum family)		
Calla palustris **L.**	**Water Calla**	**B004**
ARALIACEAE (Ginseng Family)		
Aralia nudicaulis L.	Wild Sarsaparilla	2,3,4,8,9,14
BETULACEAE (Birch Family)		
Alnus crispa (Ait.) Pursh	Green or Mountain Alder	2,3,4,4b,6,7,14
A. incana **(L.) Moench** ***ssp. Rugosa*** **(Du Roi) Spreng**	**Speckled Alder**	**B004**
Betula papyrifera Marsh.	White Birch	2,3,4b,5,6,8,9,10,12,13,14
B. pumila L. var. glandulifera Regel	Swamp Birch	5
CAPRIFOLIACEAE (Honeysuckle Family)		
Diervilla lonicera Mill.	Bush-Honeysuckle	2,6
Linnaea borealis L.	Twinflower	2,3,4,4b,6,8,9,10
Viburnum edule (Michx.) Raf.	Low Bush Cranberry	1,2
V. opulus **L.** ***var. americana*** **(Mill.) Ait**	**High Bush Cranberry**	**B006**
COMPOSITAE (Composite Family)		
Bidens cernua **L.**	**Smooth Beggarticks**	**B007**
Petasites palmatus (Ait.)	Palmate-leaved Colt's-foot	2,4b,6,13
CORNACEAE (Dogwood Family)		
Cornus canadensis L,	Bunchberry	2,4,4b,6,9,12,13,14
C. stolonifera Michx.	Red Osier Dogwood	2,13
CYPERACEAE (Sedge Family)		
Carex disperma Dewey	Two-seeded Sedge	5,13
C. trisperma Dewey	Three-seeded Sedge	3
EQUISETACEAE (Horsetail Family)		
Equisetum pratense Ehrh.	Meadow Horsetail	13
E. scirpoides Michx.	Dwarf Scouring-rush	13
E. sylvaticum L.	Woodland Horsetail	2,3,4,4b
ERICACEAE (Heath Family)		
Arctostaphylos uva-ursi (L.) Spreng.	Common Bearberry	9
Chamaedaphne calyculata (L.) Moench.	Leatherleaf	1,5,11
Gaultheria hispidula (L.) Muhl.	Creeping Snowberry	8,9,13
Kalmia polifolia Wang.	Bog Laurel	5
Ledum groenlandicum Oeder	Labrador Tea	1,4,4b,5,6,9,10,11,13
FUMARIACEAE (Fumitory Family)		
Corydalis sempervirens (L.) Pers.	Pink Corydalis	1
GENTIANACEAE (Gentian Family)		
Menyanthes trifoliata **L.**	**Buck-bean**	**B004**

Plant List cont'd		
GRAMINEAE (Grass Family)		
***Calamagrostis canadensis* (Michx.) Beauv.**	**Bluejoint**	**B004**
***Cinna latifolia* (Trev.) Griseb.**	**Drooping Wood Reed**	**B008**
Piptatherum pungens (Torr.) Romasch	Northern Rice Grass	3,4b
Phragmites communis Trin.	Common Reed Grass	3
LABIATAE (Mint Family)		
***Lycopus americanus* Muhl.**	**Water-Horehound**	**B004**
LILIACEAE (Lily Family)		
Clintonia borealis (Ait.) Raf.	Bluebead Lily	2,4,6
Maianthemum canadense Desf.	Wild Lily-of-the-valley	2,3,4,4b,5,6,7,9,11
M. trifolium (L.) Sloboda	Three-leaved Solomon's Seal	5,11
LYCOPODIACEAE (Club-moss Family)		
Diphasium complanatum (L.) Rothm.	Trailing Club-moss	3,4,4b,6,9,12
Lycopodium annotinum L.	Stiff Club-moss	4,4b,5,,8,9,12
***L. clavatum* L.**	**Running Club-moss**	**B003**
L. dendroideum L.	Ground Pine	6
MONOTROPACEAE (Indian-pipe Family)		
Monotropa uniflora L.	Indian Pipe	5,13
ONAGRACEAE (Evening-primrose Family)		
***Cicaea alpina* L.**	**Small Enchanter's Nightshade**	**B004**
Epilobium angustifolium L.	Fireweed	2,3,4b,6,9
ORCHIDACEAE (Orchid Family)		
Goodyera repens (L.) Br.	Lesser Rattlesnake-Plantain	8,13
***Platanthera obtusata* (Pursh) Richardson**	**Blunt-leaved Bog Orchid**	**B002**
PINACEAE (Pine Family)		
Abies balsamea (l.) Mill.	Balsam Fir	4b,6,8,9,12,13,14
Larix laricina (Du Roi) Koch	Larch/Tamarack	5,11,13
***Picea glauca* (Moench) Voss**	**White Spruce**	**B005, B007**
Picea mariana (Mill.) BSP.	Black Spruce	All except plot 3
Pinus banksiana Lamb.	Jack Pine	1,2,3,4,4b,6,7,8,9,10,14
POLYPODIACEAE (Fern Family)		
Cystopteris fragilis (L.) Bernh.	Fragile fern	4
Dryopteris carthusiana (Villosa) H.P. Fuchs	Fragrant Fern	4b
Polypodium virginianum L.	Rock Polypody	9
PRIMULACEAE (Primrose Family)		
Trientalis borealis Raf.	Northern Starflower	2,4,4b,6
PYROLACEAE (Wintergreen Family)		
Chimaphila umbellata (L.) Barton	Prince's Pine	3,4,9,13
***Moneses uniflora* (L.) Gray**	**One-flowered Wintergreen**	**B002, B004**
Pyrola asarifolia Michx.	Pink Wintergreen	2,14
P. elliptica Nutt.	White Wintergreen	4b,6
P. secunda L.	One-sided Wintergreen	3,9,13
P. virens Schweigger	Greenish-flowered Wintergreen	4,13

Plant List cont'd		
RANUNCULACEAE (Crowfoot Family)		
***Caltha palustris* L.**	**Marsh-marigold**	**B004**
***Ranunculus lapponicus* L.**	**Lapland Buttercup**	**B004**
ROSACEAE (Rose Family)		
Amelanchier alnifolia Nutt.	Saskatoon	2,4b
Fragaria virginiana Dcne.	Smooth Wild Strawberry	2,3,4b
***Potentilla palustris* (L.) Scop.**	**Marsh Cinquefoil**	**B004**
Prunus pensylvanica L.f.	Pincherry	3,4
Rosa acicularis Lindl.	Prickly Rose	13
R. woodsia Lindl.	Wood's Rose	13
Rubus chamaemorus L.	Cloudberry	5,11
R. idaeus (Michx.) Maxim.	Wild Red Raspberry	2,3,6
R. pubescens Raf.	Dewberry	2,3,4,4b,13,14
Sibbaldiopsis tridentata (Ait.) Rydb.	Three-toothed cinquefoil	3,7
Sorbus decora (Sarg.) C.K.	Mountain Ash	4
Spiraea alba Du Roi	Meadowsweet	2,11
RUBIACEAE (Madder Family)		
Galium triflorum Michx.	Sweet-scented Bedstraw	2
SALICACEAE (Willow Family)		
Populus balsamifera L.	Balsam Poplar	13
P. tremuloides Michx.	Trembling Aspen	2,3,4,4b,6,8,9,12,13,14
Salix bebbiana Sarg.	Bebb's Willow	3,4b
S. discolor Muhl.	Pussy Willow	4b,7
SAXIFRAGACEAE (Saxifrage Family)		
Mitell nuda L.	Bishop's Cap	13
***Ribes glandulosum* Grauer**	**Skunk Currant**	**B004**
R. oxyacanthoides L.	Northern Gooseberry	2
***R. triste* Pall.**	**Wild Red Currant**	**B008**
VACCINIACEAE (Huckleberry Family)		
***Lysimachia thrysiflora* L.**	**Tufted Loosestrife**	**B004**
Vaccinium myrtilloides Michx.	Blueberry	All except plots 5 and 11
V. oxycoccus L.	Small Bog Cranberry	5,11
V. vitis-idaea L.	Bog Cranberry	9,11
VIOLACEAE (Violet Family)		
Viola canadensis L.	Canada Violet	2
***V. renifolia* Gray**	**Kidney-leaved Violet**	**B008**

LICHENS		
CLADONIACEAE (Lichen Family)		
Cladina mitis (Sandst.) Hustich	Green Reindeer Lichen	1,7,9
C. rangiferina (L.) Nyl.	Grey Reindeer Lichen	1,3,7
C. stellaris (Opiz) Brodo	Northern Reindeer Lichen	1,3,7
Cladonia borealis S. Stenroos	Red Pixie-Cup "British Soldier"	1,3,4,5
PELTIGERACEAE (Lichen-Fungi Family)		
***Peltigera aphthosa* (L.) Willd.**	**Freckle pelt**	**B005**

MOSSES		
HYLOCOMIACEAE		
Hylocomium splendens (Hedw.) Schimp.	Stair-step Moss	1,2,3,6,8,10,11,12,13,14
Pleurozium schreberi (Brid.) Mitt.	Schreber's Moss	All except plot 5
Polytrichum sp.	**Hair-Cap Moss**	**B001**
HYPNACEAE		
Ptilium crista-castrensis (Hedw.) De Not.	Knight's Plume	1,4,4b,6,8,10,11,12,13

[1] Plots where species occurred

APPENDIX V

LIST OF PLANT SPECIES, RANK STATUS AND DISTRIBUTION AMONG FOREST COVER SUBTYPES – REVISED ROUTE (2014)

SCATLIFF + MILLER + MURRAY

List of Additional Plant Species, Rank Status and Distribution among Forest Cover Subtypes - Project 7a (Revised Route)

Species		Status Rank	B001	B002	B003	B004	B005	B006	B007	B008
Acer spicatum	Mountain Maple	S5	O	O	O	O	O	O	O	●
Alnus incana	Speckled Alder	S5	O	O	O	●	O	O	O	O
Bidens cernua	Smooth beggarticks	S5	O	O	O	O	O	O	●	O
Calamagrostis canadensis	Bluejoint	S5	O	O	O	●	O	O	O	O
Calla palustris	Water Calla	S5	O	O	O	●	O	O	O	O
Caltha palustris	Marsh Marigold	S5	O	O	O	●	O	O	O	O
Cinna latifolia	Drooping Wood Reed	S5	O	O	O	O	O	O	O	●
Circaea alpina	Small Enchanter's Nightshade	S5	O	O	O	●	O	O	O	O
Lycopodium clavatum	Running Club-moss	S3	O	O	●	O	O	O	O	O
Lycopus americanus	Water Hore-hound	S5	O	O	O	●	O	O	O	O
Lysimachia thyrsiflora	Tufted Loosestrife	S5	O	O	O	●	O	O	O	●
Menyanthes trifoliata	Buckbean	S5	O	O	O	●	O	O	O	O
Moneses uniflora	One-flowered Wintergreen	S5	O	●	O	●	O	O	O	O
Peltigera aphthosa	Freckle Pelt	no data	O	O	O	O	●	O	O	O
Picea glauca	White Spruce	S5	O	O	O	O	●	O	●	O
Platanthera obtusata	Blunt-leaved Bog Orchid	S5	O	●	O	O	O	O	O	O
Polytrichum sp.	Hair-cap Moss	no data	●	O	O	O	O	O	O	O
Potentilla palustris	Marsh Cinquefoil	S5	O	O	O	●	O	O	O	O
Ranunuculus lapponicus	Lapland Buttercup	S5	O	O	O	●	O	O	O	O
Ribes glandulosum	Skunk Currant	S5	O	O	O	●	O	O	O	O
R. triste	Wild Red Currant	S5	O	O	O	O	O	O	O	●
Viburnum opulus	High-bush Cranberry	S5	O	O	O	O	O	●	O	O
Viola renifolia	Kidney-leaved Violet	S5	O	O	O	O	O	O	O	●

APPENDIX VI
PHOTOS OF FOREST VEGETATION PLOTS – REVISED ROUTE (2014)

Image 1. Photo of Plot B005 in Forest Cover Subtype 11. (September 10, 2014).

Image 2. Photo of Plot B006 in Forest Cover Subtype 15. (September 10, 2014)

Image 3. Photo of B007 in Forest Cover Subtype 51. (September 11, 2014)