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by

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SUMMARY

This report presents the first approximation of vegetation classification of trembling aspen ecosystems in interior British Columbia. The classification is based on a total of 186 plots sampled during the summers of 1995, 1997 and 1998. We used multivariate and tabular methods to synthesize and classify ecosystems according to the Braun-Blanquet approach and the methods of biogeoclimatic ecosystem classification. The aspen ecosystems were classified into 15 basic vegetation units (associations or subassociations) that were grouped into four alliances. Communities of the Populus tremuloides – Mertensia paniculata, and Populus tremuloides – Elymus innovatus alliances were aligned with the boreal Picea glauca & mariana order and were distributed predominantly in the Boreal White and Black Spruce zone; communities of the Populus tremuloides – Thalictrum occidentale alliance were also aligned with the same order, but were distributed predominantly in the Sub-Boreal Spruce zone; communities of the Populus tremuloides – Symphoricarpos albus alliance were aligned with the wetter cool temperate Tsuga heterophylla order and the drier cool temperate Pseudotsuga menziesii order and were distributed in the Sub-boreal Spruce, Interior Western Hemlock, Montane Spruce, and Interior Douglas-fir zones. We describe the vegetation and environmental features of these units and present vegetation and environmental tables for individual plots and units.

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INTRODUCTION

Trembling aspen (*Populus tremuloides* Michx.) is one of the most common tree species in the second-growth forests of the boreal and temperate zones of North America (Little 1979). It occurs across all of non-arctic Alaska, Canada and the northern USA and reaches south to the west coast of Mexico. In British Columbia (BC), aspen grows in all forested biogeoclimatic zones, except the Mountain Hemlock (MH) zone. It is common in the Boreal White and Black Spruce (BWBS), Sub-Boreal Spruce (SBS), Sub-Boreal Pine – Spruce (SBPS), Montane Spruce (MS), Interior Douglas-fir (IDF), and Interior Cedar - Hemlock (ICH) zones. Its occurrence is marginal in the Costal Douglas-fir (CDF), Coastal Western Hemlock (CWH), Spruce – Willow – Birch (SWB), Engelmann Spruce – Subalpine Fir (ESSF), and Ponderosa Pine (PP) zones.

Aspen has become an important timber crop species in the province, yet the full ecological value of aspen in the boreal forest is not yet fully understood. The classic successional sequence of a boreal forest begins with the removal or disturbance of a coniferous stand by wildfire and the establishment of a broad-leaved stand. Over time the boreal conifers, such as white (*Picea glauca* (Moench) Voss) and black spruce (*Picea mariana* (Mill.) B.S.P) re-establish and remain until the next stand-disturbing event. The increasing presence of seral aspen stands across the landscape and the increasing demand for timber has motivated forest managers to search for ways to utilize the aspen timber resource as well as to establish and grow coniferous trees in association with the aspen. An improved knowledge of aspen ecology and ecosystems, and stand productivity and dynamics is needed in this pursuit, which presupposes classification of aspen ecosystems.

There have been only a few ecological studies carried out in aspen ecosystems in BC. These studies included local classification of aspen ecosystems (*e.g.*, DeLong 1988), aspen site index modelling and prediction from environmental factors (Chen *et al.* 1998a, 1998b), relationships between aspen site index and soil properties (Chen *et al.* 1998b), and humus form characterization (Fons *et al.* 1998). While this information has added to our knowledge base, many of these studies have been carried out on a local level. In order to integrate this information and provide a complimentary tool for further studies of aspen ecosystems in BC and their comparison with others across North America, we have developed a regional vegetation classification. The classification, which follows the biogeoclimatic ecosystem classification system, is based on samples of aspen-dominated stands across the BWBS, SBS, SBPS, IDF, MS and ICH zones of BC. Our aim was to organize aspen communities into groups that show the greatest number of vegetation and vegetation-environment relationships, are easily retained in memory and are easily conveyed through instruction. However, we do not claim that we have accounted for all of the many different aspen communities; thus the classification presented is but the first approximation.

Other aspects of aspen growth and boreal ecology, such as height/age and site index models, the integration of these productivity relationships into the ecosystem classification, a characterization of understory plant diversity, humus forms, and soil nutrient conditions of aspen ecosystems, and a comparison of the above features between aspen and black spruce ecosystems are discussed in the following reports prepared for publication: Trembling aspen site index in relation to environmental measures of site quality at two spatial scales (Chen *et al.*), Height growth models for trembling aspen in BC (Nigh *et al.*), Comparison of forest floor and mineral soil properties between black spruce and trembling aspen stands in the BWBS zone of BC (Kayahara

et al.), and Plant diversity of mid-seral black spruce and trembling aspen stands in the BWBS and SBS zones (Qian *et al.).*

In this report we present the vegetation classification, which includes, from the lowest to the highest hierarchical level: 13 subassociations, 6 associations, and 4 alliances. We present the summary and diagnostic tables and indicator plant analysis used to show floristic affinities among the units, and to interpret their relationships to climatic and edaphic gradients. The vegetation and environmental data for individual plots are also included in the appendices.

This report is available in full colour or B&W printed versions or in electronic format on Scientia Silvica CD-ROM. For further information or to order a copy visit www.forestry.ubc.ca/klinka or contact Karel Klinka, Forest Sciences Department, University of British Columbia, 3036-2424 Main Mall, Vancouver BC V6T 1Z4 (e-mail: klinka@interchange.ubc.ca).

METHODS

Study Area

The study area encompassed nearly the entire interior area of the province where aspen stands form a significant landscape component (Table 1, Figure 1). The area included (in order from north to south) the BWBS, SBS, SBPS, ICH, IDF, and MS biogeoclimatic zones (Meidinger and Pojar 1991).

The BWBS, SBPS, and SBS zones are part of the Canadian Boreal Forest Region (Krajina 1969). The BWBS zone is influenced by a continental, montane boreal climate and subject to frequent outbreaks of arctic masses, while the climate influencing the SBS and SBPS zones is milder. Forest fires are frequent in all these zones, maintaining a large portion of the landscape in early and mid-seral stages. White spruce, hybrid spruce (*Picea engelmannii x glauca*), black spruce, subalpine fir (*Abies lasiocarpa* (Hook.) Nutt.), lodgepole pine (*Pinus contorta* var. *latifolia* Dougl. ex Loud), trembling aspen, balsam poplar (*Populus balsamifera* L.) and black cottonwood (*P. trichocarpa* Torr. & Gray), paper birch (*Betula papyrifera* Marsh.) and Alaska paper birch (*Betula neoalaskana* Sarg.) are the major tree species. In upland ecosystems, aspen typically forms pure stands of various sizes ranging form small cohorts to large-area stands.

The IDF, ICH, and MS zones are part of the Cordilleran Montane Forests Region (Krajina 1969) and are influenced by a cool continental temperate climate (with the MS zone grading into a continental subalpine boreal climate). These temperate zones are much warmer than the BWBS, SBS and SBPS zones but have about the same annual precipitation (Table 1). Aspen stands are not as extensive as in the boreal zones. Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco), western redcedar (*Thuja plicata* (Donn ex D.Don) Spach), western hemlock (*Tsuga heterophylla* (Raf.) Sarg.), western larch (*Larix occidentalis* Nutt.), lodgepole pine, subalpine fir, and hybrid white spruce are the major tree species in these temperate zones.

The soils typically associated with aspen communities in the province are Brunisols, Luvisols, and Podzols (rarely Gleysols, Regosols, or Organic soils), developed from a variety of parent materials. Regardless of site characteristics, the associated humus forms are Mormoders, Moders (frequently laminated), Hemimors, Mullmoders and Mulls (Fons *et al.* 1998). More detailed information about the vegetation and environment of the zones studied is given in Krajina (1969) and Meidinger and Pojar (1991).

Table 1. General spatial, climatic, and growth characteristics of the trembling aspen study plots stratified by biogeoclimatic zones.

Biogeoclimatic zone	Number of plots		Elevation (m)	Latitude (°N)	Longitude (°W)	Mean annual precipitation (mm)	Mean annual temperature (°C)	Site index (m) (standard deviation)
	All plots	Site index plots						
Boreal White and Black Spruce (BWBS)	88	59	525-980	55°42'-59°35'	120°26'-133°10'	446 [46][1]	0.6 [84][2]	13.7 (4.64)
Sub-boreal Spruce (SBS)	25	20	790-1025	52°08'-54°35'	121°21'-124°32'	645 [78]	2.1 [129]	16.7 (3.13)
Sub-boreal Pine - Spruce (SBPS)	7	6	870-1040	52°34'-52°35'	123°01'-123°20'	479 [14]	2.4 [11]	18.7 (3.45)
Interior Douglas Fir (IDF)	23	20	960-1285	49°22'-52°11'	119°05'-123°31'	442 [90]	5.1 [73]	16.3 (5.25)
Montane Spruce (MS)	19	17	980-1285	49°01'-49°31'	115°30'-119°35'	598 [13]	3.1 [12]	22.8 (4.96)
Interior Cedar-Hemlock (ICH)	24	19	380-1025	49°02'-55°28'	116°11'-128°31'	795 [60]	5.5 [60]	21.7 (4.81)
Total or total range	186	141	380-1285	49°01'-59°35'	'115°30'-133°10'	276 (IDF) to 1916 (SBS)	-3.2 (SBS) to 9.7 (IDF)	5.5 - 30.7

1. Number of climatic stations with precipitation records
2. Number of climatic stations with temperature records

Figure 1. Map showing the native range of trembling aspen in British Columbia and the location of plots sampled in 1997 and 1998; the plots sampled by Kabzems in northeastern BC in 1995 are not shown on this map.

Sampling

Sampling in the northeastern portion of the BWBS zone was carried out in 1995 by R. Kabzems, Fort St. John Forest District. We continued the sampling in other areas in 1997 and 1998. The candidate stands were located close to access roads branching off from the Cassiar and Alaska Highways, around Tumbler Ridge, and north of Fort St. James, and from highways in southern BC (Figure 1). During the summer of 1997 we (i) carried out a reconnaissance, (ii) located candidate stands for sampling, and (iii) described 50 plots; during the summer of 1998 we completed description and sampling of selected stands. The complete data set includes vegetation and environment information obtained from 186 plots. These study plots were deliberately located over the widest possible range in climate (latitude, longitude, elevation), topography (aspect, slope gradient), soil moisture and soil nutrient conditions throughout six biogeoclimatic zones: BWBS, SBS, SBPS, IDF, ICH, and MS (Table 1).

The study plots, 20 by 20 m squares (0.04 ha), were selected in naturally established, unmanaged, fully stocked, even-aged (immature, early mature, and mature >50 but <150 years at breast height) stands without a history of suppression. The developmental stage of the selected stands ranged from stem exclusion to understory reinitiation (Oliver and Larson 1996). Each stand had a uniform canopy layer formed by trembling aspen and uniform understory vegetation, with the floristic composition varying from site to site. Biogeoclimatic subzone was identified using maps obtained from the regional offices of the BC Ministry of Forests. Latitude and longitude were determined from topographic maps, elevation was measured with a Thommen pocket altimeter, and aspect was measured with a pocket compass. Site, vegetation, and soil of each plot were described according to Luttmerding *et al.* (1990).

All plant species present within the plot were identified and their cover percentage was estimated. These cover values were converted to classes (+ to 9) of the Domin-Krajina scale of species significance. The plant nomenclature followed Qian and Klinka (1998). Unknown plants were collected and identified in the laboratory.

A soil pit was dug at each plot and soils were described and identified according to the Canadian Soil Classification System (Agriculture Canada Expert Committeee on Soil Survey 1987). Humus samples were taken from each plot for a visual analysis and identification in the laboratory using the humus form classification of Green *et al.* (1993). The type of ground cover (forest floor, decaying wood, mineral soil, coarse fragments, and open water) was recorded. A more complete description of the field methods is given in Brooke *et al.* (1970) and Luttmerding *et al.* (1990).

Soil moisture and nutrient regimes were estimated in the field by a systematically guided evaluation of a selected number of topographic (slope, aspect, gradient, and position) and soil morphological properties (humus form, rooting depth, soil texture, coarse fragment content, soil aeration, soil mineralogy, and the presence and depth of the growing-season water table). This procedure is based on interpreting relationships between these properties, soil water-holding capacity, and available nutrient levels in the soil (Green and Klinka 1994). Field-estimates of SNRs were substantiated by soil nutrient analysis (Kayahara *et al.* 2000), while SMRs were only field-estimated and not directly measured. Using the criteria proposed by Klinka *et al.* (1989), we converted relative SMRs to actual SMRs by consulting Wang *et al.* (1994) for the SBS zone, Banner *et al.* (1993) for the BWBS zone and New (1999) for the IDF, ICH, and MS zones (Table 2). For field estimates of SNR we used the following mean relative frequencies of nitrophytic species: 1% for very poor SNR, 4% for poor SNR, 9% for medium SNR, 25%

for rich SNR, and 38% for very rich SNR Wang (1992). A complete description of indicator plant analysis is given in Klinka *et al.* (1989).

Table 2. Estimated generalized relationships between relative and actual soil moisture regimes (SMRs) for the study zones. Actual SMRs are abbreviated as follows: ED - excessively dry, VD - very dry, MD - moderately dry, SD slightly dry, F - fresh, M - moist, VM - very moist, W - wet. Definitions of actual SMRs are given in Klinka *et al.* (1989).

Biogeoclimatic zone	Relative Soil Moisture Regime						
	1	2	3	4	5	6	7
Boreal White and Black Spruce	VD	MD	SD	SD	F-M	VM	W
Sub-boreal Spruce	VD	MD	SD	F	M	VM	W
Sub-boreal Pine – Spruce	VD	VD	MD	MD	SD	F-M	VM-W
Montane Spruce	VD	MD	SD	SD	F	M-VM	W
Interior Cedar – Hemlock	VD	MD	SD	F	M	VM	W
Interior Douglas-fir	ED	VD	VD	MD	SD	F-M	VM-W

Vegetation Classification

Our objective was to produce ecologically meaningful classes of ecosystems that could be identified and used as a framework for examining vegetation-environment relationships. Consistent with the methods of the biogeoclimatic ecosystem classification, the plots within each group had to represent communities that had affinities in floristic composition and physiognomy. The groups of plots were required to (1) be floristically distinct, and (2) occupy a floristically defined segment of the edaphic and local climatic gradients.

We classified the ecosystems into vegetation units at three categorical levels (subassociation, association, and alliance) using the Braun-Blanquet approach (Mueller-Dombois and Ellenberg 1974: 177-210; Westhoff and van der Maarel 1980: 287-399). This method consists of grouping the plots in a way that each group is separated from all other groups by an exclusive diagnostic combination of species. These diagnostic species must be either **differential species**, which have a much higher presence (proportion of plots of a group that it occurs in) than in other groups, or a **dominant differential species**, which have higher species significance (percent cover) than in other groups. The exact criteria are as follows (Becking 1957):

differential species: species that may be associated with more than one vegetation unit in a hierarchy; presence class $\geq$ III (occurring in $\geq$ 40% of the plots of this unit) and at least two presence classes greater than in other units of the same hierarchical level within the same higher level unit.

dominant-differential species: species that may be associated with more than one vegetation unit in a hierarchy; presence class $\geq$ III, mean species significance $\geq$ 5 ($\geq$ 10% cover) and two or more species significance classes greater than in other units of the same hierarchical level within the same higher level unit.

There is no universally accepted methodology for, nor agreement upon, the required composition of the diagnostic combination of species for a particular category (Becking 1957; Mueller-Dombois and Ellenberg 1974; Westhoff and van Maarel 1980). We used the principle of relative differentiation that allows delineation of a subassociation or association by an exclusive diagnostic combination of species. The diagnostic combination must include at least one differential species or dominant-differential species. However, a subassociation or association that represents the central concept, *i.e.* typic, of a higher circumscribing unit can be recognized without a diagnostic combination of species. A typic unit can be differentiated by the absence or low occurrence of species that characterize other subassociations or associations of the same hierarchical level within the same higher level unit (Pojar *et al.* 1987: 131-132).

The major tool used to achieve this objective was a computer-aided program, VTAB-Ecosystem Reporter, Revision 19907a (Emanuel 1999), which produces the various tables required in the analysis and synthesis of vegetation data. It arranges columns (plots or groups of plots) and rows (species) according to the criteria specified by the user for each step of the tabular analysis and synthesis.

The following four analytical steps were used to synthesize the data:

Step 1 Plots were stratified into floristically similar groups using a two-way indicator species analysis (TWINSPAN, Hill 1979). This program divides the plots into two groups, then further subdivides each of these groups in subsequent steps. When all the plots in a group are relatively uniform according to predetermined criteria, subdivision of this group stops.

Step 2 For each of the groups obtained in step 1, a tentative vegetation plot table, which shows the species significance of each species in all plots of the group (*e.g.*, Appendices 2 through 16), was produced and examined for within-group similarities and differences. A tentative differentiated summary vegetation table (*e.g.*, Table 5), showing species presence and average species significance for each group, was used to examine floristic affinities and differences between groups.

Step 3 Tentative environmental plot tables, which show selected environmental characteristics for all plots within each group (*e.g.*, Appendices 17 through 31), were used to determine whether the floristically similar plots were also similar in environmental characteristics. Floristically and environmentally aberrant plots were reassigned to the group to which they were most closely related. After reassignment, the summary vegetation tables were inspected to determine to which extent the groups of plots could be differentiated from each other in a hierarchical manner. The groups that could not be differentiated were merged.

Steps 2 and 3 were repeated iteratively in a process of successive approximation (Poore 1962), in which the production of revised vegetation and environmental tables continued until there were no more plot re-assignments and group mergers.

Step 4 A tentative hierarchy of groups was then proposed, where each group was considered to be either an association or a subassociation depending on its relationship to the hierarchy. A preliminary diagnostic table showing the diagnostic combination of species for every group was produced.

Step 4 was repeated in a process of successive approximation in which the production of tentative diagnostic tables continued until exclusive diagnostic combinations of species were obtained for each group of the hierarchy. This process typically required

changes in the structure of the hierarchy and occasionally merging of some of the groups lacking a diagnostic combination of species.

Instead of using phytosociological nomenclature (Barkman *et al.* 1976) we used the scientific names without suffixes for naming vegetation units. Plant alliances and associations were named using the generic and specific names of two dominant species from the diagnostic combination of species for that association, *e.g.*, the Populus tremuloides – Lathyrus ochroleucus plant association. Plant subassociations were named by adding a colon (:) to the association name, followed either by the term 'typic' (to represent what we believed to be the central concept of that association) or the name of one diagnostic species, *e.g.*, the Populus tremuloides – Lathyrus ochroleucus: Actaea rubra plant subassociation. All units based on the synthesis of <10 sample plots were considered tentative.

Similarity and Cluster Analysis

Using VTAB, we compared floristic similarities between pairs of vegetation units using Sørenson's index based on presence/absence of species (Equation 1, Magurran 1988), as well as on species cover (Equation 2, Qian *et al.* 1997). The presence/absence index is a simple but effective measure of the number of species shared between two vegetation units. Both indices enable the comparison of floristic similarity between vegetation units.

Equation 1. $SI = \frac{2c}{(a+b)}$, where a = the number of species in the first unit,
b = the number of species in the second unit, and
c = the number of species common to both units.

Equation 2. $SI = \frac{2C}{(A+B)}$, where A = the cover sum of all species in the first unit,
B = the cover sum of all species in the second unit, and
C = the sum of the lower of the two cover values for the species common to both units.

We carried out a cluster analysis using the average linkage method with values of the Sørenson presence/absence index as the distance measure. A dendrogram based on this cluster analysis was constructed to illustrate the relationships between the units.

Spectral Analysis

To provide a simple means for characterizing the vegetation of a group of plots complementary to tabular analysis, VTAB-assisted 'spectral analysis' was carried out (Mueller-Dombois & Ellenberg 1974:315-319). Spectral analysis was performed on indicator species groups for climate (CL), soil moisture regime (SMR), and soil nutrient regime (SNR), and on life forms (LF) (coniferous trees, broad-leaved trees, evergreen shrubs, deciduous shrubs, ferns, graminoids, herbs, mosses, liverworts, lichens, parasites and saprophytes, and dwarf woody plants) (Klinka *et al.* 1989). Spectra presenting the relative frequency of each life form (or indicator species group) were constructed for each vegetation unit. Relative frequencies were calculated using Equation 3 (Klinka *et al.* 1996). The plots were not standardized, *i.e.*, plots with a greater total vegetation cover or indicator species cover contribute relatively more to the spectrum of the vegetation unit.

Equation 3. $F_j = \frac{\sum_{i=1}^{n} C_i}{\sum_{j=1}^{m} \sum_{i=1}^{n} C_{ij}}$, where F_j = relative frequency (%) of species group j (j = 1,2,3...m) for attribute LF (m= 12), CL (m= 6), SMR (m= 6), SNR (m= 3); and

C_i = midpoint percent cover value of species i (i= 1,2,3...n).

Diversity Analysis

To compare diversity in the understory vegetation of study stands, we used the number of plant species in each sample plot as index of species diversity. Mean species diversity per plot and standard deviations of the means were calculated for each delineated vegetation unit. Analysis of variance (ANOVA) and Tukey's honestly significantly different (HSD) tests were used to detect significant differences between the means.

RESULTS AND DISCUSSION

Vegetation Classification

All 186 study plots were classified into a 3-level hierarchy of vegetation units that included 13 subassociations, 6 associations, and 4 alliances (Table 3). These units were delineated according to floristic differences (diagnostic combinations of species) that are summarized in Table 4 and Table 5; non-diagnostic species are shown in Appendix 1. The significance values of all species in each plot of each of the fifteen basic vegetation units (vegetation plot tables) are given in Appendices 2 through 16; environmental characteristics of each plot in each of the fifteen units (environmental plot tables) are given in Appendices 17 through 31. For brevity, when referring to vegetation units in the text, we avoided using 'Populus tremuloides' and the specific names without creating ambiguities; *e.g.*, Mertensia alliance instead of Populus tremuloides - Mertensia paniculata alliance.

The diagnostic table indicates that differentiation of 15 basic units was reasonably strong as each unit in the proposed hierarchy has several differential species (usually more than five), except for the Rosa - Senecio subassociation with only one differential species. The summary table provides a useful overview of distribution of the species that occur at least in one unit with the presence ≥III (41 to 60%) across a given unit.

Table 3. Synopsis of delineated vegetation units in trembling aspen ecosystems indicating levels of generalization and relationships. The row containing the names of associations are printed in bold fonts. Numerical codes indicate position of a unit in the hierarchy; the same codes are used in diagnostic and summary vegetation tables. Asterisk indicates an insufficient sampled unit (<10 plots).

Code	Plant alliance **Plant association** Plant subassociation
100	Populus tremuloides - Mertensia paniculata
110	**Populus tremuloides - Mertensia paniculata**
111	Populus tremuloides - Mertensia paniculata: Festuca altaica* (4 plots)
112	Populus tremuloides - Mertensia paniculata: Arnica cordifolia (14 plots)
113	Populus tremuloides - Mertensia paniculata: Petasites frigidus (13 plots)
200	Populus tremuloides - Elymus innovatus
210	**Populus tremuloides - Ledum groelandicum (10 plots)**
220	**Populus tremuloides - Lathyrus ochroleucus**
221	Populus tremuloides- Lathyrus ochroleucus: Hedysarum boreale (11 plots)
222	Populus tremuloides- Lathyrus ochroleucus: typic (31 plots)
223	Populus tremuloides- Lathyrus ochroleucus: Actaea rubra (10 plots)
300	Populus tremuloides - Thalictrum occidentale
310	**Populus tremuloides - Thalictrum occidentale (10 plots)**
400	Populus tremuloides - Symphoricarpos albus
410	**Populus tremuloides - Viburnum edule**
411	Populus tremuloides - Viburnum edule: Spiraea betulifolia (17 plots)
412	Populus tremuloides - Viburnum edule: Paxistima myrsinites (10 plots)
420	**Populus tremuloides - Rosa nutkana**
421	Populus tremuloides - Rosa nutkana: Aralia nudicaulis (14 plots)
422	Populus tremuloides - Rosa nutkana: Arnica cordifolia* (9 plots)
423	Populus tremuloides - Rosa nutkana: Angelica genuflexa* (9 plots)
424	Populus tremuloides - Rosa nutkana: Senecio pseudoaureus * (9 plots)
425	Populus tremuloides - Rosa nutkana: Shepherdia canadensis (15 plots)

Table 4. Diagnostic combinations of species for the vegetation units in aspen ecosystems. The diagnostic combination of species for each vegetation unit is shaded in grey. Presence values ≥III are printed in bold. An asterisk (*) indicates an insufficiently sampled unit (<10 plots).

Vegetation unit		111	112	113	210	221	222	223	300	411	412	421	422	423	424	425
Number of plots		4	14	13	10	11	31	10	10	17	10	14	9	9	9	15
Species	Diagnostic value[1]	**Species presence[2] and species significance[3]**														
100 & 110 Populus tremuloides - Mertensia paniculata alliance and association																
Cladina stellaris	(ic)	II h	I h	I h												
Cladonia ecmocyna	(ic)	II h	I h	I h												
Empetrum nigrum	(ic)	II h	I h	II 2												
Festuca altaica	(d)	**IV** 6	II +	**III** 1												
Geocaulon lividum	(d)	**IV** 3	**V** 2	**IV** 1	**IV** 3					I h	I h		I h			
Mertensia paniculata	(d)	**III** 1	**IV** 3	**IV** 2			**III** 2	**IV** 3	I h	I h			I h		I h	
Pedicularis labradorica	(ic)	**III** +	I +	II h												
Peltigera membranacea	(ic)	II h	II h	II 2							I h					
Pleurozium schreberi	(dd)	**IV** 3	**IV** 7	**IV** 6	**IV** 4	I h	I +	I h	**III** 4	**III** 4	**III** +	I h	I h			I h
Salix scouleriana	(d)	**IV** 6	II 4	**III** 4					II 4	I 3				II 2	I +	I h
Shepherdia canadensis	(d)	**V** 5	**V** 7	**IV** 3	I 1	**IV** 4	**IV** 4	I 1	I 4	II 4	II 1	I h	**III** 4	I 3	**III** 5	**IV** 6
111 Populus tremuloides - Mertensia paniculata: Festuca altaica subassociation* (4 plots)																
Arctostaphylos uva-ursi	(d)	**IV** 5	II 4	I 2	I 2	**III** 5	I h		I h						II 4	**III** 6
Festuca altaica	(dd)	**IV** 6	II +	**III** 1												
Galium boreale	(d)	**V** 3	I h	**III** 1		**IV** 4	**IV** 3	II 2	**III** +	**IV** 1	II +	II +		II h	I +	**III** +
Juniperus communis	(d)	**IV** 5	II 3	I h	I h										II 3	**III** 5
Pulsatilla patens	(d)	**III** +	I h						I h							II h
Trisetum spicatum	(d)	**III** +										I h	I h		I h	I h
Viburnum edule	(dd)	**IV** 6	**IV** 3	**III** 4		I 2	**V** 4	**V** 5	**III** 4	**IV** 6	**IV** 4	I +		II 1		
112 Populus tremuloides - Mertensia paniculata: Arnica cordifolia subassociation (14 plots)																
Arnica cordifolia	(d)		**V** 4	II 2			I 1	I +	I h	II h	II h	II 4	**IV** 4	II +	II 1	I h
Orthilia secunda	(d)	**III** +	**V** 1	**III** h		I h	**III** 1	I 2	II h	II h	**III** +	I h	II h	I h	II h	II +
Shepherdia canadensis	(dd)	**V** 5	**V** 7	**IV** 3	I 1	**IV** 4	**IV** 4	I 1	I 4	II 4	II 1	I h	**III** 4	I 3	**III** 5	**IV** 6
113 Populus tremuloides - Mertensia paniculata: Petasites frigidus subassociation (13 plots)																
Lupinus arcticus	(d)	II 2	II 1	**IV** 3											II 3	I 2
Mitella nuda	(d)			**III** +		I h		**III** 2	I h	II h	I h					
Petasites frigidus	(d)		I h	**IV** 3	**V** 4	**III** 3	**III** 3	**IV** 3	**III** 2	II +	I h	I h				
200 Populus tremuloides - Elymus innovatus alliance																
Calamagrostis canadensis	(d)	II h	I h		**III** 2	**IV** 3	**III** 3	**IV** 3	II h	II h	I h	**III** 6	II h	**IV** +	I 2	
Elymus innovatus	(d)				**III** 1	**V** 5	**IV** 4	II 1								
Salix sp.	(d)				**IV** 3	**III** 4	**V** 4	II 3								

Vegetation unit		111		112		113		210		221		222		223		300		411		412		421		422		423		424		425	
Number of plots		4		14		13		10		11		31		10		10		17		10		14		9		9		9		15	
Species	Diagnostic value[1]	**Species presence[2] and species significance[3]**																													
210 Populus tremuloides - Ledum groenlandicum association (10 plots)																															
Abies lasiocarpa	(d)	II	2	II	4	I	h	**IV**	2	I	1	I	h			I	2	II	4	I	+	I	+	II	4	I	3				
Cladina rangiferina	(d)							**IV**	4			I	t																		
Geocaulon lividum	(d)	**IV**	3	**V**	2	**IV**	1	**IV**	3									I	h	I	h			I	h						
Ledum groenlandicum	(d)			I	1	II	3	**V**	7	II	4	II	4																		
Lycopodium clavatum	(d)							**III**	3			I	1																		
Lycopodium complanatum	(d)			I	h			**IV**	5			I	+							I	h										
Melampyrum lineare	(d)							**IV**	2	I	h									I	h									I	h
Peltigera aphthosa	(d)	II	h	II	2	II	1	**IV**	4			I	t	I	h			I	h	I	h	I	h					I	h	I	h
Picea mariana	(d)			**III**	4	**IV**	5	**III**	4	I	2	I	2			I	2														
Pinus contorta	(d)	II	h	I	4	II	5	**III**	3	I	h	I	2	I	2	I	2	I	2	I	4	**III**	5	II	4	II	5	**IV**	5	**IV**	6
Pleurozium schreberi	(d)	**IV**	3	**IV**	7	**IV**	6	**IV**	4	I	h	I	+	I	h	**III**	4	**III**	4	**III**	+	I	h	I	h					I	h
Polytrichum juniperinum	(d)							**V**	3															I	h					I	h
Spiraea betulifolia	(d)			I	+			**V**	3	II	2	II	2	II	+	I	3	**IV**	4	I	+	II	1	**IV**	1	**III**	3	**III**	1	I	h
Stereocaulon tomentosum	(d)	II	+					**III**	2																						
Vaccinium vitis-idaea	(d)	II	3	I	h	**III**	3	**V**	5	**III**	3	II	3																		
220 Populus tremuloides - Lathyrus ochroleucus association																															
Amelanchier alnifolia	(d)	II	1	I	h	I	h			**III**	4	II	+	**III**	2	I	h	**IV**	4	**III**	+	**III**	2	II	+	**V**	6	**IV**	2	II	h
Aster conspicuus	(d)			I	+	I	3			**IV**	5	**IV**	4	**III**	4	**III**	3	**III**	4	I	h	I	h	I	1	**V**	3	**III**	3	II	3
Fragaria virginiana	(d)	**IV**	+	**III**	2	**III**	2			**IV**	2	**IV**	2	**III**	1	**III**	1	**III**	+	I	h	II	+	II	h	II	1	**IV**	+	**III**	+
Galium boreale	(d)	**V**	3	I	h	**III**	1			**IV**	4	**IV**	3	II	2	**III**	+	**IV**	1	II	+	II	+			II	h	I	+	**III**	+
Lathyrus ochroleucus	(d)					I	+	II	2	**V**	4	**V**	3	**III**	3			**III**	2	**III**	2							I	+	II	h
Pyrola asarifolia	(d)					I	h			II	1	**V**	4	**IV**	4	I	2	II	h	**III**	+	II	+			II	h				
Rosa acicularis	(d)	**V**	4	**V**	4	**V**	3	I	2	**V**	4	**V**	5	**V**	4	**IV**	5	**V**	5	**IV**	4	II	3	II	h			I	h	II	+
221 Populus tremuloides - Lathyrus ochroleucus: Hedysarum boreale subassociation (11 plots)																															
Achillea millefolium	(d)	**III**	+	**III**	+	**III**	+			**IV**	1	I	h	I	h	**III**	+	**III**	h			I	h	II	h	I	h	**III**	+	**III**	2
Arctostaphylos uva-ursi	(d)	**IV**	5	II	4	I	2	I	2	**III**	5	I	h			I	h											II	4	**III**	6
Hedysarum boreale	(d)									**IV**	4																				
Oryzopsis asperifolia	(d)			I	+	I	h			**III**	4	I	+			I	h	II	h											I	3
Vaccinium myrtilloides	(d)							**V**	7	**IV**	4	I	4																		
222 Populus tremuloides - Lathyrus ochroleucus: typic subassociation (31 plots)																															
Cornus canadensis	(dd)			**IV**	5	**IV**	6	**V**	5	II	5	**V**	6	**IV**	4	**III**	2	**III**	3	**IV**	3	**IV**	5	II	5			**III**	4		
Hylocomium splendens	(d)	II	h	**V**	7	**IV**	7	I	h	I	3	**IV**	3	I	h	**III**	4	I	+	II	+	I	+							I	h
Orthilia secunda	(d)	**III**	+	**V**	1	**III**	h			I	h	**III**	1	I	2	II	h	II	h	**III**	+	I	h	II	h	I	h	II	h	II	+
Rubus pubescens	(d)					I	+			II	2	**V**	4	**III**	3	**III**	2	**IV**	3	**III**	1	I	+								
Salix sp.	(d)							**IV**	3	**III**	4	**V**	4	II	3																

Vegetation unit		111	112	113	210	221	222	223	300	411	412	421	422	423	424	425
Number of plots		4	14	13	10	11	31	10	10	17	10	14	9	9	9	15
Species	Diagnostic value[1]	**Species presence[2] and species significance[3]**														
223 Populus tremuloides - Lathyrus ochroleucus: Actaea rubra subassociation (10 plots)																
Actaea rubra	(d)		I h	I +			I h	**V 4**	II +	**III 2**	I h	I h	I h	**III 4**	I 2	
Aralia nudicaulis	(d)		I h	I +		I 1	II 4	**IV 5**	II 3	**IV 5**	**V 4**	**IV 5**	II 4	I +	I 3	
Cornus sericea	(d)						I +	**V 4**								
Delphinium glaucum	(d)	**IV +**	**III +**	I h				**IV 4**								
Equisetum pratense	(d)			I h	I h	I 4	II h	**IV 5**	**III +**	I h		II h		I h	II h	
Galium triflorum	(d)		I h	I h			I h	**V 4**	II h	II h	II h	**III +**	**IV +**	**IV +**	**IV +**	
Heracleum maximum	(d)						I h	**III 4**	**I 2**	I 1		I +			I +	
Lonicera involucrata	(d)		I 2	I +		I h	II 1	**IV 4**	**III 4**	**III 4**	**III 2**	I +	I h	II 5	I h	
Mitella nuda	(d)			**III +**		I h		**III 2**	I h	II h	I h					
Osmorhiza berteroi	(d)	II h	II +	I +		I h	I h	**III 2**	I h	**V 2**	**III +**	**IV 2**	**IV 1**	**V 3**	**IV +**	I h
Populus balsamifera	(d)		II 2	I 2			I 1	**III 5**	I 4		I 3	**III 5**	I 1	I 2	I 4	
Ribes oxyacanthoides	(d)						I h	**III 3**								
Viola canadensis	(d)						I h	**III 4**	II 1	I +			I h	**III 2**	II +	I h
300 & 310 Populus tremuloides - Thalictrum occidentale alliance and association (10 plots)																
400 Populus tremuloides - Symphoricarpos albus alliance																
Amelanchier alnifolia	(d)	II 1	I h	I h		**III 4**	II +	**III 2**	I h	**IV 4**	**III +**	**III 2**	II +	**V 6**	**IV 2**	II h
Elymus glaucus	(d)		I h	I h			I +		I h	**IV +**	**III +**	**IV 1**	**IV +**	**III h**	**V 1**	II h
Maianthemum racemosum	(ic)		I h	I +				I +	I h	**III 3**	**III 2**	II 3	II +	**IV 4**	**III 3**	I h
Maianthemum stellatum	(ic)							I 1	I h	**III 1**	II h	**III 3**		**IV 2**	**III +**	I h
Osmorhiza berteroi	(ic)	II h	II +	I +		I h	I h	**III 2**	I h	**V 2**	**III +**	**IV 2**	**IV 1**	**V 3**	**IV +**	I h
Paxistima myrsinites	(d)							I h		II 5	**V 7**	II 2	**III 2**	II 5	**III 4**	II 3
Symphoricarpos albus	(d)					II 2	I +	II +		**IV 4**	**III +**	**IV 3**	**III +**	**IV 6**	**IV 5**	II +
410 Populus tremuloides - Viburnum edule association																
Aralia nudicaulis	(d)		I h	I +		I 1	II 4	**IV 5**	II 3	**IV 5**	**V 4**	**IV 5**	II 4	I +	I 3	
Cornus stolonifera	(ic)			I h		I 2		I h	II 3	**IV 5**	**IV 5**	**III 4**	**III 2**	**III 3**	II 5	
Epilobium angustifolium	(ic)	**V 6**	**V 6**	**IV 3**	**IV 3**	**III 2**	**V 4**	**IV 3**	**V 6**	**III 2**	**III +**	I h	I h	I h	II +	II +
Lathyrus ochroleucus	(d)			I +	II 2	**V 4**	**V 3**	**III 3**		**III 2**	**III 2**				I +	II h
Lonicera involucrata	(d)		I 2	I +		I h	II 1	**IV 4**	**III 4**	**III 4**	**III 2**	I +	I h	II 5	I h	
Pleurozium schreberi	(d)	**IV 3**	**IV 7**	**IV 6**	**IV 4**	I h	I +	I h	**III 4**	**III 4**	**III +**	I h	I h			I h
Pyrola asarifolia	(ic)			I h		II 1	**V 4**	**IV 4**	I 2	II h	**III +**	II +		II h		
Rosa acicularis	(d)	**V 4**	**V 4**	**V 3**	I 2	**V 4**	**V 5**	**V 4**	**IV 5**	**V 5**	**IV 4**	II 3	II h		I h	II +
Rubus pubescens	(d)			I +		II 2	**V 4**	**III 3**	**III 2**	**IV 3**	**III 1**	I +				
Viburnum edule	(d)	**IV 6**	**IV 3**	**III 4**		I 2	**V 4**	**V 5**	**III 4**	**IV 6**	**IV 4**	I +		II 1		

Vegetation unit		111	112	113	210	221	222	223	300	411	412	421	422	423	424	425
Number of plots		4	14	13	10	11	31	10	10	17	10	14	9	9	9	15
Species	Diagnostic value[1]	**Species presence[2] and species significance[3]**														
411 Populus tremuloides - Viburnum edule: Spiraea betulifolia subassociation (17 plots)																
Achillea millefolium	(d)	III +	III +	III +		IV 1	I h	I h	III +	III h		I h	II h	I h	III +	III 2
Actaea rubra	(d)		I h	I +			I h	V 4	II +	III 2	I h	I h	I h	III 4	I 2	
Aster ciliolatus	(d)			I h	I h	II +	I +	I h	I h	III 1	I h		II +	II h	III +	II h
Aster conspicuus	(d)		I +	I 3		IV 5	IV 4	III 4	III 3	III 4	I h	I h	I 1	V 3	III 3	II 3
Fragaria virginiana	(d)	IV +	III 2	III 2		IV 2	IV 2	III 1	III 1	III +	I h	II +	II h	II 1	IV +	III +
Galium boreale	(d)	V 3	I h	III 1		IV 4	IV 3	II 2	III +	IV 1	II +	II +		II h	I +	III +
Osmorhiza berteroi	(ic)	II h	II +	I +		I h	I h	III 2	I h	V 2	III +	IV 2	IV 1	V 3	IV +	I h
Picea glauca	(d)	II 1	IV 6	IV 5	III 5	V 5	IV 4	III 5	IV 7	V 6	II 3	III 4	II 4	III 4	III 4	I +
Ribes lacustre	(d)		I h	I h			I h	II 2	II 3	III 2	I h	II 1		II h	I h	I h
Spiraea betulifolia	(d)		I +		V 3	II 2	II 2	II +	I 3	IV 4	I +	II 1	IV 1	III 3	III 1	I h
Thalictrum occidentale	(d)			I 3				I +	III 3	V 2	II 2	I h	II 1	V 5	III 3	I +
Viburnum edule	(dd)	IV 6	IV 3	III 4		I 2	V 4	V 5	III 4	IV 6	IV 4	I +		II 1		
412 Populus tremuloides - Viburnum edule: Paxistima myrsinites subassociation (10 plots)																
Betula papyrifera	(d)			I h	I h		II 1	I 2	I +	I 2	III 6	III 5	IV 6		I h	
Corylus cornuta	(d)									I 4	III 6					
Paxistima myrsinites	(d)							I h		II 5	V 7	II 2	III 2	II 5	III 4	II 3
Rhytidiadelphus triquetrus	(d)		I 4	I +					I h	II 2	IV 3	I 3				
Thuja plicata	(d)										III 5	II 6	II 2		II 2	
Tsuga heterophylla	(d)										III 3	I +	II 5			
420 Populus tremuloides - Rosa nutkana association																
Acer glabrum	(ic)										II 4	III 5	III 5	II 3	II 4	I h
Alnus incana	(ic)			I h				I 1	I 3	II 4		III 5	II 3	II 5	III 5	I 3
Festuca subuliflora	(ic)			I h				I h	I h	I h		IV 2	III h	II h	III +	II h
Galium triflorum	(ic)		I h	I h			I h	V 4	II h	II h	II h	III +	IV +	IV +	IV +	
Hieracium scouleri	(ic)											I h	II h	I h	II h	II h
Lonicera utahensis	(ic)									I h		II 4	I h	II 4	II 4	I h
Mahonia aquifolium	(d)									I 3	I h	II h	III 2	IV 3	IV 4	II 2
Pinus contorta	(ic)	II h	I 4	II 5	III 3	I h	I 2	I 2	I 2	I 2	I 4	III 5	II 4	II 5	IV 5	IV 6
Pseudotsuga menziesii	(ic)		I 3					I 2		II 4	I 3	I +	IV 6	III 5	IV 5	II 5
Rosa nutkana	(d)										I h	III +	III +	IV 4	IV 4	III 2
421 Populus tremuloides - Rosa nutkana: Aralia nudicaulis subassociation (14 plots)																
Aralia nudicaulis	(d)		I h	I +		I 1	II 4	IV 5	II 3	IV 5	V 4	IV 5	II 4	I +	I 3	
Calamagrostis canadensis	(dd)	II h	I h		III 2	IV 3	III 3	IV 3	II h	II h	I h	III 6	II h	IV +	I 2	
Populus balsamifera	(d)		II 2	I 2			I 1	III 5	I 4		I 3	III 5	I 1	I 2	I 4	
Tiarella trifoliata	(d)											III +				
422 Populus tremuloides - Rosa nutkana: Arnica cordifolia subassociation* (9 plots)																
Arnica cordifolia	(d)		V 4	II 2			I 1	I +	I h	II h	II h	II 4	IV 4	II +	II 1	I h
Chimaphila umbellata	(ic)										I +	I +	III 2	II h	I h	I 1
Pinus monticola	(dd)										I 2	II 3	III 5		I h	
Vaccinium caespitosum	(dd)		I +	I 3	I 1		I h					II h	III 6		I 1	

Vegetation unit		111	112	113	210	221	222	223	300	411	412	421	422	423	424	425
Number of plots		4	14	13	10	11	31	10	10	17	10	14	9	9	9	15
Species	Diagnostic value[1]	**Species presence[2] and species significance[3]**														
423 Populus tremuloides - Rosa nutkana: Angelica genuflexa subassociation* (9 plots)																
Actaea rubra	(d)		I h	I +			I h	**V** 4	II +	**III** 2	I h	I h	I h	**III** 4	I 2	
Amelanchier alnifolia	(dd)	II 1	I h	I h		**III** 4	II +	**III** 2	I h	**IV** 4	**III** +	**III** 2	II +	**V** 6	**IV** 2	II h
Angelica genuflexa	(d)									I h			I h	**IV** 4	I h	
Aster conspicuus	(d)		I +	I 3		**IV** 5	**IV** 4	**III** 4	**III** 3	**III** 4	I h	I h	I 1	**V** 3	**III** 3	II 3
Disporum hookeri	(d)								I h	**III** 4	II 2	I 2	II 1	**IV** 5	II h	I h
Lilium columbianum	(d)									I h			II h	**V** +	II h	I h
Thalictrum occidentale	(d)			I 3				I +	**III** 3	**V** 2	II 2	I h	II 1	**V** 5	**III** 3	I +
424 Populus tremuloides - Rosa nutkana: Senecio pseudoaureus subassociation* (9 plots)																
Senecio pseudaureus	(d)								I h			II +	I h	II h	**IV** 1	I h
425 Populus tremuloides - Rosa nutkana: Shepherdia canadensis subassociation (15 plots)																
Arctostaphylos uva-ursi	(dd)	**IV** 5	II 4	I 2	I 2	**III** 5	I h		I h						II 4	**III** 6
Galium boreale	(ic)	**V** 3	I h	**III** 1		**IV** 4	**IV** 3	II 2	**III** +	**IV** 1	II +	II +		II h	I +	**III** +
Juniperus communis	(ic)	**IV** 5	II 3	I h	I h										II 3	**III** 5

1 Species diagnostic values: d = differential, dd = dominant differential, ic = important companion (Pojar *et al.* 1987).

2 Species presence classes (the percentage of plots in which the species occurs): I = 1-20%, II = 21-40%, III = 41-60%, IV = 61-80%, V = 81-100%.

3 Species significance classes and the corresponding mid-point and range (in parentheses) of cover: t = 0.005 (0.001-0.009), h = 005 (0.01 - 0.099), + = 0.2 (0.1-0.299), 1 = 0.4 (0.3-0.499), 2 = 0.75 (0.5-0.999), 3 = 1.5 (1-1.999), 4 = 3.5 (2-4.999), 5 = 7.5 (5-9.999), 6 = 15 (10-19.999),7 = 35 (20-49.999), 8 = 60 (50-69.999), 9 = 85 (70-100).

Table 5. Differentiated (in descending order of presence from left to right) summary table of the vegetation units in aspen ecosystems. This table contains only plant species present in ≥ 41% of the plots in at least one vegetation unit (presence class ≥**III**). As most of these species were diagnostic (differential, dominant-differential, and important companion species, Table 6) for a vegetation unit, only non-diagnostic species are shaded in grey. Presence values >**III** are printed in bold.

Vegetation unit	**111**		**112**		**113**		**210**		**221**		**222**		**223**		**300**		**411**		**412**		**421**		**422**		**423**		**424**		**425**	
Number of plots	4		14		13		10		11		31		10		10		17		10		14		9		9		9		15	
Species	**Species presence and species significance**[1]																													
Pulsatilla patens	**III**	+	I	h											I	h													II	h
Pedicularis labradorica	**III**	+	I	+	II	h																								
Trisetum spicatum	**III**	+																			I	h	I	h			I	h	I	h
Festuca altaica	**IV**	6	II	+	**III**	1																								
Juniperus communis	**IV**	5	II	3	I	h	I	h																			II	3	**III**	5
Salix scouleriana	**IV**	6	II	4	**III**	4									II	4	I	3							II	2	I	+	I	h
Arctostaphylos uva-ursi	**IV**	5	II	4	I	2	I	2	**III**	5	I	h			I	h											II	4	**III**	6
Delphinium glaucum	**IV**	+	**III**	+	I	h							**IV**	4																
Geocaulon lividum	**IV**	3	**V**	2	**IV**	1	**IV**	3									I	h	I	h			I	h						
Mertensia paniculata	**III**	1	**IV**	3	**IV**	2					**III**	2	**IV**	3	I	h	I	h					I	h			I	h		
Orthilia secunda	**III**	+	**V**	1	**III**	h			I	h	**III**	1	I	2	II	h	II	h	**III**	+	I	h	II	h	I	h	II	h	II	+
Galium boreale	**V**	3	I	h	**III**	1			**IV**	4	**IV**	3	II	2	**III**	+	**IV**	1	II	+	II	+			II	h	I	+	**III**	+
Pleurozium schreberi	**IV**	3	**IV**	7	**IV**	6	**IV**	4	I	h	I	+	I	h	**III**	4	**III**	4	**III**	+	I	h	I	h					I	h
Achillea millefolium	**III**	+	**III**	+	**III**	+			**IV**	1	I	h	I	h	**III**	+	**III**	h			I	h	II	h	I	h	**III**	+	**III**	2
Shepherdia canadensis	**V**	5	**V**	7	**IV**	3	I	1	**IV**	4	**IV**	4	I	1	I	4	II	4	II	1	I	h	**III**	4	I	3	**III**	5	**IV**	6
Viburnum edule	**IV**	6	**IV**	3	**III**	4			I	2	**V**	4	**V**	5	**III**	4	**IV**	6	**IV**	4	I	+			II	1				
Rosa acicularis	**V**	4	**V**	4	**V**	3	I	2	**V**	4	**V**	5	**V**	4	**IV**	5	**V**	5	**IV**	4	II	3	II	h			I	h	II	+
Epilobium angustifolium	**V**	6	**V**	6	**IV**	3	**IV**	3	**III**	2	**V**	4	**IV**	3	**V**	6	**III**	2	**III**	+	I	h	I	h	I	h	II	+	II	+
Fragaria virginiana	**IV**	+	**III**	2	**III**	2			**IV**	2	**IV**	2	**III**	1	**III**	1	**III**	+	I	h	II	+	II	h	II	1	**IV**	+	**III**	+
Linnaea borealis	**IV**	4	**V**	5	**V**	5	**V**	3	**V**	3	**V**	4	**III**	3	**III**	3	**IV**	+	**III**	4	II	+	**III**	4			II	3	II	4
Populus tremuloides	**V**	7	**V**	7	**V**	7	**V**	8	**V**	8	**V**	8	**V**	8	**V**	8	**V**	8	**V**	7	**V**	8	**V**	8	**V**	8	**V**	8	**V**	7
Goodyera repens			**III**	+	II	+									I	h			I	h										
Arnica cordifolia			**V**	4	II	2					I	1	I	+	I	h	II	h	II	h	II	4	**IV**	4	II	+	II	1	I	h
Picea mariana			**III**	4	**IV**	5	**III**	4	I	2	I	2			I	2														
Hylocomium splendens	II	h	**V**	7	**IV**	7	I	h	I	3	**IV**	3	I	h	**III**	4	I	+	II	+	I	+							I	h
Cornus canadensis			**IV**	5	**IV**	6	**V**	5	II	5	**V**	6	**IV**	4	**III**	2	**III**	3	**IV**	3	**IV**	5	II	5			**III**	4		
Picea glauca	II	1	**IV**	6	**IV**	5	**III**	5	**V**	5	**IV**	4	**III**	5	**IV**	7	**V**	6	II	3	**III**	4	II	4	**III**	4	**III**	4	I	+
Lupinus arcticus	II	2	II	1	**IV**	3																					II	3	I	2
Mitella nuda					**III**	+			I	h			**III**	2	I	h	II	h	I	h										
Petasites frigidus			I	h	**IV**	3	**V**	4	**III**	3	**III**	3	**IV**	3	**III**	2	II	+	I	h	I	h								
Ptilium crista-castrensis			II	2	**III**	3					I	h			I	h	II	3	**III**	+	I	h								
Vaccinium vitis-idaea	II	3	I	h	**III**	3	**V**	5	**III**	3	II	3																		
Abies lasiocarpa	II	2	II	4	I	h	**IV**	2	I	1	I	h			I	2	II	4	I	+	I	+	II	4	I	3				
Cladina rangiferina							**IV**	4			I	t																		
Ledum groenlandicum			I	1	II	3	**V**	7	II	4	II	4																		
Lycopodium clavatum							**III**	3			I	1																		
Lycopodium complanatum			I	h			**IV**	5			I	+							I	h										

Vegetation unit	111		112		113		210		221		222		223		300		411		412		421		422		423		424		425	
Number of plots	4		14		13		10		11		31		10		10		17		10		14		9		9		9		15	
Species	**Species presence and species significance[1]**																													
Melampyrum lineare							**IV**	2	I	h									I	h									I	h
Peltigera aphthosa	II	h	II	2	II	1	**IV**	4			I	t	I	h			I	h	I	h	I	h					I	h	I	h
Polytrichum juniperinum							**V**	3															I	h					I	h
Stereocaulon tomentosum	II	+					**III**	2																						
Vaccinium myrtilloides							**V**	7	**IV**	4	I	4																		
Elymus innovatus							**III**	1	**V**	5	**IV**	4	II	1																
Maianthemum canadense					I	+	**III**	3	**V**	4	**IV**	3	I	+	I	h														
Salix sp.							**IV**	3	**III**	4	**V**	4	II	3																
Pinus contorta	II	h	I	4	II	5	**III**	3	I	h	I	2	I	2	I	2	I	2	I	4	**III**	5	II	4	II	5	**IV**	5	**IV**	6
Spiraea betulifolia			I	+			**V**	3	II	2	II	2	II	+	I	3	**IV**	4	I	+	II	1	**IV**	1	**III**	3	**III**	1	I	h
Calamagrostis canadensis	II	h	I	h			**III**	2	**IV**	3	**III**	3	**IV**	3	II	h	II	h	I	h	**III**	6	II	h	**IV**	+	I	2		
Hedysarum boreale									**IV**	4																				
Oryzopsis asperifolia			I	+	I	h			**III**	4	I	+			I	h	II	h											I	3
Vicia americana			I	h	I	h			**III**	3	II	1	I	h	**III**	+	II	+	II	h	II	+					I	h	II	h
Lathyrus ochroleucus					I	+	II	2	**V**	4	**V**	3	**III**	3			**III**	2	**III**	2							I	+	II	h
Amelanchier alnifolia	II	1	I	h	I	h			**III**	4	II	+	**III**	2	I	h	**IV**	4	**III**	+	**III**	2	II	+	**V**	6	**IV**	2	II	h
Aster conspicuus			I	+	I	3			**IV**	5	**IV**	4	**III**	4	**III**	3	**III**	4	I	h	I	h	I	1	**V**	3	**III**	3	II	3
Pyrola asarifolia					I	h			II	1	**V**	4	**IV**	4	I	2	II	h	**III**	+	II	+			II	h				
Rubus pubescens					I	+			II	2	**V**	4	**III**	3	**III**	2	**IV**	3	**III**	1	I	+								
Cornus sericea											I	+	**V**	4																
Galium triflorum			I	h	I	h					I	h	**V**	4	II	h	II	h	II	h	**III**	+	**IV**	+	**IV**	+	**IV**	+		
Ribes oxyacanthoides											I	h	**III**	3																
Heracleum maximum											I	h	**III**	4	**I**	2	I	1			I	+					I	+		
Equisetum pratense					I	h	I	h	I	4	II	h	**IV**	5	**III**	+	I	h			II	h			I	h	II	h		
Populus balsamifera			II	2	I	2					I	1	**III**	5	I	4			I	3	**III**	5	I	1	I	2	I	4		
Viola canadensis											I	h	**III**	4	II	1	I	+					I	h	**III**	2	II	+	I	h
Osmorhiza berteroi	II	h	II	+	I	+			I	h	I	h	**III**	2	I	h	**V**	2	**III**	+	**IV**	2	**IV**	1	**V**	3	**IV**	+	I	h
Actaea rubra			I	h	I	+					I	h	**V**	4	II	+	**III**	2	I	h	I	h	I	h	**III**	4	I	2		
Aralia nudicaulis			I	h	I	+			I	1	II	4	**IV**	5	II	3	**IV**	5	**V**	4	**IV**	5	II	4	I	+	I	3		
Lonicera involucrata			I	2	I	+			I	h	II	1	**IV**	4	**III**	4	**III**	4	**III**	2	I	+	I	h	II	5	I	h		
Calamagrostis rubescens			I	h	I	4									**III**	3	I	1			II	2	**III**	4	I	h	**V**	6	**V**	6
Thalictrum occidentale					I	3							I	+	**III**	3	**V**	2	II	2	I	h	II	1	**V**	5	**III**	3	I	+
Ribes lacustre			I	h	I	h					I	h	II	2	II	3	**III**	2	I	h	II	1			II	h	I	h	I	h
Aster ciliolatus					I	h	I	h	II	+	I	+	I	h	I	h	**III**	1	I	h			II	+	II	h	**III**	+	II	h
Disporum hookeri															I	h	**III**	4	II	2	I	2	II	1	**IV**	5	II	h	I	h
Maianthemum racemosum			I	h	I	+							I	+	I	h	**III**	3	**III**	2	II	3	II	+	**IV**	4	**III**	3	I	h
Maianthemum stellatum													I	1	I	h	**III**	1	II	h	**III**	3			**IV**	2	**III**	+	I	h
Clintonia uniflora			I	+									I	h	I	h	**III**	3	**IV**	2	**III**	2	**III**	4	**III**	3	I	h		
Cornus stolonifera					I	h			I	2			I	h	II	3	**IV**	5	**IV**	5	**III**	4	**III**	2	**III**	3	II	5		
Elymus glaucus			I	h	I	h					I	+			I	h	**IV**	+	**III**	+	**IV**	1	**IV**	+	**III**	h	**V**	1	II	h
Rubus parviflorus											I	h	I	+			**IV**	5	**V**	4	**III**	5	**V**	4	**IV**	6	**III**	4		
Symphoricarpos albus									II	2	I	+	II	+			**IV**	4	**III**	+	**IV**	3	**III**	+	**IV**	6	**IV**	5	II	+
Corylus cornuta																	I	4	**III**	6										
Rhytidiadelphus triquetrus			I	4	I	+									I	h	II	2	**IV**	3	I	3								

Vegetation unit	111	112	113	210	221	222	223	300	411	412	421	422	423	424	425
Number of plots	4	14	13	10	11	31	10	10	17	10	14	9	9	9	15
Species	**Species presence and species significance[1]**														
Thuja plicata										**III** 5	II 6	II 2		II 2	
Tsuga heterophylla										**III** 3	I +	II 5			
Betula papyrifera			I h	I h		II 1	I 2	I +	I 2	**III** 6	**III** 5	**IV** 6		I h	
Paxistima myrsinites							I h		II 5	**V** 7	II 2	**III** 2	II 5	**III** 4	II 3
Tiarella trifoliata											**III** +				
Alnus incana			I h				I 1	I 3	II 4		**III** 5	II 3	II 5	**III** 5	I 3
Acer glabrum										II 4	**III** 5	**III** 5	II 3	II 4	I h
Ranunculus acris							I h	I h	I h		**III** +	I h	II h	**III** h	
Festuca subuliflora			I h				I h	I h	I h		**IV** 2	**III** h	II h	**III** +	II h
Rosa nutkana										I h	**III** +	**III** +	**IV** 4	**IV** 4	**III** 2
Chimaphila umbellata										I +	I +	**III** 2	II h	I h	I 1
Pinus monticola										I 2	II 3	**III** 5		I h	
Vaccinium caespitosum		I +	I 3	I 1		I h					II h	**III** 6		I 1	
Mahonia aquifolium									I 3	I h	II h	**III** 2	**IV** 3	**IV** 4	II 2
Pseudotsuga menziesii		I 3					I 2		II 4	I 3	I +	**IV** 6	**III** 5	**IV** 5	II 5
Angelica genuflexa									I h			I h	**IV** 4	I h	
Lilium columbianum									I h			II h	**V** +	II h	I h
Senecio pseudaureus								I h			II +	I h	II h	**IV** 1	I h
Viola renifolia					I h	II +	I h	I h		I h	II +	II h		**III** h	I h

1 Species presence and significance values as defined in Table 4.

The hierarchy of the proposed classification (Table 3) reflects the distribution of study stands according to regional climates (biogeoclimatic zones). The Mertensia, Elymus, and Thalictrum alliances represent stands located in montane boreal climates (predominantly in the BWBS and SBS zones); and the Symphoricarpos alliance represents stands located predominantly in cool temperate climates (predominantly in the IDF, ICH, and MS zones). This stratification is corroborated by climatic spectra which show two broad groups: the first group including units from 111 through 310 (the units of the Mertensia, Elymus, and Thalictrum alliances) and the second group including units 411 through 425 (the units of the Symphoricarpos alliance) (Figure 2). While the spectra of the first group are dominated by the indicators of montane boreal and cool temperate climates, the spectra of the second group feature also indicators of cool temperate & mesothermal and cool temperate & semiarid climates. This suggests the stands of the Symphoricarpos alliance are influenced by warmer and milder climates (*i.e.*, cool temperate) than the other stands.

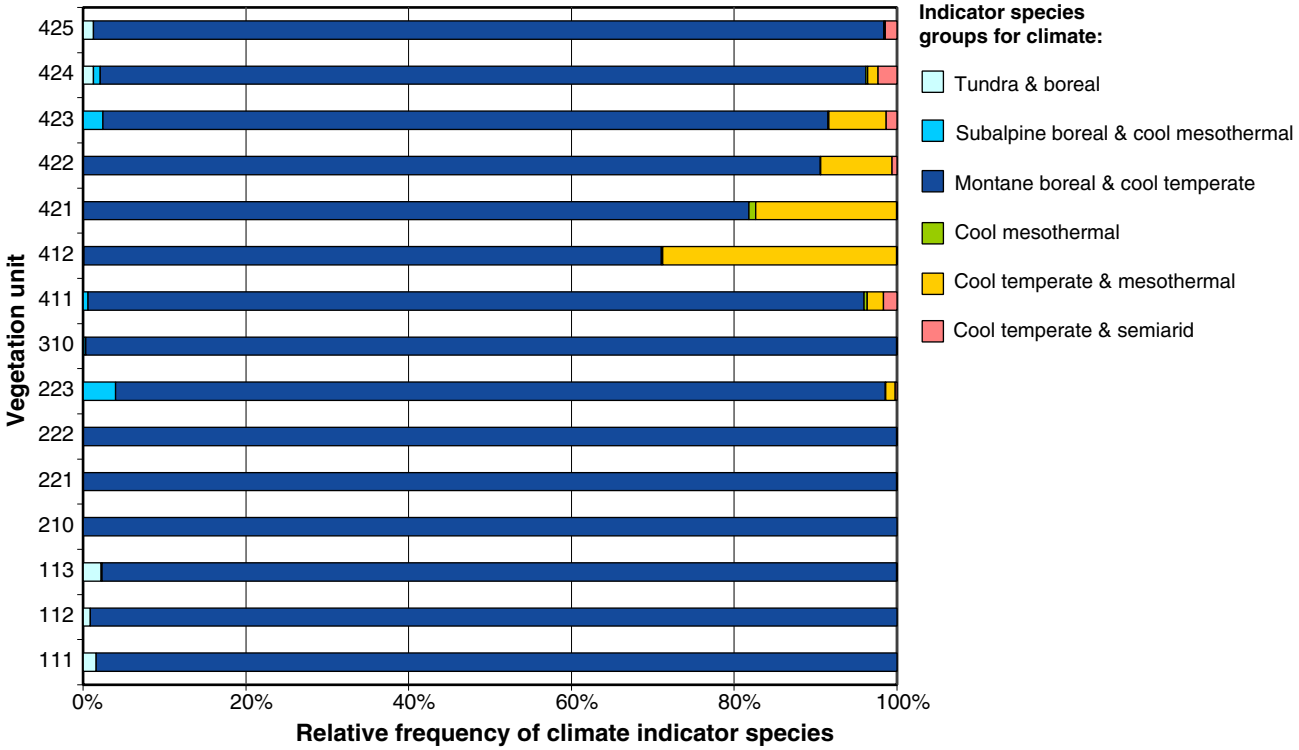

Figure 2. Climatic spectra for the 15 basic vegetation units delineated in trembling aspen stands across British Columbia. Codes for vegetation units as in Table 3.

Although all study stands, in general, can be considered to represent mid-seral successional stages, some stands featured well-established, regeneration of shade-tolerant conifers while some other stands featured only aspen regeneration in canopy gaps and not conifers (Figure 3). On montane boreal sites the understory conifers were *Abies lasiocarpa* and *Picea mariana*; regeneration of *Picea glauca* was present across the study area. *Pinus monticola*, *Pseudotsuga menziesii*, *Thuja plicata*, and *Tsuga heterophylla* were established in the understory on cool temperate sites.

Montane boreal stands of the Mertensia (100), Elymus (200), and Thalictrum (300) alliances and Viburnum - Spiraea (411) subassociation appear to be floristically aligned with the Picea glauca & mariana order (Krajina 1969) and will likely develop into white spruce and/or black spruce dominated stands, with a variable admixture of subalpine fir in the eastern portion of the BWBS zone and in the SBS zone. The stands of the Symphoricarpos (400) alliance (except for Viburnum - Spiraea (411) subassociation) shows floristic affinities to the interior Tsuga heterophylla order (Krajina 1969), and will likely develop into western hemlock and western redcedar dominated stands in the ICH zone, and Douglas-fir dominated stands in the IDF zone.

While on some sites, aspen may be replaced by conifers within a single aspen generation, replacement on some other sites may be as long as 1,000 years (Perala 1990). Also, the presence of uneven-aged aspen stands in northern Montana, Wyoming, eastern Idaho, Colorado, and North Dakota suggests that under certain conditions, aspen may be self-perpetuating without major disturbance; however, aspen regeneration can fail when apical dominance prevents suckering during gradual deterioration of clones (Mueggler 1985). In the absence of replacement by shade tolerant conifers, aspen stands, especially on moist and nutrient-rich sites, usually gradually deteriorate to shrub-dominated woodlands, with a few scattered aspen suckers and occasional conifers (Perala 1990).

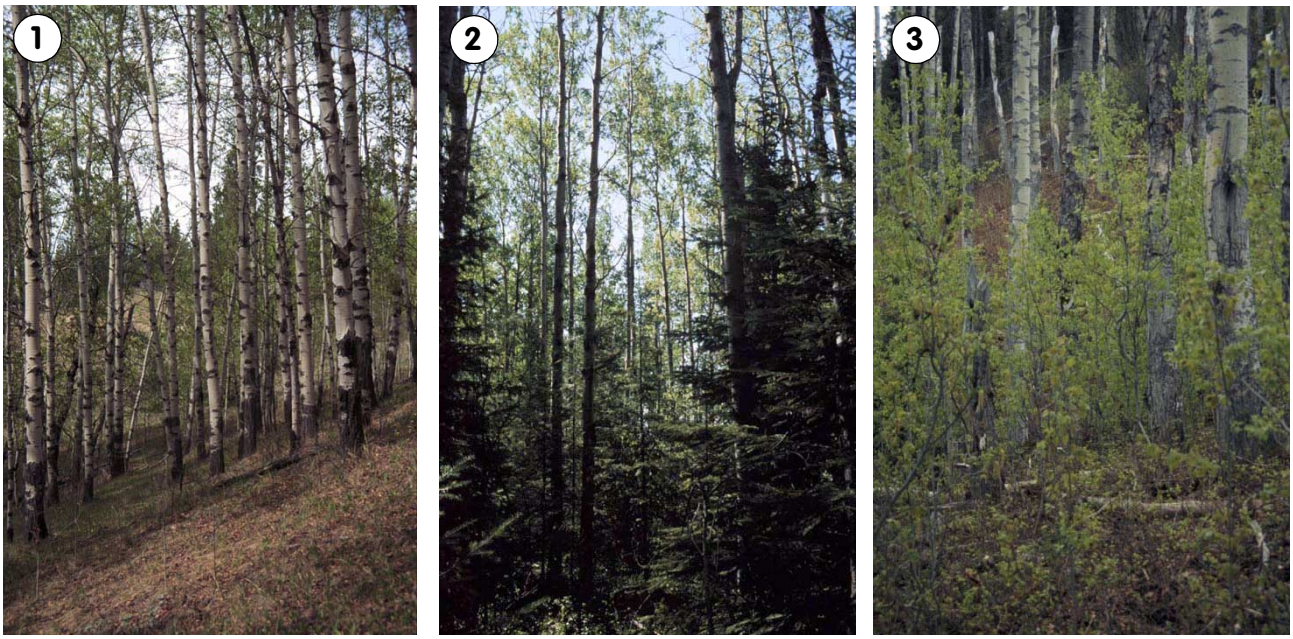

Figure 3. Three scenarios encountered in the understory of study stands: 1 - no regeneration of aspen or shade-tolerant conifers, 2 - advance regeneration of shade-tolerant conifers was present, and 3 - natural regeneration of aspen from root suckers was present, providing semi-open canopy conditions.

Since a majority of the study stands were young and many stands lacked abundant advance regeneration of conifers, we refrained from explicitly predicting succession trends. Ignoring succession trends might have resulted in framing different vegetation units on ecologically-equivalent sites, *i.e.*, in two different aspen communities that can be differentiated only by the differences in the floristic composition. We also avoided resolving a related issue concerning classification at the order level: could the delineated units form a Populus tremuloides order (similar to the Populus balsamifera order (Krajina 1969)) or should they be attached to the proposed 'coniferous' orders (Krajina 1969) according to the similarity in understory vegetation?

While the constant occurrence of *Populus tremuloides* was a consequence of the sampling design, several other species, such as *Epilobium angustifolium*, *Fragaria virginiana, Linnaea borealis, Hylocomium splendens, Cornus canadensis,* and *Picea glauca* occurred nearly in all study plots. Somewhat less widespread but frequently occurring species were *Achillea milefolium, Galium boreale, Orthilia secunda, Pleurozium schreberi, Shepherdia canadensis*, and *Viburnum edule* (Table 5). When all these commonly occurring species as well as other species with low presence and species significance (*e.g.*, *Alnus viridis, Antennaria neglecta, Cladina stellaris, Cladonia ecmocyna, Empetrum nigrum*, and others (Table 5)) showed affinity to one or more units vegetation units they were used in the diagnostic table (Table 4) as differential or companion species.

The physiognomic appearance of study stands was relatively consistent. Compared to neighbouring coniferous stands, a well developed, frequently luxuriant understory was the characteristic feature of aspen stands.

Regardless of the differences in floristic composition and site characteristics, there were generally minor differences in life forms profiles between the study stands (Figure 4). The understory vegetation was typically dominated by deciduous shrubs (*e.g.*, *Shepherdia canadensis, Rosa acicularis, R. nutkana*, and *Viburnum edule*) and herbs (*e.g.*, *Epilobium angustifolium, Fragaria virginiana*, and *Cornus canadensis*). Stands in boreal climates had a somewhat higher proportion of mosses and lichens, while stands in drier cool temperate climates had a higher proportion of graminoids.

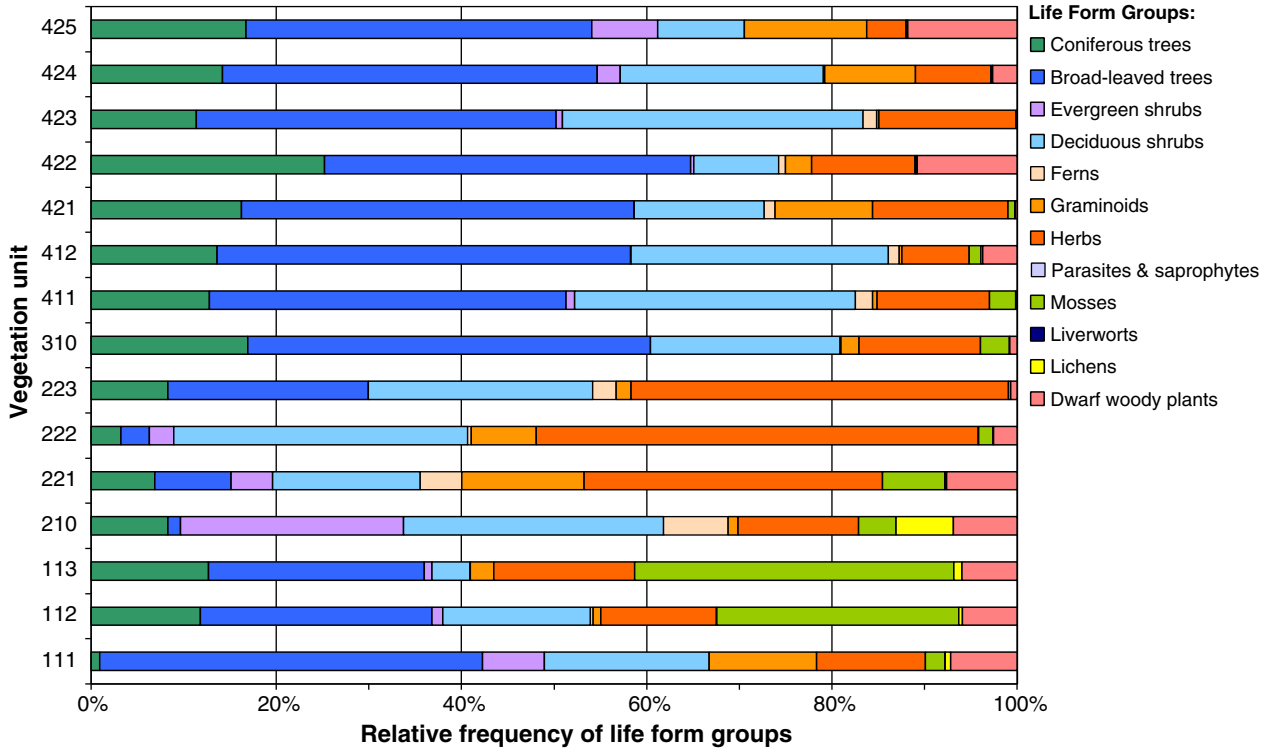

Figure 4. Life from spectra for the 15 basic vegetation units delineated in trembling aspen stands across British Columbia. Codes for vegetation units as in Table 3.

The floristic individuality of the delineated vegetation units was described by two sets of similarity indices (Table 6). Vegetation units adjacent in Table 3 were climatically equivalent, and were more similar to each other that the climatically disjunct units that were distant in the table. The most poorly differentiated unit was the Thalictrum (310) association, which was similar to nearly all other units. The Arnica (112) and Petasites (113) subassociations of the Mertensia (110) association were floristically equivalent (Table 5a), and the boreal Festuca (111) subassociation was quite similar to the cool temperate Shepherdia (425) subassociation of the Rosa (420) association. The subassociations of the cool temperate Rosa nutkana (420) association had a high similarity to each other according to both indices.

In view of a large number of study stands from climatically and edaphically different environments, it was surprising to frame only 15 units (6 associations and 13 subassociations). It appears that in mid-seral communities the uniform aspen overstory creates favourable light and edaphic conditions for the development of understory vegetation that has similar structure, life forms, and floristic composition over large areas. The major changes in the composition of understory vegetation appear to coincide with major changes in climate and regional flora.

Table 6. Matrix of floristic similarities for vegetation units delineated in trembling aspen ecosystems across British Columbia. Higher values indicate a greater number of shared species and greater floristic similarity. Codes for vegetation units as in Table 3.

A. Sørensen (coincidence) coefficient of floristic similarity based on presence/absence

Vegetation unit	111	112	113	210	221	222	223	310	411	412	421	422	423	424	425
111	1.00														
112	0.48	1.00													
113	0.42	0.70	1.00												
210	0.35	0.31	0.32	1.00											
221	0.30	0.37	0.46	0.53	1.00										
222	0.31	0.42	0.47	0.56	0.61	1.00									
223	0.27	0.39	0.46	0.35	0.53	0.67	1.00								
310	0.32	0.59	0.65	0.26	0.47	0.47	0.53	1.00							
411	0.28	0.55	0.57	0.24	0.44	0.44	0.55	0.69	1.00						
412	0.27	0.56	0.53	0.28	0.41	0.44	0.54	0.55	0.67	1.00					
421	0.24	0.41	0.48	0.22	0.38	0.43	0.54	0.59	0.61	0.59	1.00				
422	0.26	0.45	0.41	0.27	0.33	0.41	0.48	0.52	0.57	0.55	0.68	1.00			
423	0.24	0.38	0.41	0.16	0.33	0.38	0.48	0.53	0.60	0.55	0.58	0.65	1.00		
424	0.28	0.43	0.43	0.23	0.32	0.38	0.48	0.50	0.52	0.48	0.69	0.63	0.58	1.00	
425	0.32	0.41	0.41	0.24	0.31	0.32	0.37	0.50	0.50	0.47	0.55	0.52	0.49	0.65	1.00

B. Sorensen (coincidence) coefficient of floristic similarity based on cover

Vegetation unit	111	112	113	210	221	222	223	310	411	412	421	422	423	424	425
111	1.00														
112	0.49	1.00													
113	0.34	0.67	1.00												
210	0.10	0.20	0.23	1.00											
221	0.22	0.29	0.28	0.32	1.00										
222	0.24	0.29	0.26	0.29	0.52	1.00									
223	0.26	0.33	0.31	0.16	0.35	0.44	1.00								
310	0.50	0.49	0.41	0.13	0.29	0.28	0.41	1.00							
411	0.47	0.41	0.38	0.12	0.28	0.29	0.47	0.63	1.00						
412	0.34	0.35	0.34	0.07	0.17	0.15	0.30	0.40	0.54	1.00					
421	0.34	0.33	0.35	0.11	0.20	0.20	0.36	0.44	0.51	0.54	1.00				
422	0.35	0.37	0.38	0.12	0.19	0.17	0.27	0.41	0.51	0.54	0.59	1.00			
423	0.35	0.31	0.29	0.06	0.17	0.10	0.27	0.45	0.59	0.44	0.53	0.51	1.00		
424	0.41	0.38	0.37	0.10	0.21	0.17	0.30	0.50	0.57	0.49	0.60	0.58	0.62	1.00	
425	0.53	0.39	0.33	0.05	0.20	0.12	0.20	0.44	0.43	0.37	0.40	0.47	0.45	0.66	1.00

Cluster analysis using the Sørensen index based on presence/absence showed a hierarchical structure somewhat similar to that based on the tabular analysis (Table 3; Figure 5). The dendrogram shows two major clusters joined at approximately the same distance (0.3), and a smaller cluster joined at a slightly greater distance (0.34). The first cluster joined the units of the montane boreal Mertensia (100) and Elymus (200) alliances. Different from the tabular analysis was the connection of the Thalictrum (300) alliance, with stands occurring in montane boreal and cool temperate climates, to the second cluster, and separation of the Senecio (424) and Shepherdia (425) subassociations of the Rosa nutkana (420) association. These subassociations were connected with the other units at larger distance indicating that they might have been considered to form a different association.

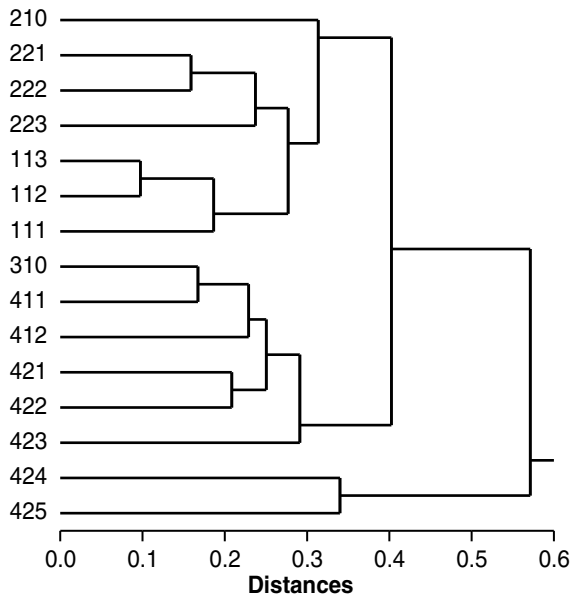

Figure 5. Dendrogram showing the groupings of the vegetation units produced by cluster analysis using the Sørensen index based on presence/absence as a distance measure.

There were only few significant differences in the mean species diversity among 15 basic vegetation units (Tables 7 and 8). The three units with the highest (>30) mean species diversity were: Viburnum - Spiraea (411), Viburnum - Paxistima (412), and Rosa - Senecio (424) subassociations; the three units with lowest (≤22) mean species diversity were: Rosa - Shepherdia (425) subassociation, Ledum (210) association, and Lathyrus - Hedysarum (221). The most species-diverse Viburnum - Spiraea (411) subassociation a had significantly higher mean species diversity that the Ledum (210) association and Lathyrus - Hedysarum (211) and Lathyrus - typic (222) subassociations; and the least species-diverse, Rosa - Shepherdia (425) subassociation had a significantly lower mean species diversity than the Viburnum - Spiraea (411), Viburnum - Paxistima (412), and the Rosa - Senecio (424) subassociations. Comparison of the most and least species-diverse units seems to indicate that more species-diverse communities develop in wetter cool temperate climate (ICH zone) and less species-diverse communities develop in montane boreal climate and on sites transitional to grasslands.

However, despite a few exceptions, the results of species diversity comparisons suggest that species richness in aspen communities is relatively consistent regardless of community type and the type of the associated environment. This inference is corroborated by consistency in the life form spectra (Figure 4) and, to some degree, by floristic similarity of the communities (Table 6). Thus, it can be expected, that the understory vegetation in aspen communities will be similar in life forms, species richness, and floristic composition over large areas, with the major changes in the composition coinciding with major changes in climate and regional flora.

Table 7. Means and standard deviations of number of species according to the 15 vegetation units.

Numerical code	Number of plots	Number of species	
		Mean	Standard deviation
111	4	25.75	8.54
112	14	24.50	4.94
113	13	25.92	6.50
210	10	21.90	3.67
221	11	22.00	3.07
222	31	23.74	3.51
223	10	28.20	5.96
310	10	25.80	5.25
411	17	31.24	6.70
412	10	30.60	7.34
421	14	26.86	9.42
422	9	25.67	3.35
423	9	27.33	7.55
424	9	30.89	8.55
425	15	21.47	6.73

Table 8. Probability in pair-wise comparisons of means of the number of species among the 15 vegetation units (Table 7) based on Tukey HSD test. The values in boldface indicate that two vegetation units in a pair have significantly different means ($P \leq 0.05$).

	Probability														
Code	**111**	**112**	**113**	**210**	**221**	**222**	**223**	**310**	**411**	**412**	**421**	**422**	**423**	**424**	**425**
111	1.000														
112	1.000	1.000													
113	1.000	1.000	1.000												
210	0.999	0.999	0.964	1.000											
221	0.999	1.000	0.964	1.000	1.000										
222	1.000	1.000	0.999	1.000	1.000	1.000									
223	1.000	0.980	1.000	0.577	0.564	0.789	1.000								
310	1.000	1.000	1.000	0.984	0.985	1.000	1.000	1.000							
411	0.954	0.127	0.536	**0.010**	**0.008**	**0.004**	0.996	0.633	1.000						
412	0.991	0.497	0.887	0.089	0.080	0.117	1.000	0.912	1.000	1.000					
421	1.000	1.000	1.000	0.816	0.809	0.961	1.000	1.000	0.801	0.978	1.000				
422	1.000	1.000	1.000	0.991	0.992	1.000	1.000	1.000	0.648	0.911	1.000	1.000			
423	1.000	0.999	1.000	0.830	0.826	0.967	1.000	1.000	0.967	0.998	1.000	1.000	1.000		
424	0.987	0.469	0.862	0.084	0.076	0.116	1.000	0.890	1.000	1.000	0.968	0.889	0.996	1.000	
425	0.996	0.992	0.836	1.000	1.000	0.998	0.296	0.919	**0.001**	**0.019**	0.525	0.950	0.599	**0.019**	1.000

Vegetation-Environment Relationships

Considering uncertainties in predicting succession trends, we refrained from deriving site units from delineated vegetation units. Instead, we characterized each basic vegetation units (association or subassociation) by climate (zone) and the range of soil moisture regimes (SMRs) and soil nutrient regimes (SNRs). The climatic and edaphic individuality of each of the 15 basic vegetation units is portrayed on the edatopic grid (Figure 6 and Figure 7) and summarized in the summary environmental table (Table 9). The ranges for each unit were derived by integrating and generalizing the results of environmental and indicator plant analysis for each plot of the unit. Diagnosis of SNRs is also supported by soil chemical analysis (Kayahara *et al.* 2000).

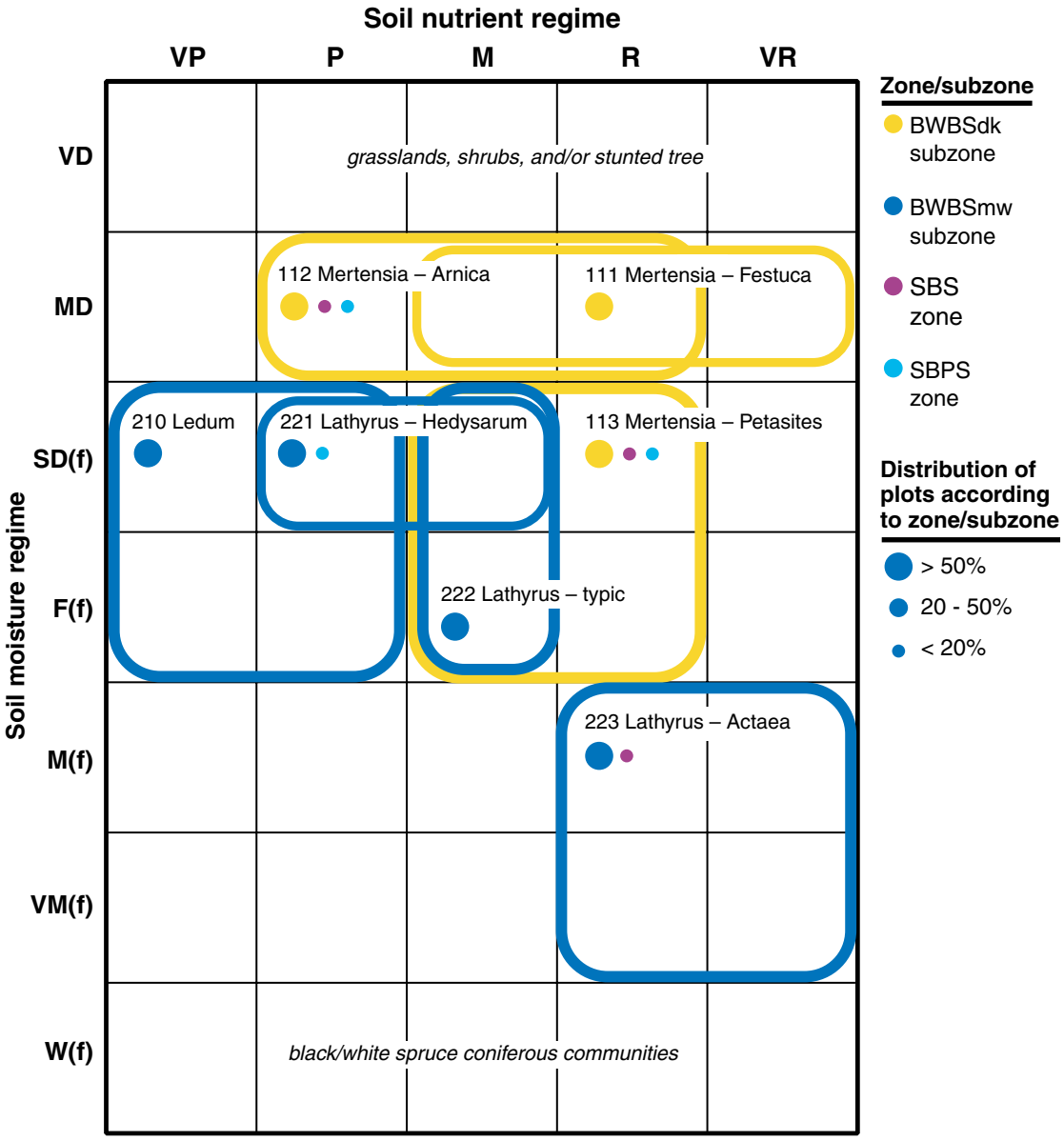

Figure 6. Edatopic grid showing the generalized relationships of the seven vegetation units to soil moisture and soil nutrient regimes in the BWBS zone. The units are named using the generic names of the understory species and vegetation unit numbers in Table 3. Abbreviations for soil nutrient and moisture regimes are defined in Table 9.

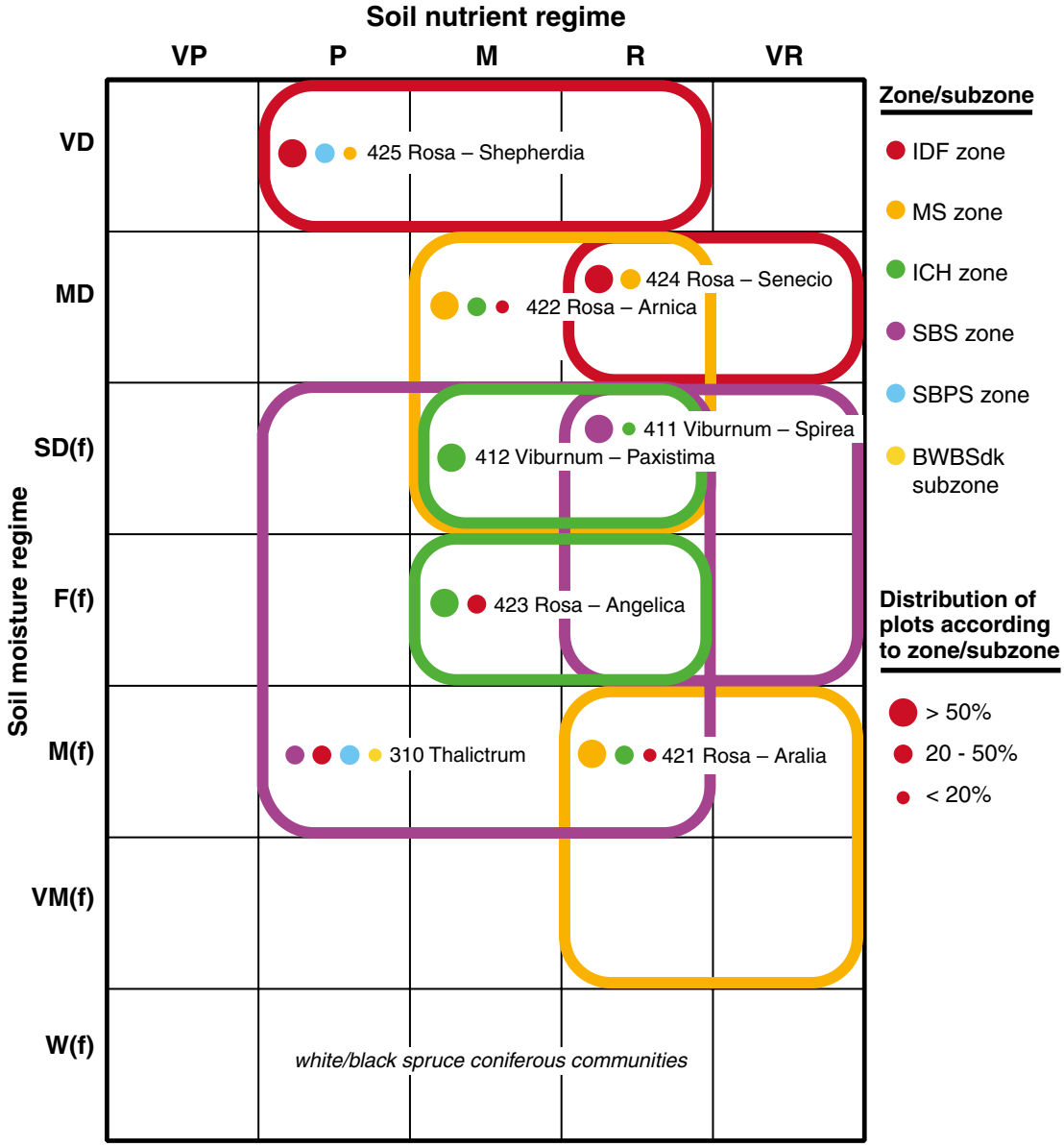

Figure 7. Edatopic grid showing the generalized relationships of the eight vegetation units to soil moisture and soil nutrient regimes in the SBS, MS, ICH, and IDF zones. The units are named using the generic names of the understory species and vegetation unit numbers in Table 3. Abbreviations for soil nutrient and moisture regimes are defined in Table 9.

Table 9. Summary environmental table for the vegetation units in aspen ecosystems. Continuous properties are characterized by mean and range; categorical properties are described by the percentage of the sample plots in each class

Vegetation unit	**111**	**112**	**113**	**210**	**221**	**222**	**223**
Number of plots	4	14	13	10	11	31	10
Property							
Zone/subzone	BWBSdk - 100	BWBSdk - 86 SBS - 7 SBPS - 7	BWBSdk - 85 SBS - 8 SBPS - 8	BWBSmw -100	BWBSmw - 91 SBS - 9	BWBSmw - 100	BWBSmw - 90 SBS - 10
Actual soil moisture regime[1]	MD - 100	MD - 86 SD - 14	SD - 85 F - 15	SD - 80 F - 20	SD - 91 M - 9	SD - 26 F - 71 M - 3	M - 80 VM - 20
Soil nutrient regime[2]	M - 25 R -75	P - 7 M - 71 R -21	P - 15 M - 54 R - 31	VP - 60 P - 40	P - 27 M - 73	P - 13 M - 77 R - 10	R - 90 VR - 10
Elevation (m)	838 (770-950)	900 (720-1040)	824 (590-900)	750	728 (710-790)	632 (450-750)	666 (450-1025)
Slope gradient (%)	15 (7-22)	19 (0-33)	12 (0-49)	2 (0-6)	15 (0-40)	4 (0-15)	7 (2-12)
Aspect[3]	S - 50 W - 50	E - 36 S - 29 W - 29 F - 7	N - 23 E - 8 S - 15 W - 23 F - 31	N - 30 W - 10 F - 60	S - 45 W - 18 F - 36	N - 3 E - 10 S - 13 W - 26 F - 48	N - 20 S - 50 W - 10
Forest floor thickness (cm)	9 (6-11)	12 (5-22)	11 (6-17)	3 (2-4)	7 (3-32)	6 (3-9)	10 (4-14)
Textural class[4]	L -25 LS - 25 SL - 50	L -14 LS - 50 SL - 21 S - 7 SC - 7	L - 31 SL - 62 SCL - 8	LS - 30 SL -20 S - 50	LS - 9 S - 82 SCL - 9	LS - 10 SL - 13 S - 16 SiL - 10 CL - 35 SiCL - 16	SL - 10 S - 30 SiL - 20 CL - 30 SCL - 10
Actual rooting depth (cm)	50 (40-60)	54 (40-70)	59 (30-80)	63 (46-80)	60 (25-80)	49 (20-90)	48 (30-60)
Potential rooting depth (cm)	59 (40-75)	60 (50-75)	65 (30-80)	63 (46-80)	60 (25-80)	42 (15-90)	47 (26-70)
Seepage depth (cm)	N/A	N/A	N/A or >60	N/A	N/A or >65	N/A or >30	N/A or 35-85
Soil drainage[5]	R - 25 W - 25	R - 7 W - 64 M - 29	W - 54 M - 38 I - 8	W - 20 M - 60 I - 20	R - 9 W - 55 M -27 I - 9	M - 52 I - 48	M - 40 I - 60
Humus form group[6]	D - 100	R - 57 D - 43	R - 38 D - 62	R - 100	R - 18 D - 82	R - 39 D - 61	R - 10 D - 80 L -10
Soil Order[7]	B - 50 P - 25 R - 25	B - 78 P - 22	B - 54 P - 31 L - 16	B - 100	B - 91 G - 9	B - 42 L - 58	B - 70 L - 30
Stand age (years @ bh)[8]	117 (59-152)	124 (67-164)	103 (50-181)	54 (51-58)	(>50-154)	(>50-70)	(>50-96)
Site index (m@50 yrs bh)[8]	8 (6-9)	12 (10-16)	13 (10-15)	8 (7-10)	13 (11-16)	19 (15-23)	22 (20-25)
Tree layer cover (%)	36 (10-70)	47 (21-90)	46 (30-81)	25 (15-36)	36 (27-86)	35 (4-43)	44 (26-100)
Shrub layer cover (%)	40 (20-64)	33 (13-77)	20 (4-63)	53 (33-65)	27 (23-47)	35 (4-83)	31 (7-67)
Herb layer cover (%)	25 (2-55)	15 (3-32)	17 (1-38)	15 (6-30)	36 (21-58)	33 (11-58)	38 (8-60)
Moss layer cover (%)	3 (0-6)	36 (0-92)	55 (0-100)	19 (3-34)	5 (0-50)	2 (0-5)	0 (0-1)

1 Actual moisture regime: VD-very dry, MD-moderately dry, SD-slightly dry, F-fresh, M-moist, VM-moist, f-fluctuating water table
2 VP-very poor, P-poor, M-medium, R-rich, VR-very rich
3 N-north, E-east, S-south, W-west, F-flat
4 S-sand, SL-sandy loam, LS-loamy sand, L-loam, SiL-silt loam, CL-clay loam, SCL-sandy clay loam, SC-sandy clay, SiCL-silty clay loam, O-organic
5 R-rapid, W-well, M- moderately well, I-imperfect, P-poor
6 F-Mor, D-Moder, L-Mull
7 B-Brunisol, P-Podzol, R-Regosol, O-Organic, L-Luvisol, G-Gleysol
8 Site index and stand age data are missing for some plots. See Appendices 10 - 16 for details.

310	**411**	**412**	**421**	**422**	**423**	**424**	**425**
10	17	10	14	9	9	9	15
BWBSdk - 10 SBS - 50 SBPS - 20 IDF - 20	SBS - 94 ICH - 6	ICH - 100	MS - 57 ICH - 29 IDF - 14	MS - 56 ICH - 33 IDF - 11	ICH - 67 IDF - 33	MS - 44 IDF - 56	MS - 13 IDF - 67 SBPS - 20
SD - 30 F - 50 M - 20	SD - 53 F - 41 M - 6	SD - 80 F - 20	F - 14 M - 71 VM - 14	MD - 44 SD - 56	SD - 22 F - 78	MD - 89 SD - 11	VD - 80 MD - 20
P - 10 M - 60 R - 30	M - 6 R - 82 VR - 12	M - 50 R - 50	M - 14 R - 64 VR - 22	M - 67 R - 33	M - 22 R - 67 VR -11	M -22 R - 67 VR - 11	P - 40 M - 40 R - 20
891 (595-1115)	860 (390-1025)	540 (380-1020)	959 (520-1115)	989 (785-1285)	945 (795-1285)	1073 (1005-1220)	1058 (960-1258)
13 (0-67)	6 (0-30)	19 (0-33)	8 (0-33)	36 (0-65)	20 (0-48)	22 (0-59)	22 (0-85)
N - 20 E - 20 S - 10 W - 20 F - 30	N - 18 E - 6 W - 24 F - 53	N - 10 E - 10 S - 30 W - 40 F - 10	N - 21 E - 29 W - 7 F - 43	N - 44 E - 11 W - 33 F - 11	E - 11 S - 67 F - 22	E - 44 S - 22 W - 22 F - 11	E - 7 S - 33 W - 13 F - 47
12 (4-40)	9 (4-19)	7 (4-10)	8 (3-30)	6 (3-10)	9 (7-10)	7 (3-13)	6 (3-10)
L - 30 [4] SL - 30 CL - 20 SCL -10 O - 10	L - 53 SL - 24 S - 12 SCL - 12	L - 20 LS - 50 SL - 30	L - 14 SL - 29 S - 21 SC - 7 SCL - 29	L - 11 LS - 56 SL - 22 S - 11	L - 44 LS - 11 SL - 22 S - 11 SCL - 11	LS - 22 SL - 56 S - 11 SCL - 11	L - 20 LS - 20 SL - 33 S - 7 CL - 7 SCL - 13
71 (30-120)	56 (30-90)	56 (35-70)	54 (30-100)	55 (30-90)	59 (45-70)	71 (40-100)	60 (25-120)
77 (35-120)	62 (30-90)	59 (35-70)	57 (20-100)	55 (30-90)	60 (50-70)	71 (40-100)	61 (25-120)
N/A or 60-90	N/A	N/A	N/A or 20-100	N/A	N/A or 55-65	N/A or >75	N/A
W - 60 M - 20 I - 10 P - 10	R - 6 W - 88 M - 6	W - 60 M - 40	W - 14 M - 36 I - 21 P - 29	R - 33 W - 56 M - 11	W - 67 I - 22 P - 11	W - 89 M - 11	R - 60 W - 33 M - 7
R - 30 D - 70	R - 12 D - 88	R - 10 D - 90	D - 57 L - 43	R - 11 D - 78 L - 11	D - 33 L - 67	R - 11 D - 22 L - 67	R - 13 D - 74 L - 13
B - 50 P - 10 L - 30 O - 10	B - 88 P - 12	B - 90 P - 10	B - 21 P - 29 R - 14 L - 36	B - 22 P - 67 R - 11	B - 78 L - 22	B - 67 P - 22 L - 11	B - 94 L - 7
73 (46-135)	90 (48-116)	79 (47-103)	70 (56-95)	65 (54-76)	70 (56-100)	75 (57-96)	82 (61-122)
19 (17-22)	16 (12-19)	18 (15-23)	26 (21-31)	23 (20-27)	22 (19-27)	21 (15-25)	12 (9-16)
72 (40-100)	82 (30-100)	63 (20-100)	82 (45-100)	88 (70-100)	74 (42-93)	67 (41-90)	52 (25-95)
33 (5-85)	54 (18-97)	46 (15-95)	26 (1-92)	33 (4-66)	47 (13-84)	37 (3-77)	27 (0-69)
17 (2-84)	15 (2-35)	6 (2-14)	32 (0-80)	18 (2-53)	29 (13-48)	22 (5-78)	18 (0-74)
4 (0-20)	4 (0-35)	2 (0-9)	1 (0-11)	0	0	0 (0-1)	0 (0-2)

It appears that each delineated vegetation units is not environmentally exclusive: they overlap and cannot be characterized by an exclusive edaphic range. The generalized plots illustrated on the two grids show overlaps in climatic range for some units that is an artifact of placing on one grid units associated with different climates (Figure 5 and Figure 6). For example, two edaphically different units (Lathyrus - Hedysarum (221) and Lathyrus typic (222)) overlap with Mertensia - Petasites (113); however, the former are from the wetter portion of the BWBS zone (BWBSmw subzone) and the latter is from the drier portion of the BWBS zone (BWBSdk subzone).

The vegetation units extend from very dry to very moist sites but are infrequent on very poor and poor sites. Except for three units (Mertensia - Arnica (112), Ledum (210), and Thalictrum (310)) all other units occupy medium and richer portion of the grids. In general, indicator plant analysis supported characterization of soil moisture conditions for the units (Figure 8). For example, the Mahonia - Shepherdia (425) subassociation, with the soil moisture range restricted to very dry SMR, has the highest (about 90%) mean relative frequency of very dry to moderately dry indicators. The moderately dry Mertensia - Festuca (111), Mertensia - Arnica (112), and Rosa - Senecio (424) subassociations have lower and similar mean relative frequencies of very dry to moderately dry indicators than the Mahonia - Shepherdia (425) subassociation, and the similar proportion of other indicator species groups in their soil moisture spectra. Similarly, the moist to very moist Lathyrus - Actaea (223) and Rosa - Aralia (421) subassociations have very similar soil moisture spectra that are dominated by indicators of fresh to very moist and very moist to wet soil moisture conditions.

Except the Ledum (210) association, the mean relative frequency of nitrogen-rich indicators of all other units is over 40% suggesting rich or very rich SNRs (Figure 9). In general, the units of the cool temperate Symphoricarpos alliance appear to be richer than those of the montane boreal Mertensia (100) and Elymus (200) alliances. However, as soil nutrient spectra reflect nutrient conditions of the forest floor (predominantly Moder humus forms) more strongly than the associated mineral soil, occurrence of very rich sites will likely be infrequent.

We made edaphic comparisons of the vegetation units of this study with those recognized by DeLong (1988) in the BWBSmw subzone (Figure 10). The comparison indicates some differences but predominantly similarities, despite different nomenclature, difficulties in comparing actual to relative SMRs, and ambiguous edaphic ranges in DeLong's units. Our Mertensia - Festuca (111) subassociation appears to be edaphically as well as floristically very similar to DeLong's Kinnikinnick unit; similarly, our Ledum (210) association and DeLong's Ledum unit occupy a very similar edaphic range and have the similar floristic composition. Although DeLong's Soopalallie and Creamy Peavine units are considered to be associated predominantly with the medium SNR, they correspond to our medium to rich Lathyrus - Hedysarum (221) and Lathyrus typic (222) subassociations. On moist to very moist, nutrient medium to very rich sites we recognized only one unit (Lathyrus - Actaea (223) subassociation) while DeLong delineated three closely related units: Oak Fern, Black Twinberry, and Cow Parsnip. Our Lathyrus - Actaea (223) subassociation included *Lonicera involucrata* as a diagnostic species but *Gymnocarpium dryopteris* and *Heracleum sphondylium* were very infrequent species.

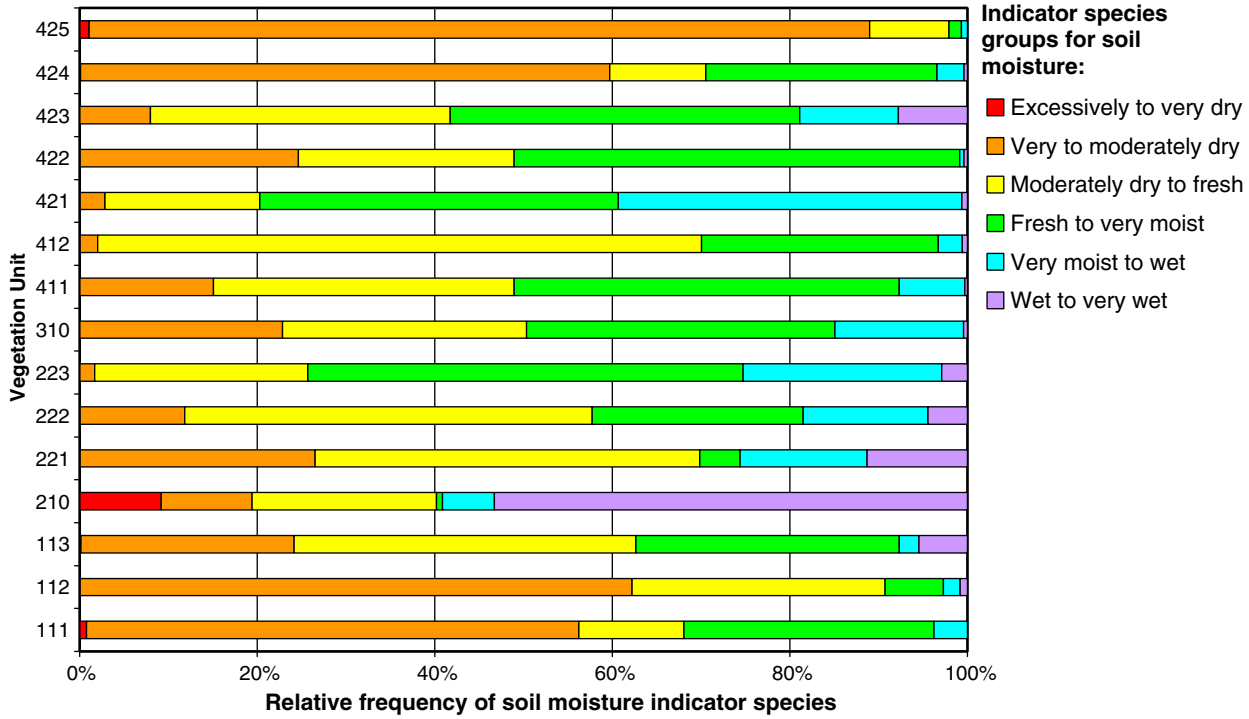

Figure 8. Soil moisture spectra for the 15 basic vegetation units delineated in trembling aspen stands across British Columbia. Codes for vegetation units as in Table 3.

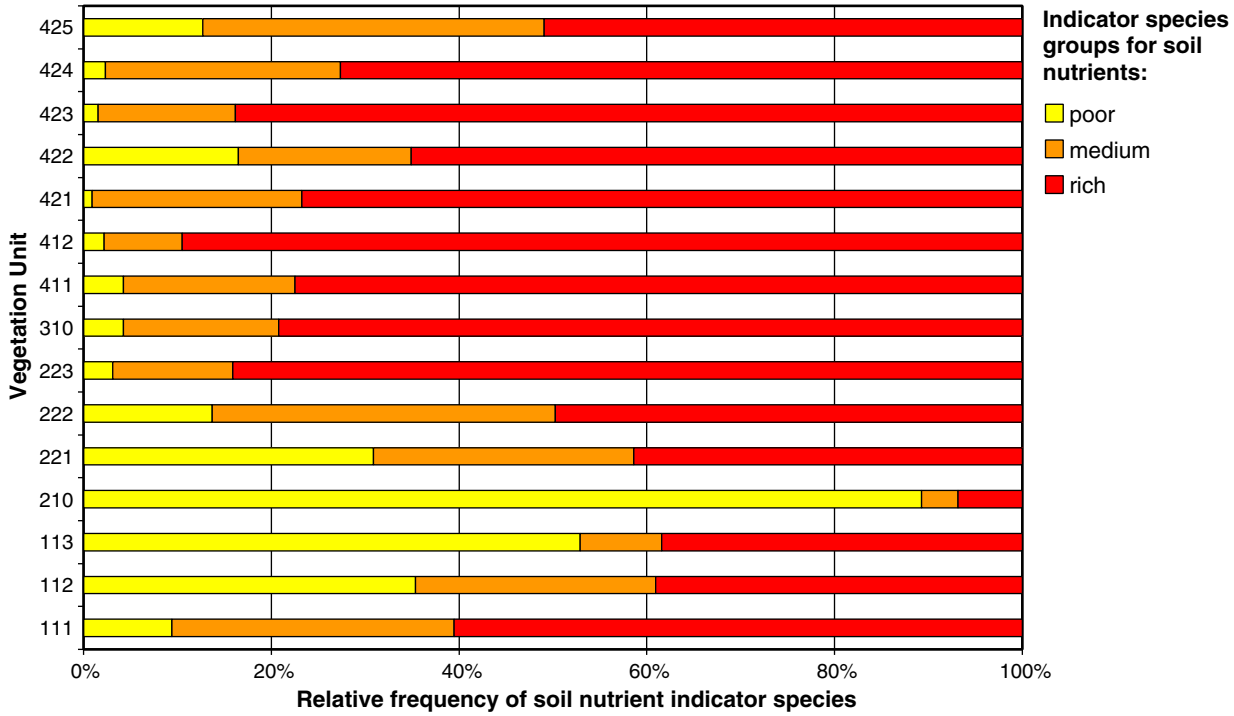

Figure 9. Soil nutrient spectra for the 15 basic vegetation units delineated in trembling aspen stands across British Columbia. Codes for vegetation units as in Table 3.

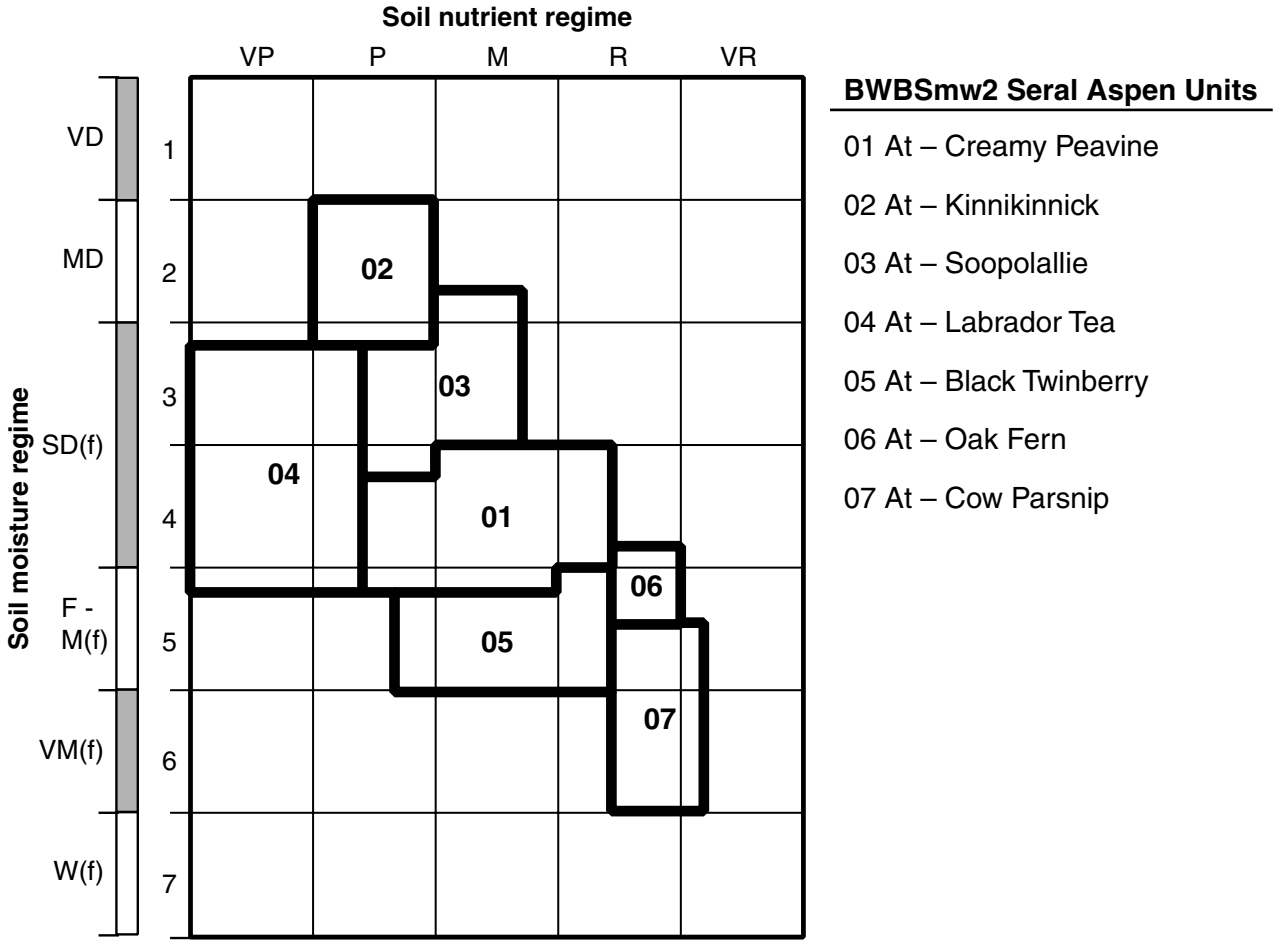

Figure 10. Edatopic grid showing the relationships to soil moisture and soil nutrient regimes of the seven vegetation units recognized by DeLong (1988) in seral aspen ecosystems in the BWBSmw subzone. The units are named by Trembling Aspen (At) and the common name of one understory species.

Description of Plant Associations

This section expands upon the vegetation classification by emphasizing floristic and stand characteristics of the delineated units. As much of this information is presented in diagnostic, summary, plot vegetation, and plot environmental tables, the description is brief and focused on the most salient features. We describe and illustrate each of the 15 basic vegetation units that represent the lowest level of the hierarchy - either associations or subassociations. Vegetation units are organized according to the order given in Table 3.

111 Populus tremuloides - Mertensia paniculata: Festuca altaica (Mertensia - Festuca) subassociation

(References: Tables 3, 4, 5, and 9; Figures 4, 6, 8, 9, 11, 12 and 13; Appendices 2 and 17)

Moderately dry, medium to rich (very rich) sites in drier montane boreal climates

Mertensia - Festuca communities occur on water-shedding ridge crests or warm-aspect upper slopes, often bordering grassland communities, in the Dry Cool BWBS (BWBSdk) subzone. These water-deficient sites support marginal to poor, often distorted, aspen growth with site index (@ 50 yrs bh) ranging from 6 to 9 m (Figures 11 to 13). The associated soils are shallow, coarse-skeletal, Dystric or Eutric Brunisols, Podzols or Regosols with Mormoder Leptomoder, or Mullmoder (when grass cover is high) humus forms (Table 9).

The canopy of the Mertensia - Festuca community is exposed to wind and early frost; however the frost damage is never so severe as on the large, cool air-receiving flats that do not support forest growth. The canopy is usually open and includes only aspen. As a result of the open-canopy conditions, the shrub and herb layers are well developed, but the cover of the moss layer is very low (Table 9, Figures 11, 12 and 13). In order of decreasing presence, the most common shrub species are: *Rosa acicularis, Shepherdia canadensis* (a diagnostic species for the Mertensia association), *Viburnum edule*, and *Arctostaphylos uva-ursi* and *Juniperus communis* (both diagnostic species for the Mertensia - Festuca subassociation). The most common species in the herb layer are: *Galium boreale* and *Festuca altaica* (both diagnostic species for this subassociation), *Epilobium angustifolium, Delphinium glaucum, Fragaria virginiana, Geocaulon lividum,* and *Linnaea borealis* (Tables 4 and 5).

Figure 11. An exposed, open-canopy, distorted, stunted, grass-dominated aspen stand on an upper slope in the Atlin Lake area bordering a grassland ecosystem (BWBSdk subzone). This stand represents the driest variation of the Mertensia - Festuca (111) subassociation.

Figure 12. A semi-open canopy, soopalallie-dominated aspen stand on an upper slope in the Atlin Lake area (BWBSdk subzone). This stand represents the typic variation of the Mertensia - Festuca (111) subassociation. Note the white and black spruce understory on the mid-slope (in the background), which is occupied by a Mertensia - Arnica (112) community.

Figure 13. A wind-exposed, closed-canopy, cranberry-dominated aspen stand on an upper slope in the Atlin Lake area (BWBSdk subzone). This stand represents the wettest variation of the Mertensia - Festuca (111) subassociation.

112 Populus tremuloides - Mertensia paniculata: Arnica cordifolia (Mertensia - Arnica) subassociation

(References: Tables 3, 4, 5, and 9; Figures 4, 6, 8, 9, 14 to 17; Appendices 3 and 18)

Moderately dry (slightly dry), (poor) medium to rich sites in drier montane boreal climates

Mertensia - Arnica communities occur predominantly on water-shedding mid-slopes, less frequently on flats, in the Dry Cool BWBS (BWBSdk) subzone. These water-deficient sites support low- to medium-productivity aspen growth, with site index (@ 50 yrs bh) ranging from 10 to 16 m. The associated soils are moderately deep, coarse-skeletal, Dystric or Eutric Brunisols or Podzols, with Hemimor, Mormoder, or Leptomoder humus forms (Table 9).

The cover of the tree canopy is variable and, in addition to aspen, it may include white spruce, black spruce, and subalpine fir. These shade-tolerant tree species also occur in the understory of many stands (Figures 14, 15,16 and 17). Lodgepole pine occurs very infrequently in the tree layer. All the understory layers may be well developed, with their cover varying from stand to stand (Table 9). In order of decreasing presence, the most common shrub species are *Shepherdia canadensis* (a diagnostic species for the Mertensia association and this subassociation), *Rosa acicularis, Viburnum edule* (a diagnostic species for this subassociation), and *Salix scouleriana* (a diagnostic species for the Mertensia association). The most common herbs are: *Arnica cordifolia* and *Orthilia secunda* (the diagnostic species for this subassociation), and *Epilobium angustifolium*, *Geocaulon lividum, Linnaea borealis, Mertensia paniculata* (a diagnostic species for the Mertensia association), *Cornus canadensis, Delphinium glaucum, Goodyera repens, Achillea millefolium, Fragaria virginiana, Lupinus arcticus, Osmorhiza berteroi,* and *Festuca altaica*. The most common moss species are *Hylocomium splendens* and *Pleurozium schreberi* (Tables 4 and 5).

Figure 14. An open-canopy, fireweed-dominated aspen stand on a mid-slope north of Dease Lake (BWBSdk subzone). This stand represents the drier variation of the Mertensia - Arnica (112) subassociation.

Figure 15. An semi-open canopy, fireweed- and highbush cranberry-dominated aspen stand on a mid-slope north of Dease Lake (BWBSdk subzone). This stand represents the wetter variation of the Mertensia - Arnica (112) subassociation.

Figure 16. A closed-canopy, grass- and herb-dominated, old-growth aspen stand on a flat in the Atlin Lake area (BWBSdk subzone). This stand represents the drier and richer variation of the Mertensia - Arnica (112) subassociation.

Figure 17. An old growth, grass- and herb-dominated aspen stand with large canopy gaps on a flat in the Atlin Lake area (BWBSdk subzone). This stand also represents the drier and richer variation of the Mertensia - Arnica (112) subassociation. Willows and infrequently, white spruce regenerate in canopy gaps.

113 Populus tremuloides - Mertensia paniculata: Petasites frigidus (Mertensia - Petasites) subassociation

(References: Tables 3, 4, 5, and 9; Figures 4, 6, 8, 9, 18 and 19; Appendices 4 and 19)

Slightly dry to fresh (often with fluctuating water table), (poor) medium to rich sites in drier montane boreal climates

More or less water-receiving Mertensia - Petasites communities occur predominantly on lower slopes, with intermittent seepage, less frequently on flats affected by a fluctuating water table, in the Dry Cool BWBS (BWBSdk) subzone. These slightly dry to fresh sites support low- to medium-productivity aspen growth, with site index (@ 50 yrs bh) ranging from 10 to 15 m. The commonly associated soils are moderately deep, sandy loam to loamy, skeletal, occasionally gleyed, Eutric Brunisols or Podzols, with Hemimor, Humimor, Mormoder, or Leptomoder humus forms (Table 9).

The cover of the tree canopy is variable and, in addition to aspen, it usually includes shade-intolerant lodgepole pine and shade-tolerant white spruce, black spruce and subalpine fir, with shade-tolerant species also regenerating in the understory of many stands (Figures 18 and 19). All the understory layers are moderately well developed, with the moss layer having the highest average cover (Table 9). In order of decreasing presence the most common shrub species are: *Rosa acicularis, Shepherdia canadensis* (a diagnostic species for the Mertensia association), *Vaccinium vitis-idaea, Viburnum edule, Empetrum nigrum*, and *Ledum groelandicum*. The most common herb species are: *Linnaea borealis, Cornus canadensis, Petasites frigidus* (a diagnostic species for this subassociation), *Epilobium angustifolium, Geocaulon lividum, Lupinus arcticus* (a diagnostic species for this subassociation), *Mertensia paniculata* (a diagnostic species for the Mertensia association), *Achillea millefolium, Festuca altaica, Galium boreale, Fragaria virginiana, Mitella nuda* (a diagnostic species for this subassociation), *Orthilia secunda, and Goodyera repens.* The most common species in the moss layer are: *Hylocomium splendens, Pleurozium schreberi, Ptilium crista-castrensis*, and *Peltigera membranacea* (Tables 4 and 5).

Figure 18. View of a closed-canopy, dense aspen stand on a lower slope with a scattered understory of white spruce in the Iskut Lake area (BWBSdk subzone). This stand represents the drier variation of the Mertensia - Petasites (113) subassociation.

Figure 19. A closed-canopy, dense aspen stand on a lower slope with a scattered understory of white spruce in the Iskut Lake area (BWBSdk subzone). This stand represents the typic variation of the Mertensia - Petasites (113) subassociation.

210 Populus tremuloides - Ledum groelandicum (Ledum) association

(References: Tables 3, 4, 5, and 9; Figures 4, 6, 8, 9, 20, 21 and 22; Appendices 5 and 20)

Slightly dry to fresh, very poor to poor sites in wetter montane boreal climates

Ledum communities occur most often on very poor and slightly dry sites, and less frequently on poor and fresh sites. They occupy variable mesoslope positions but are most common on flats or very gentle lower slopes. These communities are restricted to wetter subzones of the BWBS zone, and were described from the Dawson Creek area. Aspen productivity is low, with site index (@ 50 yrs bh) ranging from 7 to 10 m. Commonly associated soils are moderately deep, sandy to loamy, skeletal, Dystric Brunisols, with thin Hemimor or Humimor (infrequently Mormoder) humus forms (Table 9).

Due to floristic distinctiveness and uniformity, Ledum communities are represented by a single unit at the association level within the Elymus alliance. The cover of the tree layer is variable and, in addition to aspen, it may include shade-intolerant lodgepole pine and shade tolerant white spruce, black spruce, and subalpine fir, with shade-tolerant species also regenerating in the understory of many stands (Figures 20, 21 and 22). All the understory layers are moderately well developed, with the shrub layer having on the average the highest cover (Table 9). In order of decreasing presence, the most common shrub species are: *Ledum groelandicum* and *Spiraea betulifolia* (both diagnostic species for this association), *Vaccinium myrtilloides*, and *V. vitis-idaea* (a diagnostic species for this association). The most common herb species are: *Linnaea borealis, Cornus canadensis, Epilobium angustifolium, Geocaulon lividum, Petasites frigidus* (a diagnostic species for the Elymus alliance and this association), *Lycopodium complanatum* and *Melampyrum lineare* (both diagnostic species for this association). The most common species in the moss layer are *Polytrichum juniperinum* (a diagnostic species for this association), *Pleurozium schreberi, Cladina rangiferina*, and *Peltigera aphthosa* (Tables 4 and 5).

Figure 20. An immature aspen cohort on a gentle upper slope with sparsely developed understory vegetation in the Fort St. John area (BWBSmw subzone). This stand represents the drier variation of the Ledum (210) association.

Figure 21. A closed-canopy, immature aspen stand on a mid-slope with sparsely developed understory vegetation and scattered pine and white spruce in the Fort St. John area (BWBSmw subzone). This stand represents the typic variation of the Ledum (210) association.

Figure 22. An immature, Labrador tea-dominated aspen cohort on a flat in the Tumbler Ridge area (BWBSmw subzone). This stand represents the wetter and poorer variation of the Ledum (210) association.

221 Populus tremuloides - Lathyrus ochroleucus: Hedysarum boreale (Lathyrus - Hedysarum) subassociation

(References: Tables 3, 4, 5, and 9; Figures 4, 6, 8, 9, 23 and 24; Appendices 6 and 21)

Slightly dry, poor to medium sites in wetter montane boreal climates

Lathyrus - Hedysarum communities occupy variable mesoslope positions but are most common on warm-aspect, upper or mid-slopes and flats. These communities are restricted to wetter subzones of the BWBS zone, and were described from the Dawson Creek area. Aspen productivity is low to medium, with site index (@ 50 yrs bh) ranging from 11 to 15 m. The associated soils are moderately deep, sandy-skeletal, Dystric or Eutric Brunisols, with or Mor or Mormoder humus forms (Table 9).

Lathyrus - Hedysarum communities represent the driest segment of the Lathyrus association (Figure 6). The cover of the tree layer is generally high, and in addition to aspen, it may include shade tolerant white spruce and subalpine fir, which also regenerate in the understory. The shrub and graminoid-dominated herb layers are well developed, but the moss layer is generally absent or very poorly developed (Table 9, Figures 23 and 24). In order of decreasing presence, the most common shrub species are: *Rosa acicularis, Vaccinium myrtilloides* (the diagnostic species for this subassociation), *Shepherdia canadensis*, *Amelanchier alnifolia* (the diagnostic species for the Lathyrus association), *Vaccinium vitis-idaea*, and *Ledum groelandicum*. The most common herb species are: *Elymus innovatus* (a diagnostic species for the Elymus alliance), *Lathyrus ochroleucus* (a diagnostic species for the Lathyrus association), *Maianthemum canadense, Linnaea borealis, Calamagrostis canadensis, Aster conspicuus* (a diagnostic species for the Lathyrus association), *Achillea millefolium* (a diagnostic species for this subassociation), *Galium boreale* (a diagnostic species for the Lathyrus association), and *Hedysarum boreale* (a diagnostic species for this subassociation).

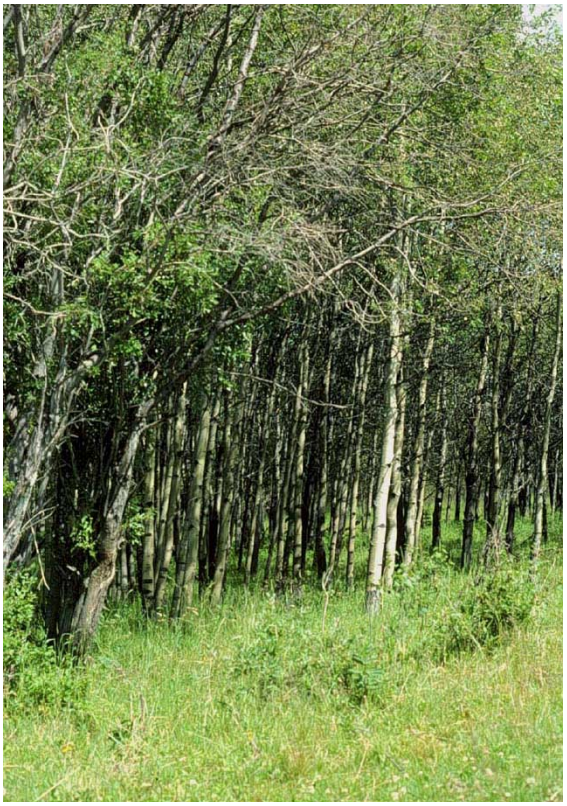

Figure 23. An immature, dense aspen stand on a gentle mid-slope in the Dawson Creek area (BWBSmw subzone) dominated by grasses (*Calamagrostis canadensis*, *Elymus innovatus*, and *Oryzopsis asperifolia*). This stand represents the typic variation of the Lathyrus - Hedysarum (221) subassociation.

Figure 24. A closed-canopy, low-productivity, mature aspen stand on a gentle mid-slope in the Dawson Creek area (BWBSmw subzone). The understory is grass-dominated (*Calamagrostis canadensis*, *Elymus innovatus*, and *Oryzopsis asperifolia*) with scattered low shrubs. This stand represents the drier variation of the Lathyrus - Hedysarum (221) subassociation.

222 Populus tremuloides - Lathyrus ochroleucus: typic (Lathyrus typic) subassociation

(References: Tables 3, 4, 5, and 9; Figures 4, 6, 8, 9, 25, 26 and 27; Appendices 7 and 22)

Slightly dry to fresh (moist), (poor) medium (rich) sites in wetter montane boreal climates

Typic Lathyrus communities occur on intermediate sites in the BWBSmw subzone, predominately on slightly dry or fresh, nutrient-medium sites. Occasionally they are found on poor or rich sites and very infrequently on moist sites. They occur most commonly on gentle mid-slopes or flats, and less frequently on lower slopes. This subassociation probably accounts for about half of the aspen communities in the wetter subzones of the BWBS zone, and, unlike the Ledum association and Lathyrus - Hedysarum subassociation, typic Lathyrus typic communities are distributed across the entire Liard Plain (Ft. Nelson, Ft. St. John, and Dawson Creek areas). Aspen productivity is medium, with site index (@ 50 yrs bh) ranging from 15 to 23 m, but timber quality is high as reflected in good growth form and absence of stem rot. The commonly associated soils are moderately deep, sandy to loamy-skeletal, Dystric or Eutric Brunisols and Gray Luvisols with Hemimor or Mormoder humus forms (Table 9).

The cover of the tree layer is generally high, and a high stand density is typical for immature stands (Figures 26 and 27). This is the result of prolific suckering after disturbance (Figure 25). In addition to aspen, the tree layer may include white spruce, subalpine fir, lodgepole pine, paper birch, and balsam poplar, with shade-tolerant species occurring in the understory. The shrub and herb layers are very well developed, but the moss layer consistently has a low cover (Table 9). In order of decreasing presence, the most common shrub species are: *Rosa acicularis* (a diagnostic species for the Lathyrus association), *Viburnum edule*, and *Shepherdia canadensis*. The most common herb species are: *Cornus canadensis* (a diagnostic species for this subassociation), *Epilobium angustifolium* (Figure 27), *Lathyrus ochroleucus* (a diagnostic species for the Lathyrus association), *Linnaea borealis*, *Rubus pubescens* (a diagnostic species for this subassociation), *Pyrola asarifolia* (a diagnostic species for the Lathyrus association), *Maianthemum canadense, Galium boreale* (a diagnostic species for the Lathyrus association), and *Elymus innovatus* (a diagnostic species for the Elymus alliance). The most common species in the moss layer is *Hylocomium splendens* (a diagnostic species for this subassociation) (Tables 4 and 5).

Figure 25. Vigorous regeneration of aspen following the cutting of conifers on a flat in the Fort St. John area (BWBSmw subzone). This stand represents an early initiation stage in stand development of the Lathyrus typic (222) subassociation.

Figure 26. A dense, immature, herb-dominated aspen stand on a flat in the Fort St. John area (BWBSmw subzone). This stand represents the drier variation of the Lathyrus typic (222) subassociation.

Figure 27. A dense, immature, fireweed-dominated aspen stand on a flat in the Fort St. John area (BWBSmw subzone). This stand represents the wetter variation of the Lathyrus typic (222) subassociation.

223 Populus tremuloides - Lathyrus ochroleucus: Actaea rubra (Lathyrus - Actaea) subassociation

(References: Tables 3, 4, 5, and 9; Figures 4, 6, 8, 9, and 28, 29, 30, and 31; Appendices 8 and 23)

Moist to very moist, rich (very rich) sites in wetter montane boreal climates

Lathyrus - Actaea communities represent the wettest segment of the Lathyrus association: in fact, the wettest sites supporting aspen growth in the BWBS zone. On these moist to very moist sites, aspen stands feature a high admixture of balsam poplar, which has a higher tolerance of water-surplus than aspen. Lathyrus - Actaea communities occupy lower slopes, which are often affected by intermittent seepage, or flats, which are often affected by a fluctuating water table. Similar to the Lathyrus typic subassociation, the Lathyrus - Actaea subassociation is distributed in the wetter subzones of the BWBS zone across the entire Laird Plain (Ft. Nelson, Ft. St. John, and Dawson Creek areas). Aspen productivity is high, with site index (@ 50 yrs bh) ranging from 20 to 25 m. Timber quality is also high as reflected in good growth form and absence of stem rot, particularly in the Fort Nelson area. The commonly associated soils are moderately deep, coase to fine-textured, Gleyed Dystric or Eutric Brunisols, occasionally Gleyed Gray Luvisols, with Mormdoder, Hydromoder, Mullmoder, or Vermimull humus forms (Table 9).

The cover of the tree layer is generally high; a high stand density is typical for immature stands (Figures 28 and 29). In addition to aspen, the tree layer usually includes white spruce and paper birch, with shade-tolerant spruce occurring in the understory (Figures 30 and 31). The shrub and herb layers are very well developed, with the moss layer usually absent (Table 9). In order of decreasing presence, the most common shrub species are: *Rosa acicularis* (a diagnostic species for the Lathyrus association), *Viburnum edule*, and *Cornus sericea* and *Lonicera involucrata* (a diagnostic species for this subassociation). The most common herbs are: *Actaea rubra* and *Aralia nudicaulis* (both diagnostic species for this subassociation), *Calamagrostis canadensis* (a diagnostic species for the Elymus alliance), *Epilobium angustifolium, Galium triflorum* (a diagnostic species for this subassociation), *Pyrola asarifolia* (a diagnostic species for the Lathyrus association), *Cornus canadensis*, *Delphinium glaucum* (a diagnostic species for this subassociation), *Equisetum pratense* (a diagnostic species for this subassociation), and *Mertensia paniculata* (Tables 4 and 5).

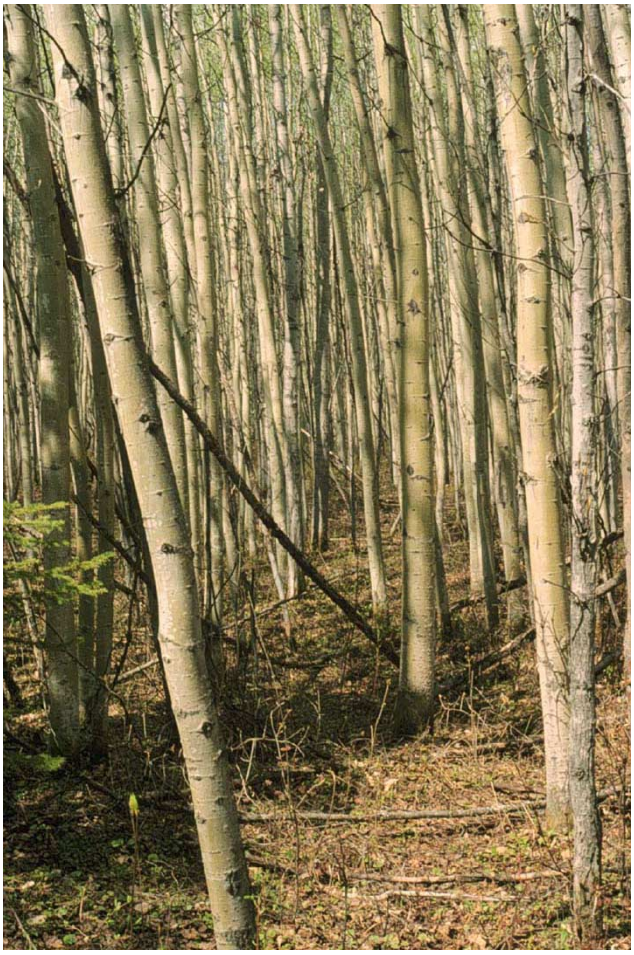

Figure 28. A dense, immature aspen stand on a lower slope in early spring in the Fort St. John area (BWBSmw subzone). This stand represents the typic variation of the Lathyrus - Actaea (223) subassociation.

Figure 29. A dense, immature, herb-dominated aspen stand on a flat in the Fort St. John area (BWBSmw subzone). This stand represents the wetter variation of the Lathyrus - Actaea (223) subassociation.

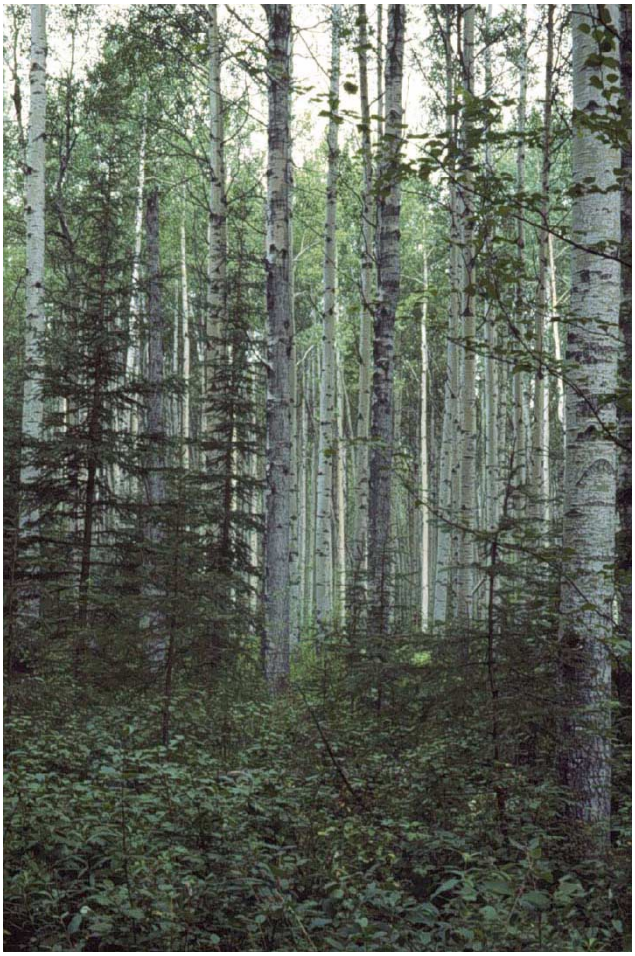

Figure 30. A semi-open canopy, mature, shrub-dominated aspen stand with scattered white spruce regeneration on an alluvial terrace in the Fort St. John area (BWBSmw subzone). This stand represents the wetter and richer variation of the Lathyrus - Actaea (223) subassociation.

Figure 31. A dense cohort of old aspen on a flat with a scattered understory of white spruce in the Fort Nelson area (BWBSdk subzone). This stand representing the wetter and richer variation of the Lathyrus - Actaea (223) subassociation is one of many with high-quality aspen timber in the area.

310 Populus tremuloides - Thalictrum occidentale (Thalictrum) association

(References: Tables 3, 4, 5, and 9; Figures 4, 7, 8, 9, 32, 33 and 34; Appendices 9 and 24)

Slightly dry to moist (often with fluctuating water table), (poor) medium to rich sites in montane boreal and cool temperate climates

The Thalictrum association represents floristically variable communities occurring in montane boreal and cool temperate climates (BWBS, SBS, SBPS, and IDF zones), with most of the communities located in the SBS zone. The floristic variability is indicated by the plot vegetation table, which shows that few species occur in more than 60% of the plots (presence class ≥ IV) (Table 5). This association lacks a diagnostic combination of species, but is defined by the low presence of species diagnostic of other units (Table 4). Thalictrum communities occur over a wide edaphic range, but are most common on fresh, nutrient-medium sites. They occupy various meso-slope positions, depending on climate, but most frequently depressions or flats with a fluctuating water table in drier climates (BWBS, SBPS, and IDF zones) (Figures 32 and 33) or the mid- or lower slopes (affected by intermittent seepage) in wetter climates (SBS zone). In the SBPS zone, Thalictrum communities typically form a narrow fringe in the transition between water surplus sites and water-deficient, upland lodgepole pine forest (Figure 34). Aspen productivity is medium, with site index (@ 50 yrs bh) ranging from 17 to 22 m. The commonly associated soils are shallow to moderately deep, loamy-skeletal, Gleyed Dystric or Eutric Brunisols, occasionally Gleyed Gray Luvisols, with Mormoder, or Leptomdoder humus forms (Table 9).

The cover of the tree layer is generally high. In addition to aspen, the tree layer nearly always includes white spruce, occasionally lodgepole pine and black spruce; white spruce, willows, and scrub birch are common in the understory (Table 9). The cover of the understory vegetation decreases in order form the shrub to the herb to the moss layer. In order of decreasing presence, the most common shrub species are: *Rosa acicularis*, *Viburnum edule, Lonicera involucrata, Salix* spp., and *Ribes lacustre*. The most common herbs are: *Epilobium angustifolium, Aster conspicuus, Fragaria virginiana, Galium boreale, Thalictrum occidentale, Achillea millefolium, Calamagrostis rubescens*, and *Cornus canadensis* (Tables 4 and 5).

Figure 32. An aspen fringe occupying a transitional area between a non-forested, mounded, graminoid community and an 'upland' lodgepole pine forest in the Nimpo Lake area (SBPS zone). The fringe and graminoid community are affected by a fluctuating water table. This stand represents the poorer variation of the Thalictrum (310) association.

Figure 33. An immature aspen stand surrounded by lodgepole pine in a shallow depression in the 100 Mile House area (IDF zone). This stand represents the drier and poorer variation of the Thalictrum (310) association on a site with a fluctuating water table.

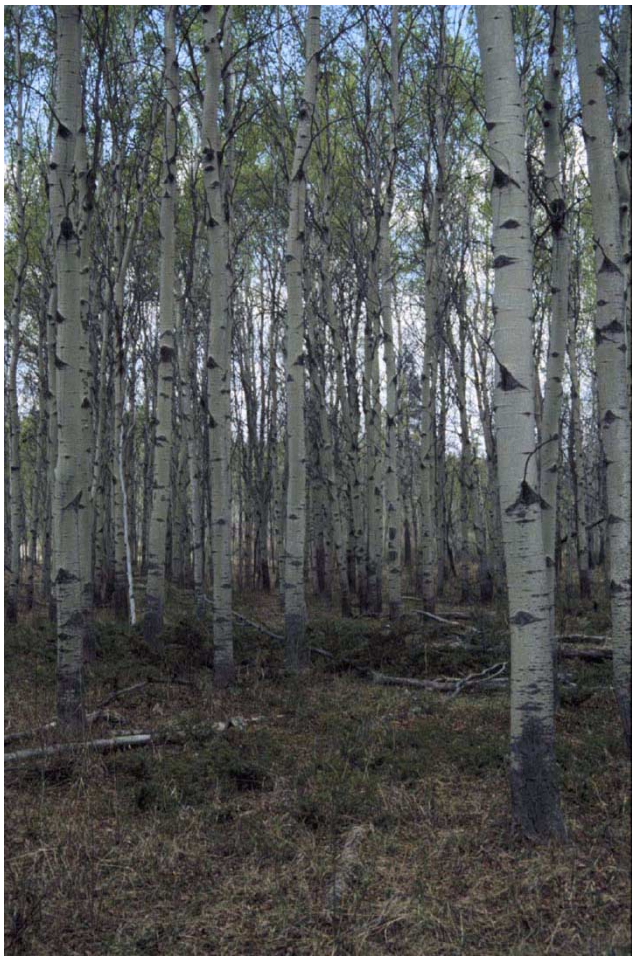

Figure 34. A closed-canopy, mature aspen stand with scattered scrub birch bordering a non-forested, frost-affected wetland (in the background) in the 100 Mile House area (IDF zone). This stand represents the wetter, most productive variation of the Thalictrum (310) association on a site with a fluctuating water table.

411 Populus tremuloides - Viburnum edule: Spiraea betulifolia (Viburnum - Spiraea) subassociation

(References: Tables 3, 4, 5, and 9; Figures 4, 7, 8, 9, 35, 36 and 37; Appendices 10 and 25)

Slightly dry to fresh (moist), (medium) rich to very rich sites in wetter montane boreal climates

The Viburnum - Spirea subassociation represents a sub-boreal segment of the Symphoricarpos alliance and Viburnum association (Tables 3 and 4). These slightly dry to fresh, nutrient-rich communities occupy flats or warm-aspect, mid- and lower slopes in the SBS zone, and feature a mixture of montane boreal and cool temperate species. The mean area of aspen stands is rather small compared to the BWBS zone. Aspen productivity is medium (Figures 35, 36 and 37), with site index (@ 50 yrs bh) ranging from 12 to 19 m. The commonly associated soils are moderately deep, well-drained, coarse or fine textured, skeletal, Dystric or Eutric Brunisols, Gray Luvisols, or Humo-Ferric Podzols, with Mormoder, or Mullmoder humus forms (Table 9).

The cover of the tree layer is generally high. In addition to aspen, the tree layer nearly always includes white spruce, and occasionally subalpine fir and Douglas-fir. White spruce, subalpine fir, and Sitka alder are common in the understory (Figure 37). The understory vegetation is always well developed; its cover decreases in order from the shrub to the herb to the moss layer (Table 9, Figures 35 and 36). In order of decreasing presence, the most common shrub species are: *Rosa acicularis* (a diagnostic species for the Viburnum association), *Amelanchier alnifolia* (a diagnostic species for the Symphoricarpos alliance), *Cornus stolonifera* (a diagnostic species for the Viburnum association), *Spiraea betulifolia, Symphoricarpos albus* (a diagnostic species for the Symphoricarpos alliance), *Viburnum edule* (a diagnostic species for the Viburnum association), and *Rubus parviflorus*. The most common herbs are: *Osmorhiza berteroi* and *Thalictrum occidentale* (both diagnostic species for this subassociation), *Aralia nudicaulis* (a diagnostic species for the Viburnum association), *Elymus glaucus* (a diagnostic species for the Symphoricarpos alliance), *Galium boreale* (a diagnostic species for this subassociation), *Linnaea borealis, Epilobium angustifolium, Rubus pubescens, Aster conspicuus and Fragaria virginiana* (both diagnostic species for this subassociation), *Clintonia uniflora*, and *Cornus canadensis* (Tables 4 and 5).

Figure 35. An immature, closed-canopy, herb-dominated aspen stand on a gentle mid-slope north of Vanderhoof (SBS zone). This stand represents the drier variation of the Viburnum - Spiraea (411) subassociation.

Figure 36. A late-immature, closed-canopy, shrub- and herb-dominated aspen stand on a flat near Cranberry Junction (ICH zone). This stand represents the wetter variation of the Viburnum - Spiraea (411) subassociation.

Figure 37. A late-immature, semi-open canopy, shrub-dominated aspen stand with scattered understory hybrid spruce on flat north of Fort St. James (SBS zone). This stand represents the wetter and richer variation of the Viburnum - Spiraea (411) subassociation.

412 Populus tremuloides - Viburnum edule: Paxistima myrsinites (Viburnum - Paxistima) subassociation

(References: Tables 3, 4, 5, and 9; Figures 4, 7, 8, 9, and 38, 39, 40, and 41; Appendices 11 and 26)

Slightly dry (fresh), medium to rich sites in wetter cool temperate climates

The Viburnum - Paxistima subassociation represents a segment of the Symphoricarpos alliance and Viburnum association that is located entirely within the ICH (Tables 3 and 4). These slightly dry to fresh, nutrient-rich communities occupy variable meso-slope positions but they occur most frequently on warm-aspect mid-slopes (Figures 39, 40 and 41), rarely on flats. Similarly to the Viburnum - Spiraea communities, the Viburnum - Paxistima stands occupy small areas compared to the montane boreal stands. Aspen productivity is medium, with site index (@ 50 yrs bh) ranging from 15 to 23 m. The commonly associated soils are moderately deep, moderately well-drained, coarse or fine textured, skeletal, Eutric Brunisols, with Mormoder or Leptomoder humus forms (Table 9).

The cover of the tree layer is variable but generally high (Figures 39, 40 and 41). The tree layer may include paper birch , western redcedar, and western hemlock (all diagnostic species for this subassociation); occasionally balsam poplar, subalpine fir, western white pine, and Douglas-fir. Shade tolerant tree species, *Alnus sitchensis*, and *Corylus cornuta* (a diagnostic species for this subassociation) are common in the understory (Table 9, Figure 41). The understory vegetation is always well developed; its cover decreases in order from the shrub to the herb to the moss layer, which has a low cover. In order of decreasing presence, the most common shrub species are: *Paxistima myrsinites* (a diagnostic species for the Symphoricarpos alliance and Viburnum - Paxistima subassociation), *Rubus parviflorus*, *Cornus stolonifera* (a diagnostic species for the Viburnum association), *Rosa acicularis*, *Viburnum edule*, and *Lonicera involucrata* (a diagnostic species for the Viburnum association). The most common herbs are: *Aralia nudicauli*s (a diagnostic species for the Viburnum association), *Clintonia uniflora*, *Cornus canadensis, Elymus glaucus, Epilobium angustifolium, Linnaea borealis*, and *Maianthemum racemosum*. The most common bryophytes are: *Rhytidiadelphus triqetrus* (a diagnostic species for this subassociation), *Pleurozium schreberi*, and *Ptilium crista-castrensis* (Tables 4 and 5).

Figure 38. An immature mixture of aspen and birch dominated by falsebox on a mid-slope in the Horsefly area (ICH zone). This stand represents the drier variation of the Viburnum - Paxistima (412) subassociation.

Figure 39. A uniform, immature, closed-canopy, falsebox-dominated aspen stand on a gentle mid-slope near Cranberry Junction (ICH zone). This stand represents the typic variation of the Viburnum - Paxistima (412) subassociation.

Figure 40. An immature mixture of aspen, black cottonwood, and birch on a mid-slope near Horsefly (ICH zone). This stand represents the wetter variation of the Viburnum - Paxistima (412) subassociation.

Figure 41. A mature aspen with *Corylus cornuta* in the upper shrub layer stand on a flat near St Marry Lake (ICH zone). This stand represents the wetter and richer variation of the Viburnum - Paxistima (412) subassociation.

421 Populus tremuloides - Rosa nutkana: Aralia nudicaulis (Rosa - Aralia) subassociation

(References: Tables 3, 4, 5, and 9; Figures 4, 7, 8, 9, 42, and 43; Appendices 12 and 27)

(Fresh) moist to very moist, (medium) rich to very rich sites in wetter cool temperate climates

Rosa - Aralia communities are most common on moister and richer sites, but occasionally occur on fresh, or nutrient-medium sites. They are found almost exclusively on cool-aspect lower slopes, sometimes affected by seepage, or on flats influenced by a strongly fluctuating water table. These communities were described from the MS, ICH, and wetter IDF subzones. These water surplus sites support high-productivity aspen growth with site index (@ 50 yrs bh) ranging from 21 to 31 m (Figure 42). The associated soils in the MS and ICH zones include coarse-skeletal Humo-Ferric Podzols, loamy-skeletal Eutric Brunisols or loamy-skeletal Gray Luvisols; the associated humus forms are predominantly Mormoders, Leptomoders or Vermimulls (Table 9).

The tree layer of the Rosa - Aralia communities includes frequently hybrid spruce, paper birch, lodgepole pine, and black cottonwood (on very moist sites); the sub-canopy may include hybrid spruce and/or western redcedar (Figure 43). Rosa - Aralia communities usually have well developed shrub and herb layer, but sometimes both of these layers have a very low cover (Table 9). The moss layer is absent or its cover is low. In order of decreasing presence, the most common shrubs are: *Symphoricarpos albus* (a diagnostic species for the Symphoricarpos alliance), *Acer glabrum* (an important companion for the Rosa association), *Rubus parviflorus*, and *Cornus stolonifera*. The most common species in the herb layer are: *Elymus glaucus* (a diagnostic species for the Symphoricarpos alliance), *Osmorhiza berteroi* (an important companion for the Symphoricarpos alliance), *Festuca subuliflora* (a diagnostic species for the Rosa association), *Aralia nudicaulis* (a diagnostic species for the Aralia subassociation), *Cornus canadensis*, *Galium triflorum* (an important companion for the Rosa association), and *Mainathemum stellatum* (an important companion for the Symphoricarpos alliance) (Tables 4 and 5).

Figure 42. View of the canopy of one of the most productive aspen stands on a moist and rich site in the SBS-ICH transition near Gavin Lake. This stand represents the wetter and richer variation of the Rosa - Aralia (421) subassociation.

Figure 43. An open-canopy aspen stand with abundant regeneration of Douglas-fir, hybrid spruce, and subalpine in the understory near Horsefly (ICH zone). This stand represents the drier variation of the Rosa - Aralia (421) subassociation.

422 Populus tremuloides - Rosa nutkana: Arnica cordifolia (Rosa - Arnica) subassociation

(References: Tables 3, 4, 5, and 9; Figures 4, 7, 8, 9, and 44; Appendices 13 and 28)

Moderately to slightly dry, medium to rich sites in montane cool temperate climates

Rosa - Arnica communities occur predominantly on mid-slopes in the MS, ICH, and IDF zones. Although water-deficient, these sites support high-productivity aspen growth, with site index (@ 50 yrs bh) ranging from 20 to 27 m. The associated soils in the MS and ICH zones are typically coarse-skeletal Humo-Ferric Podzols or, in the IDF zone, loamy-skeletal Eutric Brunisols. The associated humus forms are Mormoders and Leptomoders in the MS and ICH zones, and Hemimors in the IDF zone (Table 9).

Rosa - Shepherdia communities may include paper birch, and occasionally western white pine and western larch, in the canopy. Douglas-fir may occur in the canopy or sub-canopy in the IDF zone, and hybrid spruce in the MS, ICH, and IDF zones. In the ICH zone, western redcedar and western hemlock can be found in the sub-canopy. Most stands are structurally diversified into well developed, species-rich shrub and herb layers, either layer or both layers may be poorly developed in some cases (Table 9, Figure 44). The moss layer is essentially absent. In order of decreasing presence, the most common shrubs are: *Rubus parviflorus*, *Spiraea betulifolia*, *Acer glabrum* (an important companion for the Rosa association), *Mahonia aquifolium* (a diagnostic species for the Rosa association), and *Shepherdia canadensis*. In order of decreasing presence, the most common species in the herb layer are: *Osmorhiza berteroi* (an important companion for the Symphoricarpos alliance), *Arnica cordifolia* (a diagnostic species for this subassociation), *Galium triflorum* (an important companion for the Rosa association), *Calamagrostis rubescens*, *Chimaphila umbellata* (a diagnostic species for this subassociation), *Clintonia uniflora*, and *Linnaea borealis* (Tables 4 and 5).

Figure 44. A mature, small shrub- and herb-dominated aspen stand on a mid-slope on the side of a gully west of Williams Lake (IDF zone). This stand represents the drier variation of the Rosa - Arnica (422) subassociation.

423 Populus tremuloides - Rosa nutkana: Angelica genuflexa (Rosa - Angelica) subassociation

(References: TTables 3, 4, 5, and 9; Figures 4, 7, 8, 9, and 45; Appendices 14 and 29)

(Slightly dry) fresh, medium to rich (very rich) sites in cool temperate climates

Rosa - Angelica communities occur predominantly on south-aspect mid- or lower slopes or on flats affected by intermittent seepage in the ICH and IDF zones. These sites support medium- to high-productivity aspen growth with site index (@ 50 yrs bh) ranging from 19 to 26 m. The associated soils are typically sandy to loamy-skeletal Eutric Brunisols, occasionally Gray Luvisols, with Vermimull or Moder humus forms (Table 9).

In the IDF zone, Rosa - Angelica communities may include Douglas-fir in the canopy or sub-canopy while hybrid spruce can be present in both the IDF and ICH zones (Figure 45). Lodgepole pine in the canopy and western hemlock in the sub-canopy are infrequent. The stand structure is typically diversified into well developed, species-rich shrub and herb layers, but the moss layer is essentially absent (Table 9). In order of decreasing presence, the most common shrubs are: *Amelanchier alnifolia* (a diagnostic species for this subassociation), *Sympricarpos albus* (a diagnostic species for the Symphoricarpos alliance), *Rubus parviflorus, Cornus stolonifera, Lonicera involucrata*, and *L. utahensis* (an important companion for the Rosa association). The common herbs include: *Actaea rubra, Angelica genuflexa, Aster conspicuus, Disporum hookeri, Lilium columbianum*, and *Thalictrum occidentale* (all diagnostic species for this subassociation) (Tables 4 and 5).

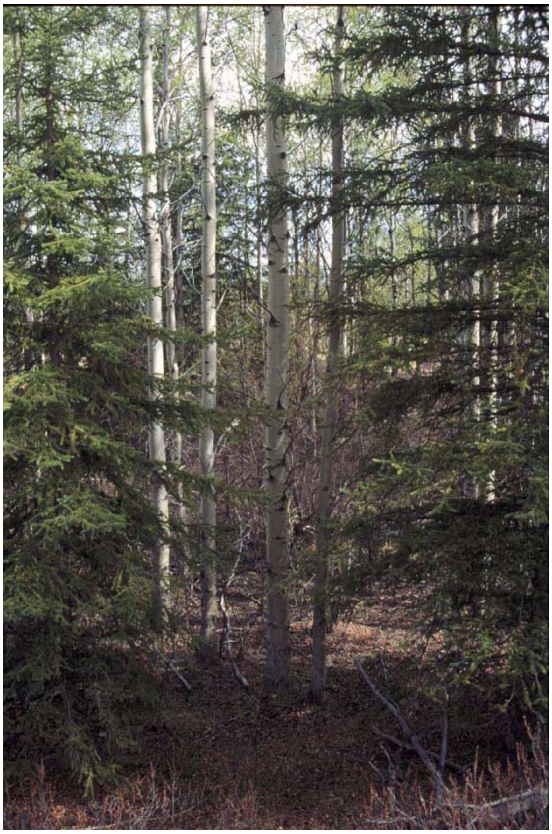

Figure 45. An immature, open-canopy, clumpy aspen stand with western hemlock and hybrid spruce in the understory on a flat near Horsefly (ICH zone). This stand represents the typic variation of the Rosa - Angelica (423) subassociation associated with a fluctuating water table.

424 Populus tremuloides - Rosa nutkana: Senecio pseudoaureus (Rosa - Senecio) subassociation

(References: Tables 3, 4, 5, and 9; Figures 4, 7, 8, 9, and 46; Appendices 15 and 30)

Moderately dry (slightly dry), (medium) to rich (very rich) sites in drier cool temperate climates

Rosa - Senecio communities occur on water-deficient sites, typically on upper or mid-slopes or on flats associated with fluvial deposits in the IDF and MS zones. While most common on moderately dry and rich sites, these communities are occasionally found on slightly dry and on medium or very rich sites. Although dry, these sites represent medium- to high-productivity conditions for aspen growth with site index @ 50 yrs bh ranging from 15 to 25 m; however, there is a high incidence of stem rot. The associated soils are loamy-skeletal Eutric Brunisols, occasionally Humo-Ferric Podzols or Grey Luvisols, with Vermimull or Leptomoder humus forms (Table 9).

Rosa - Senecio communities may include lodgepole pine in the upper canopy or Douglas-fir (in the IDF zone) or hybrid spruce (in the MS zone) in the canopy or sub-canopy, or western redcedar in the sub-canopy (in the IDF zone). The stand structure is usually simple, with either the shrub or herb layer (or both) being poorly developed (Table 9, Figure 46). The moss layer is essentially absent. Common shub species include: *Amelanchier alnifolia* (a diagnostic species for the Symphoricarpos alliance), *Mahonia aquifolium* (a diagnostic species for the Rosa association), *Rosa nutkana*, *Paxistima myrsinites* and *Symphoricarpos albus* (both diagnostic species for the Symphoricarpos alliance). *Calamagrostis rubescens* and *Elymus glaucus* (a diagnostic species for the Symphoricarpos alliance) are constant dominants, and *Senecio pseudoaureus* (a diagnostic species for this subassociation) and *Fragaria virginiana* are other common herbs. The Rosa - Senecio subassociation has only one, albeit weak, diagnostic species (*Senecio pseudoaureus*). This means that these communities are identified by the absence of diagnostic species identified for the other four subassociations of the Rosa nutkana association (Tables 4 and 5).

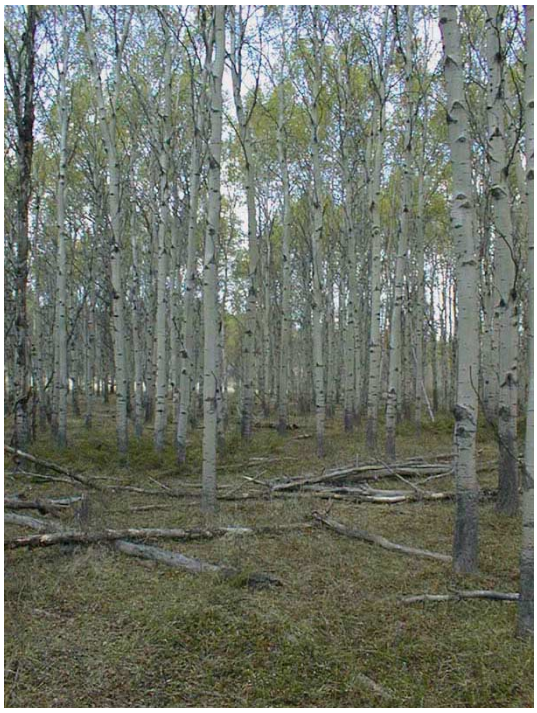

Figure 46. A uniform, closed-canopy mature aspen stand with a shrub (*Shepherdia canadensis*), grass (*Calamagrostis rubescens*), and herb-dominated understory near Yahk (MS zone). This stand represents the poorer variation of the Rosa - Senecio (424) subassociation.

425 Populus tremuloides - Rosa nutkana: Shepherdia canadensis (Rosa - Shepherdia) subassociation

(References: Tables 3, 4, 5, and 9; Figures 4, 7, 8, 9, and 47; Appendices 16 and 31)

Very dry (moderately dry), poor to rich sites in drier cool temperate climates

The Rosa - Shepherdia subassociation represents aspen communities characterized by severe water deficit. They occur on the driest and warmest sites, which are mostly very dry, and occasionally moderately dry, but have a wide range of nutrient conditions. These communities are typically found on ridge crests and warm-aspect, upper slopes in the IDF, SBPS, and MS zones, often bordering grassland communities, but sometimes occur on flats. The marginal environmental conditions for aspen growth are indicated by the occasional presence of *Juniperus scopulorum*. In the driest IDF subzones, Rosa - Shepherdia communities are located in gullies that feature ephemeral streams. The associated soils are typically loamy-skeletal Eutric Brunisols, occasionally Luvisols, with thin Leptomoder or Mull (when the cover of graminoids is high) humus forms. Small patches of exposed mineral soil are common, especially on steep slopes. Aspen growth is poor to medium (site index (@ 50 yrs bh) ranges form 8 to 16 m), often with a distorted growth form and a high incidence of stem rot (Table 9, Figure 47).

Rosa - Shepherdia communities may include lodgepole pine in the upper canopy or Douglas-fir in the canopy or sub-canopy. The stand structure is variable, typically both a shrub and herb layer are present, but either, or both may be poorly developed (Table 9). The cover of mosses is very low. *Shepherdia canadensis* and *Arctostaphylos uva-ursi* (a dominant differential species for this subassociation), *Rosa nutkana* (diagnostic for the Rosa association) and *Juniperus communis ursi* (a dominant differential species for this subassociation) are the most common shrubs. *Calamagrostis rubescens* is a constant dominant understory species; other associated grasses may include *Elymus glaucus*, *E. repens*, *Festuca subuliflora, Poa nemoralis, Oryzopsis asperifolia*, and *Stipa richardsonii*. Common forb species include: *Achillea millefolium, Fragaria virginiana*, and *Galium boreale* (an important companion for this subassociation) (Tables 4 and 5).

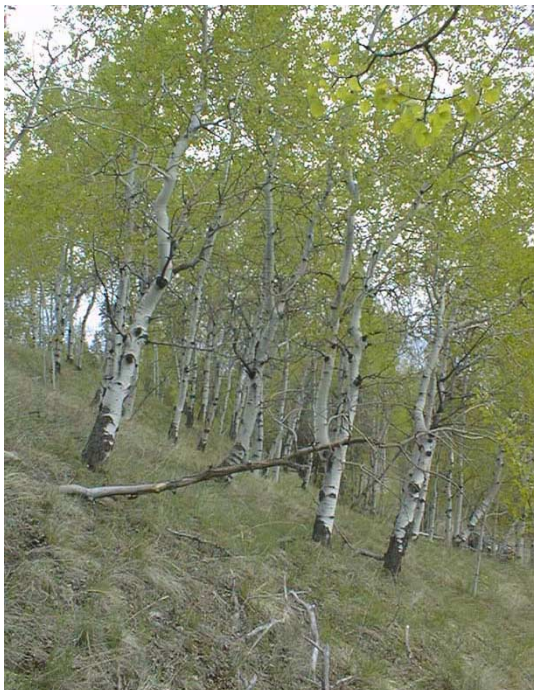

Figure 47. A distorted, mature aspen stand with a graminoid-dominated (*Calamagrostis rubescens*) understory on an upper slope near Dog Creek (IDF zone). This stand represents the drier and richer variation of the Rosa - Shepherdia (425) subassociation.

REFERENCES

Agriculture Canada Expert Committeee on Soil Survey. 1987. The Canadian system of soil classification. 2nd ed. Agric. Can. Publ. 1646. Agriculture Canada, Ottawa, ON. 164 pp.

Banner, A., W. MacKenzie, S. Haeussler, S. Thomson, J. Pojar, and R. Trowbridge. 1993. A field guide to site identification and interpretation for the Prince Rupert Forest Region. Land Management Handbook No 26. B.C. Min. For., Victoria, B.C.

Barkman, J.J., J. Moravec, and S. Rauschert. 1976. Code of phytosociological nomenclature. Vegetatio 32:131-185.

BC Ministy of Forests. no date. Biogeoclimatic units of the Prince George Forest Region. Map, scale 1:800,000. B.C. Min. For., Prince George, B.C.

BC Ministy of Forests. 1988. Biogeoclimatic and ecoregion units of the Prince Rupert Forest Region. Map, scale 1:500,000. B.C. Min. For., Prince George, B.C.

BC Ministry of Forests. 1997. Site index estimates by site series for coniferous tree species in British Columbia. Forest Renewal BC and BC Ministry of Forests, Victoria, B.C. 265 pp.

Becking, R.W. 1957. The Zurich-Montepellier School of phytosociology. Bot. Rev. 23:411-488.

Brooke, R.C., E.B. Peterson, and V.J. Krajina. 1970. The subalpine Mountain Hemlock zone. Ecol. Western N. Amer. 2:148-349.

Chen, H.Y.H., K. Klinka, and R.D. Kabzems. 1998a. Height growth and site index models for trembling aspen (*Populus tremuloides* (Michx.) in northern British Columbia. For. Ecol. Manage. 102: 157-165.

Chen, H.Y.H., K. Klinka, and R.D. Kabzems. 1998b. Site index, site quality, and foliar nutrients of trembling aspen: relationships and predictions. Can. J. For. Res. 28:1743-1755.

DeLong, C. 1988. A field guide for identification of seral aspen ecosystems of the BWBSc1, Prince George Forest Region. Land Manage. Handbook No. 16., BC Ministry of Forests, Victoria BC. 36 pp.

Emanuel, J. 1999. VTAB Ecosystem Reporter Revision 199907a. Department of Forest Sciences, University of British Columbia, Vancouver, B.C.

Fons, J., K. Klinka, and R.D. Kabzems. 1998. Humus forms of trembling aspen ecosystems in northeastern British Columbia. Forest Ecol. Manage. 105: 241-250.

Green, R.N., R.L. Towbridge, and K. Klinka. 1993. Towards a taxonomic classification of humus forms. For. Sci. Monog. 29. 49pp.

Green, R.N. and K. Klinka. 1994. A field guide to site identification and interpretaion for the Vancouver Forest Region. B.C. Min. For., Victoria, B.C. 285 pp.

Hill, M.O. 1979. TWINSPAN - a FORTRAN program for arranging multivariate data in an ordered two-way table by classification of the individuals and attributes. Cornell University, Ithaca, N.Y.

Kayahara, G.J., K. Klinka, P.V. Krestov, and H. Qian. 2000. Comparison of vegetation and soil nutrient properties between black spruce and trembling aspen ecosystems in the boreal black and white spruce zone of British Columbia. Submitted for publication in Can. J. For. Res.

Klinka, K., V.J. Krajina, A. Ceska and A.M. Scagel. 1989. Indicator plants of coastal British Columbia. University of British Columbia Press, Vancouver, B.C. 138 pp.

Klinka, K., H. Qian, J. Pojar, and D.V. Meidinger. 1996. Classification of natural forest communities of coastal British Columbia, Canada. Vegetatio 125: 149-168.

Krajina, V.J. 1969. Ecology of forest trees in British Columbia. Ecol. Western N. Amer. 2:1-146.

Little, E.L. Jr. 1979. Checklist of United States Trees. USDA For. Serv. Agricultural Handbook 541. Washington, D.C., 373 pp.

Luttmerding, H.A, D.A. Demarchi. E.C. Lea, D.V. Meidinger and T. Vold (*eds.*) 1990. Describing ecosystems in the field. 2nd ed. B.C. Min. For., Victoria, B.C.

Magurran, A.E. 1988. Ecological diversity and its measurement. Princeton University Press, Princeton, N.Y. 179 pp.

Meidinger, D.V. and J. Pojar (*eds.*) 1991. Ecosystems of British Columbia. Special Rep. Series no. 6, B.C. Min. For., Victoria, B.C.

Mueggler, W.F. Vegetation associations. Pp. 45-55 in N.V. DeByle and R.P. Vinokur (editors). Aspen: Ecology and management in the western United States. USDA For. Serv. General Technical Report RM-119, Rocky Mountain For. and Range Exp. Stat., Fort Collins, Colorado.

Mueller-Dombois, D., and H. Ellenberg. 1974. Aims and methods of vegetation ecology. John Wiley and Sons, Toronto, ON.

New, D. 1999. Productivity of western larch in relation to categorical measures of climate, soil moisture, and soil nutrients. M.Sc.Thesis, Faculty of Forestry, University of British Columbia. 47 pp.

Nigh, G.D. 1996. Growth intercept models for species without distinct annual branch whorls: western hemlock. Can. J. For. Res. 26:1407-1415.

Oliver, C.D. and B.C. Larson. 1996. Forest stand dynamics. McGraw-Hill, Inc., New York. 467 pp.

Perala, D.A. 1990. Populus tremuloides (Michx). Pp. 555 -569 in R.M. Burns and B.H. Honkala (editors). Silvics of North America. Vol. 2. Hardwoods. USDA For. Serv. Agri. Handbook 445, Washington, D.C. 877 pp.

Pojar, J. , K. Klinka, and D.V. Meidinger. 1987. Biogeoclimatic ecosystem classification in British Columbia. For. Ecol. Manage. 22:119-154.

Poore, M.E.D. 1962. The methods of successive approximation in descriptive ecology. Adv. Ecol. Res. 1:35-68.

Qian, H. and K. Klinka. 1998. Plants of British Columbia: scientific and common names of vascular plants, bryophytes, and lichens. University of British Columbia Press, Vancouver, B.C. 534 pp.

Qian, H., K. Kinka, and B. Sivak. 1997. Diversity of the understory vascular vegetation in 40 year-old and old-growth forest stands on Vancouver Island, British Columbia. J. Veg. Sci. 8:773-780.

Wang, Q. 1992. Ecological and height growth analysis of some sub-boreal immature lodgepole pine stands in central British Columbia. Ph.D. thesis, Fac. For., Univ. B.C. Vancouver, B.C. 207 pp.

Wang, Q., G.G. Wang, K.D. Coates, and K. Klinka. 1994. Use of site factors to predict lodgepole pine and interior spruce site index in the Sub-Boreal Spruce Zone. Research Note No. 114, B.C. Min. For., Victoria, B.C.

Westhoff, V. and E. van der Maarel. 1980. The Braun-Blanquet approach. *In*: R.H. Whittaker (ed). Classification of Plant Communities. Edited by R.H. Whittaker. Dr. Junk bv Publishers, The Hague.

APPENDICES

Appendix 1. Summary vegetation table (in alphabetical order) for vegetation units delineated in trembling aspen ecosystems in British Columbia. This table presents non-diagnostic species and those that occur with the presence ≤40% (= presence class ≤II) in one or more columns. Weak diagnostic species (usually important companion species) that were used in the diagnostic combinations of species (Table 4 on page 12) are shaded in grey. Codes for vegetation units as in Table 3 on page 11.

Code	**111**	**112**	**113**	**210**	**221**	**222**	**223**	**310**	**411**	**412**	**421**	**422**	**423**	**424**	**425**
Number of sample plots	4	14	13	10	11	31	10	10	17	10	14	9	9	9	15
Number of plant species	62	101	111	41	72	78	87	103	119	102	112	87	81	115	103
Species	**Species presence and species significance[1]**														
Aconitum columbianum											II +				
Adenocaulon bicolor											II 4	II 2	II +	I h	
Adoxa moschatellina		I h							I h	II h					
Agoseris aurantiaca														I h	I h
Agropyron pauciflorum							I h								
Agrostis mertensii											I h				I h
Alectoria sarmentosa										I h					
Allium cernuum														I h	II +
Alnus viridis		I h	I 4	I 1	I 2	II 4	II 3		I 4	I 2		II 4	I 1		
Anaphalis margaritacea											II h	II h		I h	
Anemone multifida					II +										
Anemone parviflora												I h			
Antennaria microphylla														I h	
Antennaria neglecta	II h													I h	II +
Antennaria pulcherrima								I h							
Apocynum androsaemifolium					I 3				I h			II 2			
Aquilegia brevistyla						I t	I 1								
Aquilegia formosa	II h							I h	II h			I h	II 1		
Arabis holboellii					I h										
Arctostaphylos alpina		I h	I h												
Asplenium viride														I h	
Aster engelmannii						I +									
Aster modestus					I h				I h						
Aster sibiricus	II h	I h	I h					II 1	I +	I 1					II +
Asterella lindenbergiana					I +										
Athyrium filix-femina									I h		II +			II h	
Aulacomnium palustre			I h												
Betula nana			II h					I 3							I +
Botrychium lunaria											I h			I h	I h
Botrychium virginianum			I h				II h								
Bromus inermis					II 1		I h	II 1	I h		I h				I h
Calliergon giganteum											I h	II h	II h	I h	
Calliergon stramineum					I 3		I h	II 1	I h		I h	II h	I h		I h
Calochortus apiculatus														I h	
Calypso bulbosa			I h		I h										
Campanula rotundifolia											I h		I h	I h	I h
Carex concinna														I h	
Carex disperma					I h			I h	I h						

Code	111	112	113	210	221	222	223	310	411	412	421	422	423	424	425
Number of sample plots	4	14	13	10	11	31	10	10	17	10	14	9	9	9	15
Number of plant species	62	101	111	41	72	78	87	103	119	102	112	87	81	115	103
Species	**Species presence and species significance[1]**														
Carex obtusata								I h							
Carex rossii								I 2							
Carex spectabilis		I h						I h							
Castilleja hyetophila				I h	II +										
Castilleja miniata		I h						I h	I h			I h			I +
Castilleja sulphurea		I h													
Ceanothus velutinus												I h			
Cerastium arvense		I h													
Cinna latifolia					I h				I h	I h			I h	I h	
Cladina arbuscula	II h	I h													
Cladina stellaris	II h	I h	I h												
Cladonia borealis	II 1														
Cladonia cornuta	II h		I h												
Cladonia crispata	II h			I h											
Cladonia ecmocyna	II h	I h	I h												
Cladonia gracilis	II h														
Cladonia multiformis		I h	I h									I h		I h	I h
Cladonia ochrochlora	II h														
Cladonia phyllophora	II h										I h				
Cladonia pyxidata	II h														
Clematis occidentalis									I h				I h		
Coeloglossum viride					I h										
Corallorhiza maculata						I h									
Corallorhiza trifida		I h	I h								I h	II h		II h	I h
Crataegus douglasii											I h				
Cypripedium montanum													I h	I h	
Dactylis glomerata											I h			II 1	
Deschampsia cespitosa		I h							I h						
Dicranella palustris		II h	I +					I h	I h	I h					
Dicranum fragilifolium		I h													
Dicranum fuscescens		I h						I h	I h	I h	I h	I h	I h	I h	I h
Dicranum polysetum		I +	I h												
Dicranum scoparium		I h					I h			I h		I h		I h	
Disporum trachycarpum							I h								
Dryopteris expansa														I h	
Dryopteris fragrans														I h	I h
Elymus repens			I h					II h						I h	I 1
Elymus smithii			I h												
Empetrum nigrum	II h	I h	II 2												
Epilobium ciliatum			I +		I h			I h							
Equisetum arvense			I h			I t			I h		I h	I h			
Equisetum hyemale														I h	
Equisetum scirpoides		I h	I h					I h							
Equisetum sylvaticum			I h				I h			I h	II h				
Eurhynchium pulchellum									I h	I h					
Festuca brachyphylla															I h
Festuca occidentalis		I h							I h	I h			I h		I h
Flavocetraria nivalis	II h														

Code	111	112	113	210	221	222	223	310	411	412	421	422	423	424	425
Number of sample plots	4	14	13	10	11	31	10	10	17	10	14	9	9	9	15
Number of plant species	62	101	111	41	72	78	87	103	119	102	112	87	81	115	103
Species	**Species presence and species significance[1]**														
Frangula purshiana											I +				
Fritillaria affinis									I h						I h
Gentianella amarella	II h							I h						I h	I h
Geranium richardsonii			I h					II +	I h						
Geum macrophyllum					I h										
Glyceria elata								I h			I +				
Goodyera oblongifolia		I h	I h					I h	II h	I h		I h	II h		I h
Gymnocarpium dryopteris							I 3		I 4	I 3	I h				
Hedysarum sulphurescens															I h
Hieracium scouleri											I h	II h	I h	II h	II h
Hieracium umbellatum								I h							
Hypopitys monotropa										I h					
Juniperus horizontalis		I +													
Juniperus scopulorum															I 2
Larix occidentalis										I 3	I 3	II 4			
Lathyrus nevadensis			I h					II h	I h	I 2	I +				I h
Letharia vulpina														I h	I h
Leucanthemum vulgare														II h	
Leymus innovatus		I 3	I 2												
Listera convallarioides													I h		
Listera cordata									I h						
Lobaria pulmonaria		I h							I h	I h					
Lonicera utahensis									I h		II 4	I h	II 4	II 4	I h
Lycopodium annotinum		I 2	I h			I 2		I h	I 1						
Lycopodium dendroideum										I h					
Lycopodium obscurum				II 2	I 2										
Maianthemum racemosum						I h	I 1								
Maianthemum stellatum					I h		I h								
Maianthemum trifoliatum								I h							
Malus fusca									I h	I +					
Matteuccia struthiopteris							I h								
Medicago sativa														II 2	I 3
Mnium spinulosum		I h													
Moehringia lateriflora	II h														
Moneses uniflora							I 1								
Oplopanax horridus									I +		I h				
Parmelia saxatilis	II h														
Pedicularis bracteosa													I h		
Pedicularis racemosa										I h			I 1		
Peltigera malacea										I +		I h	I h		I h
Peltigera membranacea	II h	II h	II 2							I h					
Peltigera praetextata		I h						I h	I h		I h	II h		I h	
Peltigera scabrosa		I h	I h												
Penstemon procerus														I h	I h
Petasites sagittatus								I h							
Phleum pratense											I h			I h	I h
Piperia unalascensis											I h			I h	I h
Plagiomnium ciliare	II h														

Code	111	112	113	210	221	222	223	310	411	412	421	422	423	424	425
Number of sample plots	4	14	13	10	11	31	10	10	17	10	14	9	9	9	15
Number of plant species	62	101	111	41	72	78	87	103	119	102	112	87	81	115	103
Species	**Species presence and species significance[1]**														
Plagiomnium drummondii					I 4		I h		I h	I h	I h			I h	
Plagiomnium medium									I h		I h				
Platanthera obtusata		II h	I h		I h										
Platanthera orbiculata		I h	I h		I +	I t		I h	I h	I h					
Poa nemorosa											I h				II h
Poa palustis			I h					I h			II h			I h	
Pogonatum contortum															I h
Polemonium boreale	II +														
Polemonium caeruleum			I h												
Polytrichum strictum											I h	II h		II h	
Potentilla glandulosa														I h	I h
Prunella vulgaris											II 2			II h	I h
Prunus virginiana									I 1						
Pteridium aquilinum											II 3	II 3	II 4		
Ptilidium pulcherrimum	II h														
Pyrola chlorantha			I h										I h	I h	
Pyrola elliptica		II h	I h							I h					
Pyrola minor		II +	II h					I h	I h			I h			
Ranunculus eschscholtzii					I h										
Rhododendron albiflorum										I h					
Rhytidiadelphus squarrosus			I h						I +	I h					
Ribes triste			I h		I h	I h	I 2		I +						
Rubus idaeus			I h			I +	II 2	I 2	I h	I h	II +		II 2		I h
Rubus pedatus			I +												
Salix bebbiana		I +	I +					I 3	I 2				I h		
Salix glauca		I 3						I 6		I h					II 1
Salix lucida								I 2					II h		
Salix myrtillifolia			I h												
Salix sitchensis								I 1							
Sambucus racemosa									I h						
Sanicula marilandica										I h					
Sanionia uncinata	II 2	I h					I h	I h	I h					II h	
Saxifraga nelsoniana														I h	
Saxifraga tricuspidata	II +														
Schizachne purpurascens					I h	I +									
Senecio triangularis													I 1		
Silene menziesii														I h	I h
Solidago canadensis							I h		I h		II +	I h	I h		I h
Solidago spathulata	II h	I h	I h											I h	I h
Sorbus scopulina						I +			II h	II +			II +		
Spiraea douglasii									I 1						
Stellaria calycantha		I h						I h	I h	I h				II h	I h
Stenanthium occidentale										I h					I h
Stipa richardsonii															I h
Streptopus amplexifolius									I h						
Taraxacum officinale			I h			I h	I +	I h	I h		I h			II h	II +
Thalictrum venulosum							II 2								
Thamnolia vermicularis	II h		I h												

Code	111	112	113	210	221	222	223	310	411	412	421	422	423	424	425
Number of sample plots	4	14	13	10	11	31	10	10	17	10	14	9	9	9	15
Number of plant species	62	101	111	41	72	78	87	103	119	102	112	87	81	115	103
Species	**Species presence and species significance[1]**														
Tomentypnum nitens	II h														
Tortula ruraliformis				II h	I h										
Trifolium pratense									I h						I +
Trifolium repens											I h			II h	I h
Trillium ovatum											I h	I h			
Trimorpha acris															I h
Trisetum cernuum		I h	I h					I h	I h	I +	I h		II h	I h	
Urtica dioica													I +		
Vaccinium membranaceum		I h	I h					I h	II +	I h	I h	I h			I h
Vaccinium scoparium		I 2													
Viola lanceolata			I h												
Viola orbiculata										I h		I h			I h
Viola palustris			I h					I h	I h				I h		
Viola septentrionalis									I h	I h			II h		
Vulpia microstachys									I h	I h					
Zigadenus elegans		I h													

1 Species presence and significance classes defined in Table 4 on pag e12.

Appendix 2. Plot vegetation table for the 111 Populus tremuloides – Mertensia paniculata: Festuca altaica subassociation. Species are arranged in order of decreasing presence and alphabetically.

Plot number[1]	1	2	3	4
Species	Species significance[2]			
Epilobium angustifolium	7	+	+	4
Galium boreale	+	2	4	2
Populus tremuloides	7	7	6	9
Rosa acicularis	4	3	+	4
Shepherdia canadensis	6	3	6	5
Arctostaphylos uva-ursi		4	4	6
Delphinium glaucum	+		+	2
Festuca altaica		2	8	4
Fragaria virginiana	+	+	+	
Geocaulon lividum	4	2		+
Juniperus communis	6	6	5	
Linnaea borealis	5	3		3
Pleurozium schreberi	4	4		2
Salix scouleriana		4	4	7
Viburnum edule	5	3		7
Achillea millefolium	+		+	
Mertensia paniculata	+			3
Orthilia secunda	+			+
Pulsatilla patens	+		+	
Pedicularis labradorica		+		+
Trisetum spicatum		+	+	
Abies lasiocarpa	4			
Amelanchier alnifolia	3			
Antennaria neglecta			+	
Aquilegia formosa		+		
Aster sibiricus		+		
Cladonia borealis		3		
Calamagrostis canadensis				+
Cladina arbuscula ssp. mitis		+		
Cladina stellaris		+		
Cladonia cornuta		+		
Cladonia crispata		+		
Cladonia ecmocyna		+		
Cladonia gracilis		+		
Cladonia ochrochlora		+		
Cladonia phyllophora		+		
Cladonia pyxidata		+		
Drepanocladus uncinatus	4			
Empetrum nigrum	+			
Flavocetraria nivalis		+		
Gentianella amarella		+		
Hylocomium splendens				+
Lupinus arcticus				4
Moehringia lateriflora				+
Osmorhiza berteroi	+			
Parmelia saxatilis		+		
Peltigera aphthosa		+		
Peltigera membranacea		+		
Picea glauca	3			
Pinus contorta		+		
Plagiomnium ciliare	+			
Polemonium boreale			2	
Ptilidium pulcherrimum		+		
Rhizomnium glabrescens	+			
Saxifraga tricuspidata			2	
Solidago spathulata			+	
Stereocaulon tomentosum		1		
Thamnolia vermicularis		+		
Tomentypnum nitens	+			
Vaccinium vitis-idaea		5		

1 Plot numbers have been simplified in this report. See Appendix 32 on page 112 for original plot codes.
2 Species significance classes see Table 4 on page12 .

Appendix 3. Plot vegetation table for the 112 Populus tremuloides – Mertensia paniculata: Arnica cordifolia subassociation. Species are arranged in order of decreasing presence and alphabetically.

Plot number[1]	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Species	**Species significance[2]**													
Hylocomium splendens	6	8	7	+	7	2	3	7	7	7	6	+	+	6
Populus tremuloides	8	7	6	7	7	8	7	6	7	8	7	7	8	6
Shepherdia canadensis		4	7	5	7	6	6	8	6	5	7	7	6	5
Arnica cordifolia		4	+	5	+	+	+	3	6		+	+	+	+
Epilobium angustifolium		3	+	7	3	7	7	4	2		+	6	2	+
Geocaulon lividum	4	+	3	+	+	+	+	3	3	+	+			+
Linnaea borealis		5	4	7	5	+	3		4	+	5	6	2	+
Orthilia secunda	4	+	+	+	+	+	+	+		+		+	+	+
Rosa acicularis	2	+		3	3	3	5		2	5	+	4	6	+
Picea glauca	6	7	6	4	5	4	5		7	6	6			5
Mertensia paniculata		3	+	+	+	3	5	3	3		+	4		
Pleurozium schreberi	7	7	8	+		+	5	6	7	4				9
Viburnum edule	5	4	3	4	3	4	3	+				4		+
Cornus canadensis	+	4	7		3	5	5	5	5					+
Delphinium glaucum		+	+	+		+	+		3		+	+		
Goodyera repens		+	+		+		+	+	+	+				+
Achillea millefolium				+					+	+	+	+	+	+
Picea mariana	5	4	4	4	5	5	4							
Fragaria virginiana	+			5		+			+		+			+
Lupinus arcticus									+	+	4	+	3	
Osmorhiza berteroi			+		+	+	+	3						
Salix scouleriana		2						3		+		7	5	
Abies lasiocarpa	6	5			5			3						
Festuca altaica										+	+	+	3	
Juniperus communis				+						5			+	6
Peltigera aphthosa			+		+			4	4					
Arctostaphylos uva-ursi											4	4	7	
Dicranella palustris					+				+				+	
Peltigera membranacea	2				+						+			
Platanthera obtusata		+						+	+					
Populus balsamifera						+	3	5						
Ptilium crista-castrensis		5			+				+					
Pyrola elliptica			+	+			+							
Pyrola minor		+				+		3						
Rhizomnium glabrescens		+			+		+							
Actaea rubra						+		+						
Amelanchier alnifolia	+				+									
Castilleja sulphurea											+		+	
Cladonia ecmocyna										+	+			
Corallorhiza trifida						+		+						
Dicranum scoparium								+						+
Elymus glaucus	+											+		
Empetrum nigrum				+			+							
Galium boreale				+						+				
Goodyera oblongifolia	+													+
Ledum groenlandicum		4	3											
Lobaria pulmonaria	+	+												
Lycopodium annotinum	+	5												
Oryzopsis asperifolia	+													3
Pedicularis labradorica								3					+	
Peltigera scabrosa	+				+									
Pinus contorta										4				7
Rhytidiadelphus triquetrus					7				+					
Ribes lacustre	+						+							
Spiraea betulifolia	4													+
Alnus viridis														2
Adoxa moschatellina			+											

Plot number[1]	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Species	**Species significance[2]**													
Aralia nudicaulis	+													
Arctostaphylos alpina														+
Aster conspicuus	3													
Aster sibiricus														+
Calamagrostis canadensis												+		
Calamagrostis rubescens														+
Carex spectabilis														+
Castilleja miniata														+
Cerastium arvense														+
Cladina arbuscula														+
Cladina stellaris														+
Cladonia multiformis									+					
Clintonia uniflora	3													
Deschampsia cespitosa	+													
Dicranum fragilifolium							+							
Dicranum fuscescens					+									
Dicranum polysetum														4
Drepanocladus uncinatus		+												
Equisetum scirpoides		+												
Festuca occidentalis	+													
Galium trifidum										+				
Juniperus horizontalis										3				
Leymus innovatus										6				
Lonicera involucrata	5													
Lycopodium complanatum		+												
Maianthemum racemosum	1													
Pulsatilla patens										+				
Peltigera praetextata		+												
Petasites frigidus									+					
Platanthera orbiculata														+
Pseudotsuga menziesii	6													
Salix bebbiana								3						
Salix glauca											6			
Solidago spathulata											+			
Stellaria calycantha							+							
Trisetum cernuum				+										
Vaccinium caespitosum														4
Vaccinium membranaceum	+													
Vaccinium scoparium														5
Vaccinium vitis-idaea			2											
Vicia americana									+					
Zigadenus elegans													+	

1 Plot numbers have been simplified in this report. See Appendix 32 on page 112 for original plot codes.
2 Species significance classes defined in Table 4 on page 12.

Appendix 4. Plot vegetation table for the 113 Populus tremuloides – Mertensia paniculata: Petasites frigidus subassociation. Species are arranged in order of decreasing presence and alphabetically.

Plot number[1]	19	20	21	22	23	24	25	26	27	28	29	30	31
Species	**Species significance[2]**												
Populus tremuloides	5	7	7	6	6	9	6	7	8	7	5	9	7
Linnaea borealis	2	4			4	5	5	5	7	2	3	4	+
Rosa acicularis	+		+	+	+	+	2	4	6	+		2	2
Hylocomium splendens	6	7		9	9	7	8	7		8	9	5	
Shepherdia canadensis	4		+		+	+	3	4		+	+	5	2
Cornus canadensis	7	7	7	6		+	6	6		+		4	
Petasites frigidus	+	3	3	3	3	2	+	6					4
Pleurozium schreberi	7	8	7	5	6	6	6			7	6		
Epilobium angustifolium	6	3			3			3	3	+	+	3	
Geocaulon lividum		+	4	+		+	+	+			+	3	
Lupinus arcticus		3	5	4	4	4	4	+		2			
Mertensia paniculata		4		3	+		3	3	+		+	+	
Picea glauca	5	6			3	4	7				6	5	3
Picea mariana	7		6	6	4	3		6		5	5		
Achillea millefolium			+	+	3	+	+			+			+
Festuca altaica		+		3	3	+	+			2	+		
Galium boreale	+	+			+	3	+					3	+
Salix scouleriana				5	3	3		5	5		4		4
Vaccinium vitis-idaea		2	5	4	3		4				+	4	
Viburnum edule	3	3	3			7	4				+	3	
Fragaria virginiana	+			+	4	+		4					2
Mitella nuda	+		+	+	+	3	+						
Orthilia secunda					+		+	+	+	+	+		
Ptilium crista-castrensis	5	3		+	5		+				4		
Goodyera repens		3				+	+	+			+		
Peltigera membranacea	1	1		5						4	2		
Pinus contorta				6	7					6	6	5	
Arnica cordifolia	+			3		4				4			
Empetrum nigrum			3	+				+		5			
Ledum groenlandicum			4	5						5	+		
Pedicularis labradorica			+	+		+				+			
Peltigera aphthosa		+	+					3			4		
Pyrola minor					+	+				+		+	
Betula nana				+	+		+						
Abies lasiocarpa	1								+				
Arctostaphylos alpina				+						+			
Arctostaphylos uva-ursi			5		+								
Aster conspicuus	5												6
Aulacomnium palustre			+		+								
Calypso bulbosa						+						+	
Cladina stellaris				+						+			
Delphinium glaucum		2								+			
Dicranella palustris			3	+									
Equisetum scirpoides			+					+					
Galium triflorum	+												+
Leymus innovatus											4	5	
Platanthera obtusata						+		+					
Platanthera orbiculata		+										+	
Populus balsamifera	5						+						
Pyrola elliptica									+			+	
Rubus pedatus			3		+								
Rubus pubescens	3												+
Salix bebbiana										3		3	
Thamnolia vermicularis					+	+							
Vaccinium caespitosum						6	5						
Viola lanceolata			+			+							
Alnus incana												2	

Plot number[1]	19	20	21	22	23	24	25	26	27	28	29	30	31
Species	**Species significance[2]**												
Alnus viridis									7				
Actaea rubra	3												
Amelanchier alnifolia												2	
Aralia nudicaulis												4	
Aster ciliolatus	1												
Aster sibiricus													+
Betula papyrifera												2	
Botrychium virginianum	+												
Calamagrostis rubescens													7
Cladonia cornuta					+								
Cladonia ecmocyna								+					
Cladonia multiformis			1										
Corallorhiza trifida								+					
Cornus stolonifera	+												
Dicranum polysetum											+		
Elymus glaucus													+
Elymus repens													+
Elymus smithii	+												
Epilobium ciliatum													4
Equisetum arvense	+												
Equisetum pratense													+
Equisetum sylvaticum								+					
Festuca subuliflora													+
Geranium richardsonii													2
Goodyera oblongifolia								+					
Juniperus communis			+										
Lathyrus nevadensis													+
Lathyrus ochroleucus	3												
Lonicera involucrata	3												
Lycopodium annotinum										+			
Maianthemum racemosum	4												
Maianthemum canadense												4	
Osmorhiza berteroi	4												
Oryzopsis asperifolia													+
Poa palustris													+
Peltigera scabrosa		2											
Polemonium caeruleum			+										
Pyrola asarifolia	+												
Pyrola chlorantha		+											
Rhytidiadelphus squarrosus			+										
Rhytidiadelphus triquetrus	4												
Ribes lacustre	2												
Ribes triste	2												
Rubus idaeus													+
Salix sp.											2		
Salix myrtillifolia								+					
Solidago spathulata					+								
Taraxacum officinalis													+
Thalictrum occidentale	6												
Trisetum cernuum													+
Vaccinium membranaceum	+												
Vicia americana													+
Viola palustris					+								

1 Plot numbers have been simplified in this report. See Appendix 32 on page112 for original plot codes.
2 Species significance classes defined in Table 4 on page12.

Appendix 5. Plot vegetation table for the 210 Populus tremuloides – Ledum groenlandicum association. Species are arranged in order of decreasing presence and alphabetically.

Plot number[1]	32	33	34	35	36	37	38	39	40	41
Species	**Species significance[2]**									
Populus tremuloides	8	9	9	8	8	7	7	7	9	9
Cornus canadensis	4	4	4	4	5	6	6	5	5	4
Ledum groenlandicum	6	4	6	7	7	6	7	7	6	7
Petasites palmatus	2	2	+	4	4	4	4	4	3	3
Spiraea betulifolia	3	3	3	4	3	3	4	+	2	4
Vaccinium myrtilloides	7	7	7	7	6	5	5	5	7	7
Vaccinium vitis-idaea	5	5	5	4	4	4	4	2	5	5
Linnaea borealis	2	2	2		3	4	4	3	2	3
Polytrichum juniperinum	4	3	4		+	+	3	3	4	3
Epilobium angustifolium	2	3	+		2		4	5	2	2
Geocaulon lividum	3	3	2	3	3	3			4	3
Lycopodium complanatum	4	4	4		5	4		5	6	5
Pleurozium schreberi	4	3	5		4	4	3	4	4	
Abies lasiocarpa		3	2	2	2		2	2		+
Cladina rangiferina	5	4	5		5	3			4	5
Melampyrum lineare	2	2	+		3	2	3			+
Peltigera aphthosa	4	4	4		4	3			4	4
Salix sp.			2	2	2	3		3	4	3
Picea glauca	6			5	4			6	5	4
Picea mariana	4	4	4	4		4	4			
Calamagrostis canadensis			+		2	3	3	4		
Elymus innovatus	3	2	2						3	+
Lycopodium clavatum	4		4		4		3	5		
Maianthemum canadense					3		+	4	4	3
Pinus contorta			4	4	2	4				4
Stereocaulon tomentosum	3		3			+			3	4
Lathyrus ochroleucus	3		2				4	4		
Tortula ruraliformis		+	+			+	+			
Lycopodium obscurum		4							+	4
Alnus viridis				3		3				
Arctostaphylos uva-ursi						4	4			
Rosa acicularis									3	4
Aster ciliolatus							+			
Betula papyrifera				+						
Castilleja hyetophila								+		
Cladonia crispata										2
Equisetum pratense			+							
Hylocomium splendens			+							
Juniperus communis					+					
Shepherdia canadensis										4
Vaccinium caespitosum						4				

1 Plot numbers have been simplified in this report. See Appendix 32 on page 112 for original plot codes.
2 Species significance classes defined in Table 4 on page12 .

Appendix 6. Plot vegetation table for the 221 Populus tremuloides – Lathyrus ochroleucus: Hedysarum boreale subassociation. Species are arranged in order of decreasing presence and alphabetically.

Plot number[1]	42	43	44	45	46	47	48	49	50	51	52
Species	**Species significance[2]**										
Populus tremuloides	7	9	8	9	9	8	9	8	8	8	9
Elymus innovatus	6	4	6	4	6	6	6	3	4	3	
Lathyrus ochroleucus	5	3	4	3	4	4	4	3	3	4	
Maianthemum canadense	4	2	3	2	4	5	4	4	4	2	
Linnaea borealis	4	2		+	2	+	+		4	4	+
Picea glauca	5	5		6	4	3		4	4	4	6
Rosa acicularis	4	4	3	4	4		4	4	4	4	
Aster conspicuus	6	3	3	3	4	7	4	4			
Calamagrostis canadensis	2	4		4	2	2			4	4	3
Galium boreale	4	4	4	4	4	4	5	4			
Vaccinium myrtilloides	6	5		4	3	4		4	5	4	
Achillea millefolium	2	2	2	+	2		3	+			
Fragaria virginiana	2	2	2	3	3	4		2			
Hedysarum boreale	4	+	4	3	6	4	3				
Salix sp.	4	5		4		4			3	4	6
Shepherdia canadensis	4		5	3	4	4		4		4	
Amelanchier alnifolia	4	2			6	5	4	4			
Oryzopsis asperifolia	4	5	4	5	4		4				
Vaccinium vitis-idaea		+	2	3	3		5		3		
Vicia americana	4	2	+	2			5	4			
Arctostaphylos uva-ursi			6		4	6	5	6			
Epilobium angustifolium	3				2			2	4	4	
Petasites frigidus		4		2					4	4	+
Aster ciliolatus	2	+	3					2			
Cornus canadensis		4							7	6	+
Ledum groenlandicum		4		6					6	6	
Spiraea betulifolia			3			3		2	4		
Anemone multifida			2		+		+				
Bromus inermis	3						4		+		
Castilleja hyetophila			2			2	2				
Pyrola asarifolia	3	2		3							
Rubus pubescens				2					4		4
Symphoricarpos albus			3		2			4			
Abies lasiocarpa										4	3
Alnus viridis ssp. fruticosa									4	4	
Asterella lindenbergiana					3	2					
Hylocomium splendens										+	6
Lycopodium obscurum									4	4	
Platanthera orbiculata									3	+	
Apocynum androsaemifolium								6			
Arabis holboellii								+			
Aralia nudicaulis								4			
Aster modestus											2
Calliergon stramineum											6
Calypso bulbosa											+
Carex disperma											+
Cinna latifolia											+
Coeloglossum viride							+				
Cornus stolonifera											5
Epilobium ciliatum											+
Equisetum pratense											7
Geum macrophyllum											2
Lonicera involucrata										+	
Maianthemum stellatum									+		
Melampyrum lineare										2	
Mitella nuda											+
Osmorhiza berteroi											+

Plot number[1]	42	43	44	45	46	47	48	49	50	51	52
Species	**Species significance[2]**										
Orthilia secunda											+
Picea mariana											5
Pinus contorta		2									
Plagiomnium drummondii											7
Platanthera obtusata											+
Pleurozium schreberi									+		
Ranunculus eschscholtzii											+
Ribes triste											2
Schizachne purpurascens		2									
Tortula ruraliformis										+	
Viburnum edule											5
Viola renifolia				+							

1 Plot numbers have been simplified in this report. See Appendix 32 on pag e112 for original plot codes.
2 Species significance classes defined in Table 4 on page12 .

Appendix 7. Plot vegetation table for the 222 Populus tremuloides – Lathyrus ochroleucus: typic subassociation. Species are arranged in order of decreasing presence and alphabetically.

Plot number[1]	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
Species	**Species significance[2]**																														
Populus tremuloides	8	9	7	8	9	8	8	7	9	9	8	7	7	9	9	9	7	9	7	8	9	8	7	7	7	8	8	8	9	7	7
Rosa acicularis	6	6	5	6	3	4	4	5	7	4	6	6	6	6	6	5	4	4	6	6	6	5	5	5	4	4	5	3	4	5	4
Cornus canadensis	3	6	4		4	5	4	4	4	5	5	5	5	4	4	7	6	7	5	5	5	5	7	6	4	4		3	7	6	4
Epilobium angustifolium	4	6	2	3	4	3	5	5	4	4	6	2	4	4	4	3		3	6	4	4	4	4	4		5	5	5	5	4	2
Lathyrus ochroleucus	5	3	4	3	2	4	4	3	4	3	3	3	+		+	3	3	2	4	3	+	3		3	3	3	3	3	3	3	3
Linnaea borealis		4	2	+	3	3	3	3		4	4	4	4	4	4	4	4	4	4	4	4	3	4	4	3		2	3	5	3	4
Viburnum edule	4	5	5	5	4		4	4	5	4	4	5	5	5	5	3	4	+	3	4	4		6	6	4		4	2	3	5	5
Rubus pubescens	2	2	4	4	3	2	4	4	4	4	3	4		4	3	4	4	4		4	3	4	4	4	4	3	3	3			4
Salix sp.	3	4	4	4	3	4		3		4	6	5	4	4	5	4	4	5	3	4	4		4	3		4	4	3	4	3	5
Pyrola asarifolia		2	3		4	4	3	4	2	3	3	5	3	4	2	4			4	4	5	4	4	4	4	2		3	6	3	2
Maianthemum canadense	4	2	+	4	4	2	2	+	2	4	5	4	4		3	3	3	4	3	5	4		4	4	3					2	
Shepherdia canadensis	5	5	4	4		2	5		4		4	4	5	5	5	4	5	5	4	3	5				4	6	4	2	3	2	
Galium boreale	3	2	4	2		4	3	3	2		3	3	3	2	3				3	2	3				2	4	3	3		3	4
Hylocomium splendens	2				3		2	+		4			3	3	3	4	5	5	4	2	2	3	5	4	4	+		4	3		
Picea glauca					4	5	4	4		4	6		2	4	4	6	4	5	3	3	4	5	4	4	+	2					5
Elymus innovatus	5	4	2	+	+	6	3	3	5	4			5	4	4	4	4	4		5	5				5						5
Aster conspicuus	4	4	4	5			2		6					4	3	2	2	+		3					3	6	5	4	4	5	3
Fragaria virginiana	+	+	3	3		4	4	4	3		3	3		3		3	+	2	2							4	2	3	3		
Calamagrostis canadensis	+		4	2	+	3	4	2		3												4	4	4	2	3	4	3	4	4	3
Orthilia secunda		+		+		2	2		3		2		2	+	3		3	3						+		+		3	3	+	+
Petasites frigidus	3		3	3	4	6	4	4	4	2				2		4		3				3			4		2			2	4
Mertensia paniculata	4	+	4	3		2					4		3	2					2						2	4	4	2			3
Alnus viridis				3	5					6	5					4	5	4				5	3	4					4	4	
Aralia nudicaulis	5			7					6		4	5					+		5	4	4	5		4						4	
Ledum groenlandicum			+		4	6		+		6						6	6	6	+			5		+				2			
Vaccinium vitis-idaea						+					3	3	+			2	4	4		4	4	4	5	4							
Lonicera involucrata					2				+	2	3	+				+	+	+										+	5	+	
Spiraea betulifolia	4			5	4	+	3	4	4	4									+							2				3	
Vicia americana	4	+		+		4			+				+	+	2			+			+							2			
Amelanchier alnifolia	+	+	+					2				2														2	+		3	2	
Betula papyrifera								3						3					3		4	4	2				3				+
Viola renifolia								+								3	4	3							+		+	+			2
Equisetum pratense																	+					+			2	2	2	+			+
Achillea millefolium			+			2								+		+	2											+			
Arnica cordifolia							4	3																	3	3	3			4	
Lycopodium clavatum					2					3							3	4					4	4							
Symphoricarpos albus	3	2	2																							3	3			+	
Vaccinium myrtilloides					5	3				7						7	6	6													
Corallorhiza maculata		+		+		+	+		+																						
Cornus sericea	+								3							2		+								2					

Plot number[1]	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
Species	**Species significance[2]**																														
Rubus idaeus		+		4		2	+		2	+																		2		
Aster ciliolatus					2	5		3						4	4	4			3												
Pinus contorta																+		+													+
Populus balsamifera					4															4											
Galium triflorum																2	+	+													
Picea mariana							3	2																							
Pleurozium schreberi									3	+						2															
Ribes oxyacanthoides											4								4												
Ribes triste				4					2																						
Vaccinium caespitosum												+																			
Actaea rubra																															
Aster engelmannii																															
Elymus glaucus																															
Lycopodium annotinum																															
Maianthemum racemosum																															
Oryzopsis asperifolia																															
Ptilium crista-castrensis																															
Ribes lacustre																															
Sorbus scopulina																															
Taraxacum officinale																															
Viola canadensis																															
Abies lasiocarpa																															
Aquilegia brevistyla																															
Arctostaphylos uva-ursi																															
Cladina rangiferina																															
Equisetum arvense																															
Heracleum maximum																															
Lycopodium complanatum																															
Osmorhiza berteroi																															
Peltigera aphthosa																															
Platanthera orbiculata																															
Rubus parviflorus																															
Schizachne purpurascens																															

1 Plot numbers have been simplified in this report. See Appendix 32 on pag e112 for original plot codes.
2 Species significance classes as defined in Table 4 on page 12.

Appendix 8. Plot vegetation table for the 223 Populus tremuloides – Lathyrus ochroleucus: Actaea rubra subassociation. Species are arranged in order of decreasing presence and alphabetically.

Plot number[1]	84	85	86	87	88	89	90	91	92	93
Species	**Species significance[2]**									
Populus tremuloides	9	9	7	9	8	8	8	8	7	9
Actaea rubra	+	5		4	4	3	3	3	2	2
Cornus sericea	3	4	+	3	5	5	6	4	5	
Galium triflorum	3	4	3		4	4	4	3	4	+
Rosa acicularis	4	4	4	4		5	4	4	5	+
Viburnum edule	5		4	4	5	5	6	6	6	4
Aralia nudicaulis	4		6	4	4	4	5	4	6	
Calamagrostis canadensis		3	3	2	3	3	4	4	4	
Epilobium angustifolium	3	4	3	4	3	2		4	4	
Lonicera involucrata	6	2		3	3	3		2	5	4
Pyrola asarifolia		3	3	4	4	4	4	4		+
Cornus canadensis	2	4		3	4			5	5	3
Delphinium glaucum		4		5	3	4	3	4	4	
Equisetum pratense	+	3	3	2	5	3	7			
Mertensia paniculata	5	4	2	3	3	3		4		
Petasites frigidus	3	4		3	3	4	4			+
Aster conspicuus	4	4		5	4			5	5	
Lathyrus ochroleucus	3	4	4	+		2			4	
Picea glauca	3	4		4		3		+		7
Rubus pubescens	4				4	5		2	4	2
Amelanchier alnifolia		+	2	4				4		+
Fragaria virginiana	2	3			3			+		+
Heracleum maximum		6	4	6				4		+
Linnaea borealis	+	3			4	4		4		
Mitella nuda	+	3	2		4	4				
Osmorhiza berteroi		4	4	3					2	3
Populus balsamifera	5	2				4	4			7
Ribes oxyacanthoides					3	4	5	3	4	
Viola canadensis	5	6		6	3		3			
Elymus innovatus		+			4	2		+		
Galium boreale		2				+	4	3		
Ribes lacustre			4					4	3	+
Alnus viridis	5			5					4	
Botrychium virginianum		+		+						+
Rubus idaeus	4				4				+	
Salix sp.				5		4		4		
Spiraea betulifolia			+	3						+
Symphoricarpos albus	2							3	+	
Thalictrum venulosum			3	+			4			
Agropyron pauciflorum								2	+	
Aquilegia brevistyla					3	3				
Maianthemum canadense			2		3					
Maianthemum racemosum		4		2						
Maianthemum stellatum		+	2							
Orthilia secunda					4			4		
Ribes triste					4	4				
Taraxacum officinale		+					3			
Alnus incana										4
Achillea millefolium					2					
Arnica cordifolia									3	
Aster ciliolatus										2
Betula papyrifera								5		
Betulaceae		4								
Bromus inermis			+							
Calliergon stramineum										+
Clintonia uniflora										+
Cornus stolonifera										1

Plot number[1]	84	85	86	87	88	89	90	91	92	93
Species	**Species significance[2]**									
Dicranum scoparium										+
Disporum trachycarpum									2	
Drepanocladus uncinatus										+
Equisetum sylvaticum										+
Festuca subuliflora										+
Gymnocarpium dryopteris			6							
Hylocomium splendens								2		
Maianthemum racemosum										3
Maianthemum stellatum										4
Matteuccia struthiopteris								+		
Moneses uniflora				4						
Paxistima myrsinites										+
Peltigera aphthosa										+
Pinus contorta										5
Plagiomnium drummondii										+
Pleurozium schreberi										+
Pseudotsuga menziesii										5
Ranunculus acris										+
Rubus parviflorus				3						
Shepherdia canadensis								4		
Solidago canadensis										+
Thalictrum occidentale										3
Vicia americana	+									
Viola renifolia									2	

1 Plot numbers have been simplified in this report. See Appendix 32 on page 112 for original plot codes.
2 Species significance classes defined in Table 4 on page12 .

Appendix 9. Plot vegetation table for the 310 Populus tremuloides – Thalictrum occidentale association. Species are arranged in order of decreasing presence and alphabetically.

Plot number[1]	94	95	96	97	98	99	100	101	102	103
Species	**Species significance[2]**									
Populus tremuloides	8	9	9	8	9	8	7	7	7	8
Epilobium angustifolium	+		3	+	6	4	+	3	9	+
Picea glauca	6	6		9	3	6	7	7		7
Rosa acicularis	4	6	4	5	6	5	4		3	
Aster conspicuus				6	3	3		3	+	+
Fragaria virginiana		+	3	+	2	+		+		
Galium boreale		+			+	+	+		+	+
Thalictrum occidentale			+		+		+	5	4	2
Viburnum edule	6			+		5	5		1	+
Achillea millefolium		+	+	+		+	+			
Calamagrostis rubescens			+	+	3	+		6		
Cornus canadensis	+			+		4	4			+
Equisetum pratense		+		+	+		+			+
Hylocomium splendens	4			+			3	3		6
Linnaea borealis	4			+		5	3			+
Lonicera involucrata		+			5	+	7			1
Petasites frigidus				+	+	+	5			+
Pleurozium schreberi	2			+	2			5		6
Rubus pubescens				+	4	+	4			+
Vicia americana			+		+	1		+	+	
Actaea rubra	+							+	2	3
Aster sibiricus				+	+		4		+	
Elymus repens		+	+		+		+			
Lathyrus nevadensis			+		+	+			+	
Ribes lacustre		+			3		6			2
Aralia nudicaulis	2							6	4	
Bromus inermis			4					+	+	
Calamagrostis canadensis		+		+			+			
Calliergon stramineum					+	+	4			
Cornus stolonifera							2		+	6
Galium triflorum							+		+	+
Geranium richardsonii					3			+	2	
Orthilia secunda				+		+	+			
Salix scouleriana					4			5	6	
Viola canadensis						+	+		4	
Alnus incana	4									5
Arnica cordifolia						+				+
Betula nana		6	+							
Carex disperma		+			+					
Disporum hookeri								+		2
Elymus glaucus					+	+				
Equisetum scirpoides	+						+			
Festuca subuliflora		+	+							
Hieracium umbellatum				+					+	
Maianthemum racemosum							+			2
Maianthemum stellatum				+	+					
Mitella nuda							1			+
Osmorhiza berteroi						+				+
Poa palustris			+		+					
Populus balsamifera							2	7		
Pyrola asarifolia	3					4				
Rhytidiadelphus triquetrus				+				+		
Salix glauca		8	7							
Senecio pseudaureus		+	+							
Shepherdia canadensis						7	+			
Abies lasiocarpa										5
Amelanchier alnifolia										+

Plot number[1]	94	95	96	97	98	99	100	101	102	103
Species	**Species significance[2]**									
Antennaria pulcherrima			2							
Aquilegia formosa										+
Arctostaphylos uva-ursi			+							
Aster ciliolatus		+								
Betula papyrifera	3									
Carex obtusata							+			
Carex rossii		5								
Carex spectabilis		+								
Castilleja miniata					+					
Clintonia uniflora										+
Dicranella palustris	2									
Dicranum fuscescens				+						
Drepanocladus uncinatus										+
Epilobium ciliatum		+								
Gentianella amarella		+								
Glyceria elata		+								
Goodyera oblongifolia										+
Goodyera repens				+						
Heracleum maximum									5	
Lycopodium annotinum	+									
Maianthemum trifolium		+								
Maianthemum canadense	+									
Mertensia paniculata	+									
Oryzopsis asperifolia			+							
Pulsatilla patens			+							
Peltigera praetextata				+						
Petasites sagittatus			+							
Picea mariana										5
Pinus contorta										5
Platanthera orbiculata	+									
Ptilium crista-castrensis								+		
Pyrola minor		+								
Ranunculus acris							+			
Rubus idaeus									5	
Salix sp.							6			
Salix bebbiana		6								
Salix lucida			5							
Salix sitchensis						4				
Spiraea betulifolia										6
Stellaria calycantha								+		
Taraxacum officinalis			+							
Trisetum cernuum					+					
Vaccinium membranaceum										+
Viola palustris		+								
Viola renifolia		+								

1 Plot numbers have been simplified in this report. See Appendix 32 on page 112 for original plot codes.
2 Species significance classes defined in Table 4 on page12 .

Appendix 10. Plot vegetation table for the 411 Populus tremuloides – Viburnum edule: Spiraea betulifolia subassociation. Species are arranged in order of decreasing presence and alphabetically.

Plot number[1]	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Species	**Species significance[2]**																
Populus tremuloides	9	8	8	9	9	9	9	9	8	9	7	7	7	9	7	8	9
Rosa acicularis	5		2		1	4	6	4	5	6	4	6	5	7	+	3	6
Osmorhiza berteroi	+	4	4		+	4	+	+	+	+	+	+	+	+		+	
Picea glauca	5	7	5	5	6			5	6		+	7	3	6	7	8	5
Thalictrum occidentale		4	3	2		3	+	+	3	4	+	+	+	+		+	+
Amelanchier alnifolia	+	3	3	6	5	3	6	6	5	5				3	+		+
Aralia nudicaulis	7	6		4	4	6		4	6		3	5	3		6	4	3
Elymus glaucus	+	+	+	+			+	+	+	+	+		+	+		+	+
Cornus stolonifera		5	5	4	5	5	7	6	4		4	+	3			5	
Spiraea betulifolia	7	2	3	5	6				4	3	+	+	+			3	2
Symphoricarpos albus	3	+				4	2	3	3	5	+	4	6	5		4	
Viburnum edule		7	7	3	7	6	7	7	4			+	+		2		5
Galium boreale		4	1	2	+	+			+	+	+	+		+		+	
Linnaea borealis		3	1				+	+	+		+	+	+		+	+	+
Rubus parviflorus	5	6		6	3	3			4		+	+	5		2	7	
Rubus pubescens		4	5		1	3	3	3		1	+	+	+			+	
Aster conspicuus	6	4	5	5	2				3	5					+	+	6
Clintonia uniflora	6	1		4	3	+			5		+	+			2	+	
Cornus canadensis		5		2		3		4	4	3		+	+		+	+	
Disporum hookeri	+	4	5		5	2	+		4	6		+	+				
Fragaria virginiana		2	+				+	+	3			+	+	+	+		+
Lonicera involucrata		2	7	4	5	4	1	+		5					+	2	
Maianthemum racemosum	4	5	+	2	4	4	3	+		4	4						
Epilobium angustifolium		+		2	4			2	4	3	+					+	4
Maianthemum stellatum		+	4	1	+	2						+		+	+	+	
Pleurozium schreberi		5	5	3	3	2					3	+			6	5	
Ribes lacustre	1	4	4		3	3		+				+	+				
Achillea millefolium								+	+		+	+	+	+			+
Actaea rubra	2	+	4	1	2	5										+	
Aster ciliolatus						4	2	2	+			+	+			+	
Lathyrus ochroleucus		4		1			4	+	4	2					2		
Abies lasiocarpa	2	5	6	6		5										5	
Mitella nuda	+	+	+		+			+								+	
Pyrola asarifolia	+			+	+		+				+				+		
Shepherdia canadensis				7					5		4	+	2		5		
Calamagrostis canadensis	+	1				+				+			+				
Galium triflorum		+	+		+			+				+					
Oryzopsis asperifolia		+							+				+	+	+		
Petasites frigidus		2	1			+		2								1	
Vicia americana								+	+	4				+			+
Alnus incana			5			5							5			6	
Aquilegia formosa											+	+		+		+	
Arnica cordifolia		+		+								+			+		
Goodyera oblongifolia	+	+										+				+	
Orthilia secunda		+							2	+					+		
Paxistima myrsinites											7	+			8	5	
Pseudotsuga menziesii				5								6	7	5			
Ptilium crista-castrensis		4										2			6	3	
Rhytidiadelphus triquetrus			1								+	2			6		
Sorbus scopulina	+	+		+	2												
Vaccinium membranaceum		1			2	4									+		
Alnus viridis	6				6							6					
Calamagrostis rubescens												+		+			5
Cinna latifolia						+		+	+								
Heracleum maximum							+	4		4							
Salix scouleriana	2								6					4			
Viola canadensis												+	+	4			
Aster modestus						1		+									
Aster sibiricus											3				+		
Betula papyrifera													6	2			

Plot number[1]	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Species	**Species significance[2]**																
Bromus inermis													+				+
Equisetum arvense						+		+									
Eurhynchium pulchellum			+								+						
Festuca occidentalis				+											+		
Festuca subuliflora												+		+			
Gymnocarpium dryopteris					7	5											
Hylocomium splendens		4	3														
Lathyrus nevadensis								+				+					
Lilium columbianum															+	+	
Lycopodium annotinum		5			+												
Mahonia aquifolium													6	6			
Malus fusca											+						+
Ribes triste			3					3									
Rubus idaeus													+				+
Sambucus racemosa					+						+						
Trisetum cernuum	+										+						
Viola palustris		+	2														
Adoxa moschatellina					+												
Angelica genuflexa								+									
Apocynum androsaemifolium											+						
Athyrium filix-femina						3											
Calliergon stramineum												+					
Carex disperma						+											
Castilleja miniata									1								
Clematis occidentalis						+											
Corylus cornuta											7						
Deschampsia cespitosa				+													
Dicranella palustris			+														
Dicranum fuscescens												+					
Drepanocladus uncinatus				+													
Equisetum pratense																+	
Fritillaria affinis												+					
Geocaulon lividum															+		
Geranium richardsonii																	+
Listera cordata																+	
Lobaria pulmonaria											+						
Lonicera utahensis												+					
Mertensia paniculata							+										
Oplopanax horridus						4											
Peltigera aphthosa															+		
Peltigera praetextata															+		
Pinus contorta	6																
Plagiomnium drummondii																1	
Plagiomnium medium												+					
Platanthera orbiculata																+	
Prunus virginiana							5										
Pyrola minor												+					
Ranunculus acris														+			
Rhytidiadelphus squarrosus		4															
Salix bebbiana							6										
Solidago canadensis														+			
Spiraea douglasii										5							
Stellaria calycantha											+						
Streptopus amplexifolius																1	
Taraxacum officinalis														+			
Trifolium pratense														+			
Viola septentrionalis										2							
Vulpia microstachys				+													

1 Plot numbers have been simplified in this report. See Appendix 32 on pag e112 for original plot codes.
2 Species significance classes defined in Table 4 on pag e12.

Appendix 11. Plot vegetation table for the 412 Populus tremuloides – Viburnum edule: Paxistima myrsinites subassociation. Species are arranged in order of decreasing presence and alphabetically.

Plot number[1]	121	122	123	124	125	126	127	128	129	130
Species	**Species Significance[2]**									
Paxistima myrsinites	6	7	8	5	6	7	7	5	5	5
Populus tremuloides	7	7	8	9	7	7	7	7	6	7
Aralia nudicaulis	+	4	6	3	4	+	+	2	3	
Rubus parviflorus	+	3	5	+	6	5	4	5	4	
Clintonia uniflora	+	+	+	+		3	+		4	2
Cornus canadensis	+	+	+		3	+	5	3	2	
Cornus stolonifera		3	6	7	4	6	3	5	+	
Rosa acicularis	3	3	+	4	4	6	4	5		
Viburnum edule	5	3	3		4	3	3	5	+	
Rhytidiadelphus triquetrus		+	1	+	3	+	+	5		
Betula papyrifera		+	8		5		7	5		6
Elymus glaucus	+		+		+	+	+	+		
Epilobium angustifolium	+	+			+	+	+	+		
Linnaea borealis	+				3	3	7		+	4
Lonicera involucrata	4	2	+	3		3			+	
Maianthemum racemosum	+	4	3	4	+			+		
Osmorhiza berteroi	+	+	3	+		+			+	
Pyrola asarifolia	+	+	+		3	+	+			
Symphoricarpos albus	+	+		+				3	+	+
Amelanchier alnifolia		2	+		+		3	+		
Corylus cornuta	7	7	7	5	3					
Lathyrus ochroleucus	4	3	3		3	+				
Orthilia secunda		+		+	+				+	+
Pleurozium schreberi	+		2		3	+	+			
Ptilium crista-castrensis	+				+	+	+	+		
Rubus pubescens	+	+	+		3	3				
Thuja plicata					+	6	3		6	7
Tsuga heterophylla					3	5	3	5	2	
Acer glabrum					2			2	5	6
Adoxa moschatellina	+		+	+		+				
Arnica cordifolia	+	+	+	+						
Hylocomium splendens					+	+	+	2		
Picea glauca			3		3		4		4	
Sorbus scopulina	+					2	3	+		
Disporum hookeri	4			4					3	
Galium boreale	+				3		+			
Galium triflorum	+			+					+	
Maianthemum stellatum				+				+		+
Shepherdia canadensis					3	+	3			
Thalictrum occidentale	+	4		3						
Vicia americana	+					+	+			
Abies lasiocarpa						2		2		
Aster ciliolatus	+		+							
Aster conspicuus						+			+	
Calamagrostis canadensis		+			+					
Fragaria virginiana	+								+	
Goodyera oblongifolia									+	+
Goodyera repens					+	+				
Lobaria pulmonaria				+		+				
Lycopodium complanatum					+		+			
Mahonia aquifolium									+	1
Mitella nuda	+		+							
Petasites frigidus	+			+						
Platanthera orbiculata							+	+		
Pyrola elliptica				+	+					
Sanicula marilandica	+	+								
Vaccinium membranaceum					+				+	

Plot number[1]	121	122	123	124	125	126	127	128	129	130
Species	**Species Significance[2]**									
Alnus viridis									5	
Actaea rubra	+									
Alectoria sarmentosa						+				
Aster sibiricus									4	
Chimaphila umbellata										3
Cinna latifolia								+		
Dicranella palustris							+			
Dicranum fuscescens			+							
Dicranum scoparium					+					
Equisetum sylvaticum									+	
Eurhynchium pulchellum			+							
Festuca occidentalis							+			
Geocaulon lividum	+									
Gymnocarpium dryopteris			6							
Hypopitys monotropa				+						
Larix occidentalis									6	
Lathyrus nevadensis					5					
Lycopodium dendroideum			+							
Malus fusca						3				
Melampyrum lineare							+			
Pedicularis racemosa									2	
Peltigera aphthosa				+						
Peltigera malacea										3
Peltigera membranacea			+							
Pinus contorta								7		
Pinus monticola									5	
Plagiomnium drummondii			+							
Populus balsamifera									6	
Pseudotsuga menziesii									6	
Rhizomnium glabrescens	+									
Rhododendron albiflorum									+	
Rhytidiadelphus squarrosus	+									
Ribes lacustre					+					
Rosa nutkana										2
Rubus idaeus					+					
Salix glauca									+	
Spiraea betulifolia									3	
Stellaria calycantha						+				
Stenanthium occidentale									+	
Trisetum cernuum									3	
Viola orbiculata									+	
Viola renifolia										+
Viola septentrionalis				+						
Vulpia microstachys	+									

1 Plot numbers have been simplified in this report. See Appendix 32 on page 112 for original plot codes.
2 Species significance classes defined in Table 4 on page12 .

Appendix 12. Plot vegetation table for the 421 Populus tremuloides – Rosa nutkana: Aralia nudicaulis subassociation. Species are arranged in order of decreasing presence and alphabetically.

Plot number[1]	131	132	133	134	135	136	137	138	139	140	141	142	143	144
Species	**Species significance[2]**													
Populus tremuloides	7	8	7	8	9	9	9	9	9	8	8	8	7	7
Elymus glaucus		3	+	+	+	+	+	3	+				+	+
Festuca subuliflora		+	+	+	+	+	2	3	5				2	+
Osmorhiza berteroi	+	3	+	+	1	+		+			+		4	4
Aralia nudicaulis	5	7	7	6			2	2		1	1		6	
Cornus canadensis	3	5	+	2	7	5		7			+			6
Symphoricarpos albus	+	5		4	+		4	+	4	+	+			
Acer glabrum	+	3	7	5							+	3	7	+
Clintonia uniflora		3	1	3	3	3				+	+		+	
Rubus parviflorus		6	5	7	3	+		+					6	7
Alnus incana				6	5	6	4	5					6	6
Cornus stolonifera	6		3	+	3	3				+			6	
Galium trifidum	3			+	+	+					+		+	+
Maianthemum stellatum	3		+				+	6	3				2	+
Picea glauca			5		5	5		5	5	5				6
Populus balsamifera		7	6	6	6	6			6		6			
Ranunculus acris		+	+		+		2		+				2	+
Rosa nutkana			+	+	+		2	+		+	+			
Amelanchier alnifolia			+		3	4	+	+					3	
Betula papyrifera	6	7		6		3				4		2		
Calamagrostis canadensis			7			7	9	6	8					+
Pinus contorta	4				7	5		6					7	5
Tiarella trifoliata					+		2	+	+	+	+			
Adenocaulon bicolor		6								+	+		4	6
Arnica cordifolia			2			7		3					+	2
Athyrium filix-femina	+		2	2			3				+			
Calamagrostis rubescens				5	3	+		2						+
Equisetum pratense		+					+	+					1	+
Fragaria virginiana		+			+	+			+					2
Linnaea borealis	3				+			+		+				+
Solidago canadensis				+			2		+				+	+
Spiraea betulifolia				+	+	+							4	3
Thuja plicata								3		7	8	9	5	
Pteridium aquilinum		5	6	3								+		
Pyrola asarifolia			2	3		3	+							
Ribes lacustre					4					+	+			3
Senecio pseudaureus		+						+	4					+
Viola renifolia							+	+	4		+			
Aconitum columbianum							+		+				3	
Anaphalis margaritacea					+	+								2
Equisetum sylvaticum		+		+		+								
Galium boreale							4	+	+					
Lonicera utahensis							5						7	3
Maianthemum racemosum	6	+									+			
Mahonia aquifolium								1		+			+	
Paxistima myrsinites	5									2				+
Poa palustris			+					+	2					
Pinus monticola		4	5	5										
Prunella vulgaris		+					+		5					
Rosa acicularis	4	4											5	
Rubus idaeus					2	+								2
Vaccinium caespitosum				+	2									+
Vicia americana		4	+						+					
Actaea rubra							+						+	
Agrostis mertensii		+		+										
Calliergon giganteum			+											+
Chimaphila umbellata										+				3

Plot number[1]	131	132	133	134	135	136	137	138	139	140	141	142	143	144
Species	**Species significance[2]**													
Dicranum fuscescens								+						+
Disporum hookeri													5	+
Epilobium angustifolium	+													+
Equisetum arvense					+		+							
Frangula purshiana		+					4							
Heracleum maximum			3				3							
Larix occidentalis		5											6	
Lonicera involucrata													3	3
Peltigera praetextata								+						+
Phleum pratense		+							+					
Pseudotsuga menziesii				4				+						
Rhytidiadelphus triquetrus	6													+
Taraxacum officinalis				+					+					
Thalictrum occidentale							+						2	
Trillium ovatum							+			+				
Trisetum cernuum								+	+					
Trisetum spicatum				+	+									
Abies lasiocarpa	4													
Achillea millefolium								+						
Aster conspicuus														+
Botrychium lunaria											+			
Bromus inermis								+						
Calliergon stramineum											+			
Campanula rotundifolia		+												
Cladonia phyllophora														+
Corallorhiza trifida														+
Crataegus douglasii										2				
Dactylis glomerata								+						
Glyceria elata							3							
Gymnocarpium dryopteris	+													
Hieracium scouleri														+
Hylocomium splendens	3													
Lathyrus nevadensis	3													
Oplopanax horridus											+			
Orthilia secunda														+
Plagiothecium sp.														+
Poa nemoralis		+												
Peltigera aphthosa														+
Petasites frigidus	+													
Piperia unalascensis														+
Plagiomnium drummondii					+									
Plagiomnium medium	+													
Pleurozium schreberi								2						
Polytrichum strictum			+											
Ptilium crista-castrensis								1						
Rubus pubescens	3													
Salix sp.														+
Shepherdia canadensis								+						
Trifolium repens								+						
Tsuga heterophylla								3						
Vaccinium membranaceum	+													
Viburnum edule	4													

1 Plot numbers have been simplified in this report. See Appendix 32 on page112 for original plot codes.
2 Species significance classes defined in Table 4 on page12 .

Appendix 13. Plot vegetation table for the 422 Populus tremuloides – Rosa nutkana: Arnica cordifolia subassociation. Species are arranged in order of decreasing presence and alphabetically.

Plot number[1]	145	146	147	148	149	150	151	152	153
Species	**Species significance[2]**								
Populus tremuloides	8	7	7	8	7	7	9	7	9
Rubus parviflorus	4	3		+	2	6	6	+	4
Osmorhiza berteroi	3	+	+		+		+	+	3
Pseudotsuga menziesii	5	4	6		6	6	4		7
Arnica cordifolia	6	3	5	4				+	+
Betula papyrifera	6			+	7	7	6		+
Elymus glaucus	+	+	+	+	+				+
Galium trifidum	+	+	+		+	+			+
Spiraea betulifolia	2	+		3			2	+	1
Acer glabrum	4	+			3	7	6		
Calamagrostis rubescens			6	5			4	+	6
Chimaphila umbellata	2	+		+	+	5			
Clintonia uniflora	+	5	5	4	+				
Linnaea borealis	+	5	5	5	+				
Mahonia aquifolium					4	+	2	+	+
Shepherdia canadensis	3	4				3	6		3
Cornus stolonifera	3	4			+				3
Festuca subuliflora			+	+				+	+
Paxistima myrsinites					+	2		4	3
Pinus monticola	6	7		6	+				
Rosa nutkana			3		2	+	+		
Symphoricarpos albus	+				+	+			2
Vaccinium caespitosum	2	6	8	8					
Alnus incana	3		2						6
Alnus viridis	5	6						6	
Adenocaulon bicolor					4	4	+		
Amelanchier alnifolia			+		3		2		
Apocynum androsaemifolium					4	2	3		
Cornus canadensis	7		5	6					
Hieracium scouleri			+			+	+		
Larix occidentalis			6	6			5		
Peltigera praetextata						+	+	+	
Picea glauca		5	6						6
Pinus contorta			6	6	5				
Abies lasiocarpa				2				7	
Achillea millefolium			+	+					
Anaphalis margaritacea			+	+					
Aralia nudicaulis					6	6			
Aster ciliolatus	3								+
Calamagrostis canadensis	+		+						
Calliergon giganteum			+			+			
Calliergon stramineum	+						+		
Corallorhiza trifida				+	+				
Disporum hookeri					4	1			
Fragaria virginiana		+	+						
Lilium columbianum								+	+
Maianthemum racemosum								3	2
Orthilia secunda						+			+
Polytrichum strictum					+	+			
Pteridium aquilinum					5	4			
Rosa acicularis		+							+
Thalictrum occidentale								+	4
Thuja plicata				+		5			
Tsuga heterophylla			6	7					
Viola renifolia				+			+		
Actaea rubra								1	
Anemone parviflora			+						

Plot number[1]	145	146	147	148	149	150	151	152	153
Species	**Species significance[2]**								
Angelica genuflexa								+	
Aquilegia formosa								+	
Aster conspicuus									4
Castilleja miniata				+					
Ceanothus velutinus							2		
Cladonia multiformis					+				
Dicranum fuscescens	+								
Dicranum scoparium								+	
Epilobium angustifolium		+							
Equisetum arvense	+								
Geocaulon lividum				+					
Goodyera oblongifolia								+	
Lonicera involucrata								+	
Lonicera utahensis								+	
Mertensia paniculata			+						
Peltigera malacea					+				
Pleurozium schreberi			+						
Polytrichum juniperinum					+				
Populus balsamifera		4							
Pyrola minor						+			
Ranunculus acris			+						
Senecio pseudaureus			+						
Solidago canadensis									+
Trillium ovatum		+							
Trisetum spicatum			+						
Vaccinium membranaceum		+							
Viola canadensis					+				
Viola orbiculata								+	

1 Plot numbers have been simplified in this report. See Appendix 32 on page 112 for original plot codes.
2 Species significance classes as defined in Table 4 on page 12.

Appendix 14. Plot vegetation table for the 423 Populus tremuloides – Rosa nutkana: Angelica genuflexa subassociation. Species are arranged in order of decreasing presence and alphabetically.

Plot number[1]	154	155	156	157	158	159	160	161	162
Species	**Species significance[2]**								
Populus tremuloides	8	8	9	9	9	8	8	7	8
Amelanchier alnifolia	5	6	6	6	7	6	5	2	
Aster conspicuus	3	+	+		4	4	+	2	+
Lilium columbianum	+	+	+	+	+	2		+	+
Osmorhiza berteroi	+	+	2		4	5	2	+	2
Thalictrum occidentale	4	6	4		5	4	5	6	5
Angelica genuflexa	2	2	+	3		+	6	6	
Maianthemum racemosum	+	5		3		3	4	4	4
Maianthemum stellatum			+	+	+	+	+	2	4
Symphoricarpos albus	3	6	7	4	6	6			1
Calamagrostis canadensis		+	+			+	+	+	+
Disporum hookeri	5	6	5	5	6		3		
Galium triflorum			+	+	+	3	+	+	
Mahonia aquifolium	5	2				3	+	+	2
Rosa nutkana		2	3		6	4	+		2
Rubus parviflorus	7	7	7	6	6				3
Actaea rubra				4	5	3		5	+
Clintonia uniflora		+	2			6	1	+	
Pseudotsuga menziesii	6	7					6	3	6
Viola canadensis	4	2		+	+			+	
Cornus stolonifera		+	5				4		4
Elymus glaucus		+			+	+		+	
Picea glauca		5				6	5	3	
Spiraea betulifolia	3						2	+	5
Acer glabrum		5	3		+				
Arnica cordifolia							3	+	+
Aster ciliolatus	+							+	+
Calliergon giganteum	+				1				+
Festuca subuliflora							+	+	+
Fragaria virginiana	2					4		+	
Lonicera involucrata							4	7	+
Lonicera utahensis							4	6	1
Trisetum cernuum	+	+						+	
Alnus incana							6	7	
Adenocaulon bicolor							1	2	
Aquilegia formosa							4	+	
Chimaphila umbellata		+							+
Galium boreale	+				+				
Goodyera oblongifolia		+					+		
Paxistima myrsinites	5	7							
Pinus contorta							4		7
Pteridium aquilinum			6	5					
Pyrola asarifolia								+	+
Ranunculus acris							+	+	
Ribes lacustre								+	+
Rubus idaeus				+	5				
Salix lucida								+	+
Salix scouleriana			2				5		
Senecio pseudaureus						+			+
Sorbus scopulina							+	2	
Viburnum edule	3							3	
Viola septentrionalis		+		+					
Alnus viridis									4
Abies lasiocarpa	6								
Achillea millefolium	+								
Aralia nudicaulis		3							
Calamagrostis rubescens							+		

Plot number[1]	154	155	156	157	158	159	160	161	162
Species	**Species significance[2]**								
Calliergon stramineum	+								
Campanula rotundifolia			+						
Cinna latifolia								+	
Clematis occidentalis						2			
Cypripedium montanum	+								
Dicranum fuscescens							+		
Epilobium angustifolium		2							
Equisetum pratense									+
Festuca occidentalis	+								
Hieracium scouleri								+	
Listera convallarioides								+	
Orthilia secunda									1
Pedicularis bracteosa								+	
Pedicularis racemosa	4								
Peltigera malacea						+			
Populus balsamifera	5								
Pyrola chlorantha							+		
Salix bebbiana			2						
Senecio triangularis								4	
Shepherdia canadensis	6								
Solidago canadensis									+
Urtica dioica				3					
Viola palustris								+	

1 Plot numbers have been simplified in this report. See Appendix 32 on page 112 for original plot codes.
2 Species significance classes defined in Table 4 on pag e12.

Appendix 15. Plot vegetation table for the 424 Populus tremuloides – Rosa nutkana: Senecio pseudoaureus subassociation. Species are arranged in order of decreasing presence and alphabetically.

Plot number[1]	163	164	165	166	167	168	169	170	171
Species	**Species significance[2]**								
Populus tremuloides	9	8	9	7	7	7	7	8	9
Calamagrostis rubescens	4	6	8	6	6	2	+		6
Elymus glaucus	+	+	+	+		+	2	+	2
Amelanchier alnifolia		2	2	+	+	+	4		+
Mahonia aquifolium			+	4	6	2	+	+	1
Pseudotsuga menziesii		5	3	+	2	7	6	6	
Rosa nutkana	3	2	2		+	+	+	6	
Senecio pseudaureus	+	+	+	+		3	+	+	
Fragaria virginiana	+	+	3		+	+	+		
Galium trifidum		+	+	+		+	+	+	
Osmorhiza berteroi		+	+	+		+		1	+
Pinus contorta		4	5	7	6	2	5		
Symphoricarpos albus		5	2			6	4	6	5
Alnus viridis		3	+			7		6	3
Festuca subuliflora		+	2	2			+	1	
Paxistima myrsinites			+		4	2	6		+
Spiraea betulifolia		3	2		+	+			2
Thalictrum occidentale	5	2	3					+	5
Achillea millefolium	+		+	+	3				
Aster ciliolatus	2				2			2	+
Aster conspicuus	+		3					5	2
Cornus canadensis		5	6			4	+		
Maianthemum racemosum		1				3		6	1
Maianthemum stellatum			+	1			+		2
Picea glauca		5	3			6		6	
Ranunculus acris		+	+	+			+		
Rubus parviflorus			+			6	6		+
Shepherdia canadensis			+	+	+				8
Viola renifolia		+			+	+	+		
Acer glabrum						1	7		2
Cornus stolonifera						+	7	7	
Hieracium scouleri			+	+			+		
Juniperus communis					5	5	2		
Linnaea borealis				2		6			+
Viola canadensis			+				+	2	
Arctostaphylos uva-ursi					6	4			
Arnica cordifolia				4					+
Athyrium filix-femina		+					+		
Corallorhiza trifida			+	+					
Dactylis glomerata				+			4		
Disporum hookeri			+						1
Drepanocladus uncinatus		1		+					
Epilobium angustifolium	2								+
Equisetum pratense		+	+						
Leucanthemum vulgare		+	+						
Lilium columbianum		+					+		
Lonicera utahensis	5	6							
Lupinus arcticus			4		5				
Medicago sativa			+		5				
Orthilia secunda				+			+		
Polytrichum strictum				+		+			
Prunella vulgaris		+	+						
Stellaria calycantha	+		+						
Taraxacum officinalis	+	+							
Thuja plicata						5	2		
Trifolium repens		+	+						
Actaea rubra								5	

Plot number[1]	163	164	165	166	167	168	169	170	171
Species	**Species significance[2]**								
Adenocaulon bicolor							+		
Agoseris aurantiaca		+							
Allium cernuum					+				
Anaphalis margaritacea			+						
Angelica genuflexa								+	
Antennaria microphylla					+				
Antennaria neglecta					+				
Aralia nudicaulis							6		
Asplenium viride					+				
Betula papyrifera						+			
Botrychium lunaria			+						
Calamagrostis canadensis						5			
Calliergon giganteum		+							
Calochortus apiculatus					+				
Campanula rotundifolia			+						
Carex concinna		+							
Chimaphila umbellata				+					
Cinna latifolia		+							
Cladonia multiformis				+					
Clintonia uniflora							+		
Cypripedium montanum						+			
Dicranum fuscescens				+					
Dicranum scoparium		+							
Dryopteris expansa				+					
Dryopteris fragrans					+				
Elymus repens				+					
Equisetum hyemale			+						
Galium boreale	3								
Gentianella amarella					+				
Heracleum maximum							+		
Lathyrus ochroleucus	3								
Letharia vulpina					+				
Lonicera involucrata								+	
Mertensia paniculata					+				
Penstemon procerus					+				
Poa palustris		+							
Peltigera aphthosa							+		
Peltigera praetextata			+						
Phleum pratense		+							
Pinus monticola			2						
Piperia unalascensis							+		
Plagiomnium drummondii		+							
Populus balsamifera								7	
Potentilla glandulosa					+				
Pyrola chlorantha									+
Ribes lacustre							2		
Rosa acicularis									+
Salix scouleriana									3
Saxifraga nelsoniana					+				
Silene menziesii				+					
Solidago spathulata				2					
Trisetum cernuum							+		
Trisetum spicatum			+						
Vaccinium caespitosum				4					
Vicia americana	2								

1 Plot numbers have been simplified in this report. See Appendix 32 on page 112 for original plot codes.
2 Species significance classes as defined in Table 4 on page 12.

Appendix 16. Plot vegetation table for the 425 Populus tremuloides – Rosa nutkana: Shepherdia canadensis subassociation. Species are arranged in order of decreasing presence and alphabetically.

Plot number[1]	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186
Species	**Species significance[2]**														
Populus tremuloides	7	7	8	9	7	6	6	9	7	7	8	9	7	7	7
Calamagrostis rubescens	+	8	4	2	+	2	+	5	4	5	7	8		+	7
Pinus contorta	7	6		4	6	6	6		3	5	6			7	7
Shepherdia canadensis	8	+			3	5	6	2	3	4	6	6			7
Arctostaphylos uva-ursi	6	1			+	7	5	4	6	8		7			
Rosa nutkana	3	+	+	+					4	3	2	+	+		
Achillea millefolium	+		+			3	+	+	5		+	+			
Fragaria virginiana	+	+			+	+	2	+		+	+				
Galium boreale	+	+	3	2	2	+	+	+							
Juniperus communis					3	7	6	6	+	6	7	3			
Linnaea borealis					+	+	7	2			+				+
Orthilia secunda	3				+			+			+			2	+
Taraxacum officinalis	+		3			+	+	+	+						
Antennaria neglecta	+				+	3			+	+					
Aster conspicuus		+								2	2	6			2
Elymus glaucus			+					+	+		+	+			
Pseudotsuga menziesii									7		6	7	5	3	
Rosa acicularis					3	+	+	+							2
Salix glauca	2			3	3		3			2					
Vicia americana	+	+	+			+		+							
Allium cernuum		+	3						+	+					
Amelanchier alnifolia			+		+				+	+					
Aster ciliolatus		+	2							+		+			
Aster sibiricus						2	3	+					+		
Epilobium angustifolium					3	+		+							+
Festuca subuliflora						+	+	+				+			
Hieracium scouleri											+	+		+	+
Lathyrus ochroleucus						+	+	+	2						
Mahonia aquifolium									4	4	3	+			
Paxistima myrsinites											2		+	4	6
Poa nemoralis			+		+	+		+							
Pulsatilla patens		+	2			+	+								
Symphoricarpos albus			+					+		3		3			
Agoseris aurantiaca		+	+			1									
Castilleja miniata		+					3		3						
Chimaphila umbellata												+		3	4
Elymus repens			4			+	3								
Gentianella amarella						+	+	+							
Lupinus arcticus									5	4		4			
Maianthemum racemosum												+		+	+
Oryzopsis asperifolia						6	3	5							
Salix scouleriana					+						+				+
Senecio pseudaureus						+	+				+				
Stipa richardsonii			2			+	+								
Thalictrum occidentale						+		+				3			
Agrostis mertensii					+				+						
Arnica cordifolia											+				1
Campanula rotundifolia					+					+					
Dicranum fuscescens	+				+										
Dryopteris fragrans									+				+		
Goodyera oblongifolia														+	+
Juniperus scopulorum												2	5		
Letharia vulpina	+													+	
Lonicera utahensis														+	+
Medicago sativa									6	+					
Osmorhiza berteroi											+	+			
Penstemon procerus									2	+					

Plot number[1]	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186
Species	**Species significance[2]**														
Piperia unalascensis										+		+			
Pleurozium schreberi	+						+								
Potentilla glandulosa						+						+			
Solidago canadensis	2								+						
Solidago spathulata					+					+					
Spiraea betulifolia											+			+	
Trisetum spicatum	+		+												
Viola canadensis		+								+					
Viola renifolia	+										+				
Alnus incana														6	
Acer glabrum															2
Betula nana						4									
Botrychium lunaria													+		
Bromus inermis			+												
Calliergon stramineum											2				
Cladonia multiformis											2				
Corallorhiza trifida															+
Disporum hookeri											+				
Festuca brachyphylla													+		
Festuca occidentalis						+									
Fritillaria affinis												+			
Hedysarum sulphurescens	2														
Hylocomium splendens	+														
Lathyrus nevadensis			1												
Lilium columbianum											+				
Maianthemum stellatum	+														
Melampyrum lineare															+
Peltigera aphthosa											2				
Peltigera malacea								+							
Phleum pratense									+						
Picea glauca									4						
Pogonatum contortum													+		
Polytrichum juniperinum													+		
Prunella vulgaris									+						
Ribes lacustre								+							
Rubus idaeus													+		
Silene menziesii									+						
Stellaria calycantha						+									
Stenanthium occidentale	+														
Trimorpha acris								+							
Trifolium pratense									4						
Trifolium repens	+														
Vaccinium membranaceum															+
Viola orbiculata					+										

1 Plot numbers have been simplified in this report. See Appendix 32 on page112 for original plot codes.
2 Species significance classes defined in Table 4 on pag e12.

Appendix 17. Selected environmental characteristics for plots of the 111 Populus tremuloides – Mertensia paniculata: Festuca altaica subassociation.

Plot number[1]	1	2	3	4
Zone/subzone	BWBS dk	BWBS dk	BWBS dk	BWBS dk
Soil moisture regime[2]	2/MD	2/MD	2/MD	2/MD
Soil nutrient regime[3]	R	M	R	R
Elevation (m)	950	850	780	770
Slope gradient (%)	18	22	11	7
Aspect[4]	S	S	W	W
Forest floor thickness (cm)	9	11	6	9.5
Textural class[5]	SL	L	SL	LS
Actual rooting depth (cm)	60	40	40	60
Potential rooting depth (cm)	65	40	55	75
Seepage depth (cm)	N/A[6]	N/A	N/A	N/A
Soil drainage[7]	W	R	W	W
Humus form group[8]	TD	RD	TD	TD
Soil great group[9]	EB	R	DYB	FHP
Stand age (years @ bh)	152	114	59	144
Site index (m @ 50 yrs bh)	8	8.8	5.5	9.1
Tree layer cover (%)	44	20	10	70
Shrub layer cover (%)	43	33	20	64
Herb layer cover (%)	33	2	55	11
Moss layer cover (%)	6	5	0	1

1 Plot numbers have been simplified in this report. See Appendix 32 on pag e112 for original plot codes.
2 Relative soil moisture regime: 1-xeric, 2-subxeric, 3-submesic, 4-mesic, 5-subhygric, 6-hygric
Actual soil moisture regime: VD-very dry, MD-moderately dry, SD-slightly dry, F-fresh, M-moist, VM-very moist, f-fluctuating water table
3 VP-very poor, P-poor, M-medium, R-rich, VR-very rich
4 N-north, E-east, S-south, W-west, F-flat
5 S-sand, SL-sandy loam, LS-loamy sand, L-loam, SiL-silt loam, CL-clay loam, SCL-sandy clay loam, SC-sandy clay, SiCL-silty clay loam, O-organic
6 N/A - not applicable; N/D - not determined
7 R-rapid, W-well, M- moderately well, I-imperfect, P-poor
8 HR-Hemimor, UR-Humimor, YR-Hydromor, RD-Mormoder, TD-Leptomoder, MD-Mullmoder, YD-Hydromoder, VL-Vermimull, YL-Hydromull
9 EB-Eutric Brunisol, DYB-Dystric Brunisol, MB-Melanic Brunisol, SB-Sombric Brunisol, GL-Grey Luvisol, GBL- Grey Brown Luvisol, HG-Humic Gleysol, G-Gleysol, LG-Luvic Gleysol, HFP-Humo-Ferric Podzol, FHP-Ferro-Humic Podzol, R-Regosol, HR-Humic Regosol, H-Humisol

Appendix 18. Selected environmental characteristics for plots of the 112 Populus tremuloides – Mertensia paniculata: Arnica cordifolia subassociation.

Plot number[1]	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Zone/subzone	SBS dw	BWBS dk	BWBS dk	BWBS dk	BWBS dk	BWBS dk	BWBS dk	BWBS dk	BWBS dk	BWBS dk	BWBS dk	BWBS dk	BWBS dk	SBPS xc
Soil moisture regime*	3/SD	2/MD	2/MD	2/MD	2/MD	2/MD	2/MD	2/MD	2/MD	2/MD	2/MD	3/SD	2/MD	3/MD
Soil nutrient regime*	M	M	M	R	M	R	R	M	M	M	M	M	M	P
Elevation (m)	890	930	930	930	1005	970	980	910	950	720	800	780	770	1040
Slope gradient (%)	4	27	18	33	33	27	31	27	0	4	18	31	9	7
Aspect*	E	W	W	S	S	E	E	S	F	E	S	W	W	E
Forest floor thickness (cm)	13	22	12	12	14	17	18	13	8	5.5	5	9	8	5
Textural class*	L	LS	LS	LS	LS	LS	SL	SL	SL	SC	LS	L	S	LS
Actual rooting depth (cm)	50	60	60	70	60	60	60	60	40	50	40	40	60	50
Potential rooting depth (cm)	60	60	60	70	60	60	60	60	50	55	55	58	75	50
Seepage depth (cm)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Soil drainage*	W	W	W	M	M	M	W	M	W	W	W	W	W	R
Humus form group*	HR	UR	HR	TD	RD	TD	TD	RD	HR	HR	HR	RD	HR	HR
Soil great group*	HFP	EB	EB	EB	EB	EB	EB	EB	EB	HFP	FHP	DYB	DYB	EB
Stand age (years @ bh)	120	151	N/D	139	N/D	160	164	154	90	94	67	138	143	69
Site index (m @ 50 yrs bh)	14.8	10.5	N/D	10	N/D	11.5	11.5	12.9	11.9	14.8	12.9	10.4	11.5	15.5
Tree layer cover (%)	90	48	27	30	35	72	38	21	60	63	40	40	50	41
Shrub layer cover (%)	14	13	25	29	37	19	17	52	13	16	51	77	76	24
Herb layer cover (%)	8	13	32	31	3	27	31	15	19	11	3	13	3	3
Moss layer cover (%)	41	86	90	0	61	1	6.2	37	62	23	10	0	0	92

1 Plot numbers have been simplified in this report. See Appendix 32 on page112 for original plot codes.

* Abbreviations defined in Appendix 17 on pag e96.

Appendix 19. Selected environmental characteristics for plots of the 113 Populus tremuloides – Mertensia paniculata: Petasites frigidus subassociation.

Plot number[1]	19	20	21	22	23	24	25	26	27	28	29	30	31
Zone/subzone	SBS dw	BWBS dk	BWBS dk	BWBS dk	BWBS dk	BWBS dk	BWBS dk	BWBS dk	BWBS dk	BWBS dk	BWBS dk	BWBS dk	SBPS xc
Soil moisture regime*	4/Ff	4/SDf	4/SD	3/SD	3/SD	3/SDf	3/SDf	3/SDf	3/SD	3/SDf	3/SD	3/SD	5/F
Soil nutrient regime*	R	M	M	M	M	R	P	M	M	P	M	R	R
Elevation (m)	870	900	805	790	780	810	840	850	860	890	850	590	880
Slope gradient (%)	0	2	18	18	18	0	0	4	49	4	11	16	18
Aspect*	F	F	E	N	N	F	F	W	S	N	W	S	W
Forest floor thickness (cm)	16.5	13	6	9	11	13	9	12	10	12	9	9	8
Textural class*	L	SCL	L	SL	SL	SL	SL	SL	L	SL	SL	SL	L
Actual rooting depth (cm)	30	60	60	60	60	60	60	60	60	60	60	80	60
Potential rooting depth (cm)	30	70	60	70	70	70	60	70	70	65	72	80	60
Seepage depth (cm)	N/A	N/A	N/A	N/A	N/A	N/A	60	N/A	N/A	N/A	N/A	N/A	N/A
Soil drainage*	W	I	M	W	W	W	M	M	W	M	M	W	W
Humus form group*	MD	MD	RD	HR	HR	RD	HR	TD	HR	RD	HR	RD	RD
Soil great group*	EB	GBL	EB	EB	EB	EB	EB	GL	HFP	HFP	HFP	HFP	EB
Stand age (years @ bh)	97	157	66	63	63	145	102	62	68	181	156	124	50
Site index (m @ 50 yrs bh)	10.5	11	9.6	13.8	14.4	14.4	12.7	15.4	15.1	10.8	10.8	15.4	N/D
Tree layer cover (%)	40	30	35	35	48	74	40	40	70	35	30	81	41
Shrub layer cover (%)	63	5	15	16	5	51	18	16	35	15	5	17	4
Herb layer cover (%)	13	36	38	17	9	9	19	26	1	4	4	14	33
Moss layer cover (%)	40	97	42	100	95	40	70	41	0	93	97	5	0

1 Plot numbers have been simplified in this report. See Appendix 32 on pag e112 for original plot codes.

* Abbreviations defined in Appendix 17 on pag e96.

Appendix 20. Selected environmental characteristics for plots of the 210 Populus tremuloides – Ledum groenlandicum association.

Plot number[1]	32	33	34	35	36	37	38	39	40	41
Zone/subzone	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw
Soil moisture regime*	4/SD	4/SD	4/SD	5/F	4/SD	4/SD	4/SD	5/F	4/SD	4/SD
Soil nutrient regime*	VP	VP	VP	P	VP	P	P	P	VP	VP
Elevation (m)	750	750	750	750	750	750	750	750	750	750
Slope gradient (%)	0	0	0	5	0	5	4	6	0	0
Aspect*	F	F	F	N	F	W	N	N	F	F
Forest floor thickness (cm)	4	2	3	4	4	2	3	3.5	3	2.5
Textural class*	LS	S	LS	SL	SL	S	S	LS	S	S
Actual rooting depth (cm)	60	50	70	60	80	60	80	70	55	46
Potential rooting depth (cm)	60	50	70	60	80	60	80	70	55	46
Seepage depth (cm)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Soil drainage*	M	M	M	M	M	W	W	I	M	I
Humus form group*	UR	UR	UR	UR	UR	HR	HR	HR	UR	UR
Soil great group*	DYB	DYB	DYB	DYB	DYB	DYB	DYB	DYB	DYB	DYB
Stand age (years @ bh)	54	51	54	55	55	52	58	52	53	57
Site index (m @ 50 yrs bh)	9	8	6.6	9.3	7.6	8.8	9.9	10.2	8.6	6.9
Tree layer cover (%)	23	22	23	26	30	18	36	33	15	24
Shrub layer cover (%)	62	55	60	54	51	40	33	48	58	65
Herb layer cover (%)	7	7	6	11	15	22	30	26	13	8
Moss layer cover (%)	21	16	27	34	17	8	3	18	22	21

1 Plot numbers have been simplified in this report. See Appendix 32 on page112 for original plot codes.

* Abbreviations defined in Appendix 17 on page96 .

Appendix 21. Selected environmental characteristics for plots of the 221 Populus tremuloides – Lathyrus ochroleucus: Hedysarum boreale subassociation.

Plot number[1]	42	43	44	45	46	47	48	49	50	51	52
Zone/subzone	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	SBS dw
Soil moisture regime*	3/SD	3/SD	3/SD	4/SD	3/SD	3/SD	3/SD	3/SD	3/SD	3/SD	5/Mf
Soil nutrient regime*	M	M	M	M	M	M	M	P	P	P	M
Elevation (m)	710	710	710	710	710	710	710	750	750	750	790
Slope gradient (%)	2	2	5	2	30	40	35	40	5	5	0
Aspect*	F	F	S	F	S	S	S	S	W	W	F
Forest floor thickness (cm)	4	4.5	6	6.5	5	5	7.5	3	4.5	3	32
Textural class*	S	S	S	S	S	LS	S	S	S	S	SCL
Actual rooting depth (cm)	60	60	60	70	75	60	50	80	52	65	25
Potential rooting depth (cm)	60	60	60	70	75	60	50	80	52	65	25
Seepage depth (cm)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	65
Soil drainage*	M	M	W	M	R	W	W	W	W	W	I
Humus form group*	RD	RD	RD	RD	RD	RD	RD	RD	HR	RD	YR
Soil great group*	DYB	DYB	EB	DYB	DYB	DYB	DYB	EB	DYB	DYB	GL
Stand age (yrs @ bh)	>50	>50	>50	53	>50	52	53	52	56	56	154
Site index (m 50 yr bh)	N/D	N/D	N/D	15.5	N/D	15	13.1	10.8	13.1	12.4	12.2
Tree layer cover (%)	38	35	30	27	28	28	28	30	35	33	86
Shrub layer cover (%)	26	25	25	47	23	28	23	25	29	26	25
Herb layer cover (%)	58	26	28	21	41	53	38	37	39	26	25
Moss layer cover (%)	0	0	0	1	0	0	0	0	3	2	50

1 Plot numbers have been simplified in this report. See Appendix 32 on page112 for original plot codes.

* Abbreviations defined in Appendix 17 on pag e96.

Appendix 22. Selected environmental characteristics for plots of the 222 Populus tremuloides – Lathyrus ochroleucus: typic subassociation.

Plot number [1]	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68
Subzone/Variant	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw
Soil moisture regime*	5/F	5/F	5/M	5/F	5/F	5/F	5/F	5/F	5/F	5/F	4/SD	4/SD	5/F	5/F	5/F	5/F
Soil nutrient regime*	M	M	M	R	P	P	M	M	R	P	R	M	M	M	M	M
Elevation (m)	645	630	630	630	750	710	740	740	645	750	525	525	480	465	465	450
Slope gradient (%)	0	5	0	6	4	6	1	3	3	0	2	1	0	2	3	0
Aspect*	F	S	F	E	S	S	F	W	E	F	F	F	F	F	S	F
Forest floor thickness (cm)	9	6	7	6	6	5.5	4.5	5.5	8	7	4	5	3	5	4.5	6
Textural class*	SL	CL	CL	SiL	CL	LS	SL	CL	CL	LS	SL	LS	CL	SiL	SiCL	S
Actual rooting depth (cm)	40	50	20	50	25	80	60	50	50	30	85	70	40	40	40	35
Potential rooting depth (cm)	30	20	15	50	25	80	35	20	50	30	85	70	40	25	20	55
Seepage depth (cm)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	30	N/A	N/A	N/A	N/A	N/A	N/A
Soil drainage*	M	I	I	M	I	M	I	I	I	I	M	M	M	M	M	I
Humus form group*	RD	TD	RD	RD	HR	RD	RD	RD	RD	HR	HR	HR	HR	HR	HR	RD
Soil great group*	GL	GL	GL	EB	EB	DYB	GL	GL	EB	DYB	DYB	DYB	GL	GL	GL	DYB
Stand age (years @ bh)	70	>50	>50	55	52	53	64	65	69	67	>50	>50	>50	>50	>50	>50
Site index (m @ 50 yrs bh)	17.6	N/D	N/D	18.9	18.2	17.4	20.3	16.8	19.5	14.8	N/D	N/D	N/D	N/D	N/D	N/D
Tree layer cover (%)	40	40	35	38	25	43	40	4	35	33	35	28	35	32	38	34
Shrub layer cover (%)	27	21	18	36	65	20	15	18	38	83	50	30	31	30	38	65
Herb layer cover (%)	35	27	22	42	18	51	32	29	46	24	40	36	22	20	18	45
Moss layer cover (%)	1	1	1	0	1	0	1	0	0	2	0	1	1	1	1	3

Plot number[1]	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
Subzone/Variant	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw
Soil moisture regime*	5/F	5/F	4/SD	4/SD	4/SD	5/F	4/SD	4/SD	5/F	5/F	5/F	5/F	5/F	4/SD	5/F
Soil nutrient regime*	P	M	M	M	M	M	M	M	M	M	M	M	M	M	M
Elevation (m)	450	465	525	525	525	750	750	750	750	720	720	720	700	700	750
Slope gradient (%)	0	3	2	2	2	0	15	4	7	5	4	1	15	9	4
Aspect*	F	W	F	F	F	F	E	W	W	N	W	F	W	W	W
Forest floor thickness (cm)	6	6	4.5	6.5	5	5	7	5	6	4	4	4	7	6	4.5
Textural class*	S	SL	S	S	S	CL	SiCL	SiCL	SiL	SiCL	CL	CL	CL	CL	SiCL
Actual rooting depth (cm)	45	32	90	55	70	25	60	40	60	50	35	60	50	50	45
Potential rooting depth (cm)	45	32	90	55	70	25	60	30	60	50	35	20	45	20	30
Seepage depth (cm)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Soil drainage*	I	I	M	M	M	M	M	M	I	I	I	I	M	M	I
Humus form group*	RD	RD	HR	RD	RD	HR	RD	RD	RD	RD	RD	HR	HR	HR	RD
Soil great group*	DYB	DYB	GL	DYB	DYB	GL	EB	GL	GL	GL	GL	GL	GL	GL	GL
Stand age (years @ bh)	>50	>50	>50	49	>50	66	>50	>50	>50	>50	>50	>50	>50	>50	50
Site index (m @ 50 yrs bh)	N/D	N/D	N/D	22.7	N/D	21.1	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	18.6
Tree layer cover (%)	25	26	35	40	40	35	37	35	40	36	40	42	36	43	30
Shrub layer cover (%)	59	60	37	27	42	44	38	38	9	21	14	4	34	55	23
Herb layer cover (%)	32	50	35	36	33	39	48	37	24	32	29	21	58	11	23
Moss layer cover (%)	5	5	3	1	1	2	5	3	4	0	0	4	1	1	2

1 Plot numbers have been simplified in this report. See Appendix 32 on pag e112 for original plot codes.

* Abbreviations defined in Appendix 17 on page96 .

Appendix 23. Selected environmental characteristics for plots of the 223 Populus tremuloides – Latyrus ochrocleucus: Actaea rubra subassociation.

Plot number[1]	84	85	86	87	88	89	90	91	92	93
Zone/subzone	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	BWBS mw	SBS dw
Soil moisture regime*	5/M	5/M	5/M	6/VM	5/M	6/VM	5/M	5/M	5/M	5/M
Soil nutrient regime*	R	R	R	R	R	R	R	R	R	VR
Elevation (m)	630	750	750	750	450	450	450	700	700	1025
Slope gradient (%)	3	2	8	4	10	12	12	8	4	2
Aspect*	S	F	S	N	S	S	S	W	N	F
Forest floor thickness (cm)	11	12	6	8.5	9	13	10	12	14	4
Textural class*	CL	SiL	S	SL	S	S	SiL	CL	CL	SCL
Actual rooting depth (cm)	70	40	45	35	60	60	60	50	30	50
Potential rooting depth (cm)	70	40	45	35	60	60	60	26	30	70
Seepage depth (cm)	N/A	N/A	N/A	45	N/A	35	N/A	N/A	N/A	85
Soil drainage*	I	M	M	I	I	I	M	I	M	I
Humus form group*	MD	RD	RD	RD	RD	RD	RD	HR	RD	VL
Soil great group*	MB	EB	DYB	DYB	DYB	DYB	EB	GL	GL	GBL
Stand age (years @ bh)	57	56	52	55	N/D	N/D	N/D	57	N/D	96
Site index (m @ 50 yrs bh)	25.1	21.2	23.0	19.7	N/D	N/D	N/D	20.1	N/D	23.7
Tree layer cover (%)	26	30	40	30	45	46	45	43	39	100
Shrub layer cover (%)	28	14	26	24	27	27	40	67	45	7
Herb layer cover (%)	25	60	36	57	45	35	44	35	36	8
Moss layer cover (%)	0	0	0	0	0	0	0	1	0	1

1 Plot numbers have been simplified in this report. See Appendix 32 on page 112 for original plot codes.

* Abbreviations defined in Appendix 17 on page96 .

Appendix 24. Selected environmental characteristics for plots of the 310 Populus tremuloides – Thalictrum occidentale association.

Plot number[1]	94	95	96	97	98	99	100	101	102	103
Zone/subzone	BWBS dk	IDF xm	IDF dk	SBPS dc	SBPS dc	SBS dw	SBS dw	SBS dw	SBS dw	SBS dw
Soil moisture regime*	4/SD	5/SDf	5/SDf	5/Ff	5/Ff	4/F	5/Mf	4/F	5/Mf	4/Ff
Soil nutrient regime*	M	R	P	M	M	M	M	R	R	M
Elevation (m)	595	1115	960	900	870	880	880	885	900	920
Slope gradient (%)	13	0	0	25	5	17	3	67	3	0
Aspect*	S	F	F	W	W	E	N	E	N	F
Forest floor thickness (cm)	6.5	21	6	5	4	9	40	9	8	9
Textural class*	SL	SCL	CL	CL	L	SL	O	L	L	SL
Actual rooting depth (cm)	100	70	30	80	90	35	70	60	120	50
Potential rooting depth (cm)	100	70	90	80	90	35	70	60	120	50
Seepage depth (cm)	N/A	75	90	N/A	N/A	N/A	60	N/A	N/A	N/A
Soil drainage*	W	M	I	M	W	W	P	W	W	W
Humus form group*	HR	MD	RD	RD	TD	HR	YR	RD	TD	TD
Soil great group*	HFP	GBL	GL	GL	EB	EB	H	EB	EB	EB
Stand age (years @ bh)	135	68	48	50	75	63	87	61	46	99
Site index (m @ 50 yrs bh)	18.4	16.8	N/D	18.3	22.4	18.5	20	18.3	N/D	16.7
Tree layer cover (%)	71	80	70	100	76	60	51	70	40	100
Shrub layer cover (%)	19	85	32	5	23	47	53	20	19	31
Herb layer cover (%)	2	9	8	11	15	8	8	20	84	4
Moss layer cover (%)	4	0	0	1	1	0	4	6	0	20

1 Plot numbers have been simplified in this report. See Appendix 32 on page 112 for original plot codes.

* Abbreviations defined in Appendix 17 on page96.

Appendix 25. Selected environmental characteristics for plots of the 411 Populus tremuloides – Viburnum edule: Spiraea betulifolia subassociation.

Plot number[1]	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Zone/subzone	SBS dw	SBS dw	SBS dw	SBS dw	SBS dw	SBS dw	SBS dw	SBS dw	SBS dk	SBS dk	ICH mc	SBS dw	SBS dw	SBS dw	SBS dw	SBS dw	SBS dw
Soil moisture regime*	3/SD	3/SD	3/SD	3/SD	3/SDf	4/Ff	4/F	4/F	4/F	3/SD	4/F	4/F	3/SD	3/SD	4/Ff	5/Mf	3/SD
Soil nutrient regime*	R	R	VR	R	R	VR	R	R	R	R	R	R	R	R	M	R	R
Elevation (m)	920	880	890	870	900	900	890	890	880	810	390	1025	855	850	885	880	900
Slope gradient (%)	2	7	7	0	0	0	2	0	0	4	11	14	11	16	0	0	30
Aspect*	F	N	N	F	F	F	F	F	F	W	W	N	W	W	F	F	E
Forest floor thickness (cm)	5	5.5	12.5	10	10	19	10	13	6.5	9.5	8.5	6	5	4	7.5	7	8
Textural class*	L	L	L	L	L	L	L	L	SL	L	SL	SCL	SL	SL	S	S	SCL
Actual rooting depth (cm)	30	60	60	50	50	50	60	60	60	60	60	30	30	90	70	80	60
Potential rooting depth (cm)	30	60	70	60	60	60	70	70	70	70	70	30	30	90	70	80	60
Seepage depth (cm)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Soil drainage*	W	W	W	W	W	W	W	W	W	W	W	M	W	W	R	W	W
Humus form group*	RD	RD	MD	TD	TD	MD	MD	MD	UR	MD	TD	TD	RD	RD	RD	HR	RD
Soil great group*	HFP	HFP	DYB	EB	DYB	EB	EB	EB	EB	EB	EB	EB	EB	EB	EB	EB	EB
Stand age (years @ bh)	N/D	104	105	101	103	112	N/D	N/D	81	103	72	116	85	65	83	81	48
Site index (m @ 50 yrs bh)	N/D	18.6	18.6	12.1	18.9	19.4	N/D	N/D	16.7	15.2	13	17.3	15.2	18.1	13.6	15.6	N/D
Tree layer cover (%)	96	100	75	95	95	85	70	85	70	90	30	95	91	86	55	100	85
Shrub layer cover (%)	55	65	85	59	52	48	97	48	54	39	50	18	38	59	67	67	22
Herb layer cover (%)	24	35	22	11	35	22	5	8	21	29	4	2	3	5	2	2	20
Moss layer cover (%)	0	12	7	1	1	1	0	0	0	0	1	2	0	0	35	6	0

1 Plot numbers have been simplified in this report. See Appendix 32 on pag e112 for original plot codes.

* Abbreviations defined in Appendix 17 on pag e96.

Appendix 26. Selected environmental characteristics for plots of the 412 Populus tremuloides – Viburnum edule: Paxistima myrsinites subassociation.

Plot number[1]	121	122	123	124	125	126	127	128	129	130
Zone/subzone	ICH mc	ICH mc	ICH mc	ICH mc	ICH mc	ICH mc	ICH mc	ICH mc	ICH mw	ICH dw
Soil moisture regime*	3/SD	3/SD	3/SD	3/SD	4/F	3/SD	3/SD	3/SD	4/F	3/SD
Soil nutrient regime*	R	R	R	R	R	M	M	M	M	M
Elevation (m)	390	380	380	420	500	500	500	520	790	1020
Slope gradient (%)	11	27	18	33	0	22	27	11	25	16
Aspect*	W	S	N	W	F	W	W	S	S	E
Forest floor thickness (cm)	7.5	10	8	8.5	6	8.5	7	5	3.5	8
Textural class*	L	SL	LS	LS	LS	LS	LS	SL	L	SL
Actual rooting depth (cm)	40	60	70	70	70	70	40	50	50	35
Potential rooting depth (cm)	50	70	70	70	70	70	40	60	50	35
Seepage depth (cm)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Soil drainage*	W	W	M	W	M	M	M	W	W	W
Humus form group*	TD	RD	TD	TD	TD	HR	TD	TD	RD	RD
Soil great group*	DYB	EB	EB	EB	EB	EB	EB	EB	HFP	EB
Stand age (years @ bh)	103	99	N/D	N/D	63	71	71	N/D	47	96
Site index (m @ 50 yrs bh)	16.9	14.8	N/D	N/D	22.5	16.6	20.3	N/D	N/D	N/D
Tree layer cover (%)	20	40	100	70	52	50	79	71	74	75
Shrub layer cover (%)	54	63	95	37	41	50	54	31	15	18
Herb layer cover (%)	8	6	14	6	10	2	6	2	8	2
Moss layer cover (%)	0	0	1	0	2	1	1	9	0	1

1 Plot numbers have been simplified in this report. See Appendix 32 on page 112 for original plot codes.

* Abbreviations defined in Appendix 17 on pag e96.

Appendix 27. Selected environmental characteristics for plots of the 421 Populus tremuloides – Rosa nutkana: Aralia nudicaulis subassociation.

Plot number[1]	131	132	133	134	135	136	137	138	139	140	141	142	143	144
Zone/subzone	ICH mc	MS dk	MS dk	MS dk	MS dk	MS dk	MS dk	MS dk	MS dk	ICH dw	ICH dw	ICH mw	IDF dm	IDF dm
Soil moisture regime*	5/M	6/Mf	6/Mf	6/M	6/M	6/M	6/Mf	6/Mf	6/M	5/M	6/VM	6/VM	6/F	6/F
Soil nutrient regime*	R	VR	R	R	R	M	R	R	R	R	VR	VR	R	M
Elevation (m)	520	815	980	990	1045	1035	1020	1040	1040	850	850	1025	1100	1115
Slope gradient (%)	22	0	0	33	13	7	0	2	8	0	0	6	6	8
Aspect*	N	F	F	E	E	N	F	F	W	F	F	N	E	E
Forest floor thickness (cm)	7	10	2.5	7	4	8	2.5	3	3	5	30	17	6	10
Textural class*	SL	SC	S	SL	L	S	SCL	SL	SCL	S	L	SCL	SCL	SL
Actual rooting depth (cm)	70	30	80	50	30	60	45	45	45	100	90	38	40	35
Potential rooting depth (cm)	70	60	80	50	30	80	55	45	65	100	90	38	20	35
Seepage depth (cm)	100	60	N/A	N/A	N/A	N/A	55	N/A	65	70	45	45	20	N/A
Soil drainage*	M	I	M	M	M	M	P	W	P	I	I	P	P	W
Humus form group*	TD	TD	VL	TD	MD	TD	VL	VL	VL	RD	YL	YD	VL	RD
Soil great group*	EB	GL	HFP	EB	HFP	R	GL	HFP	GL	HFP	HR	GL	GL	EB
Stand age (years @ bh)	95	N/D	58	56	59	58	75	73	74	80	80	81	63	62
Site index (m @ 50 yrs bh)	28.3	N/D	29.6	26.4	26.6	26.8	26.6	24.8	24.5	29.3	30.7	24.1	20.6	22.3
Tree layer cover (%)	54	100	60	78	100	91	80	97	85	79	100	100	75	45
Shrub layer cover (%)	27	44	46	57	12	14	17	9	3	2	1	1	92	35
Herb layer cover (%)	15	26	44	11	25	78	80	49	70	3	3	0	15	32
Moss layer cover (%)	11	0	0	0	0	0	0	1	0	0	0	0	0	1

1 Plot numbers have been simplified in this report. See Appendix 32 on page112 for original plot codes.

* Abbreviations defined in Appendix 17 on page96 .

Appendix 28. Selected environmental characteristics for plots of the 422 Populus tremuloides – Rosa nutkana: Arnica cordifolia subassociation.

Plot number[1]	145	146	147	148	149	150	151	152	153
Zone/subzone	MS dk	MS dk	MS dk	MS dk	ICH dw	ICH dw	ICH dw	MS dk	IDF dm
Soil moisture regime*	3/SD	2/MD	3/SD	2/MD	3/SD	3/SD	3/SD	2/MD	4/MD
Soil nutrient regime*	M	M	M	M	R	R	R	M	M
Elevation (m)	980	980	1020	1030	785	805	800	1285	1215
Slope gradient (%)	40	48	21	27	42	65	65	0	16
Aspect*	N	N	N	N	W	W	W	F	E
Forest floor thickness (cm)	8	7	3	7	6	7	6	4	10
Textural class*	LS	LS	S	L	LS	SL	LS	LS	SL
Actual rooting depth (cm)	80	60	35	45	70	90	30	45	40
Potential rooting depth (cm)	80	60	35	45	70	90	30	45	40
Seepage depth (cm)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Soil drainage*	W	W	M	W	R	R	R	W	W
Humus form group*	TD	TD	VL	TD	RD	TD	TD	RD	HR
Soil great group*	HFP	HFP	EB	HFP	HFP	HFP	R	HFP	EB
Stand age (years @ bh)	58	58	54	55	73	73	75	76	N/D
Site index (m @ 50 yrs bh)	26.7	25.3	26.1	21.8	20	24.1	20.4	20.5	N/D
Tree layer cover (%)	95	70	80	100	85	75	93	90	100
Shrub layer cover (%)	8	27	57	66	16	57	42	4	16
Herb layer cover (%)	53	7	26	22	15	11	4	2	17
Moss layer cover (%)	0	0	0	0	0	0	0	0	0

1 Plot numbers have been simplified in this report. See Appendix 32 on pag e112 for original plot codes.

* Abbreviations defined in Appendix 17 on page 96.

Appendix 29. Selected environmental characteristics for plots of the 423 Populus tremuloides – Rosa nutkana: Angelica genuflexa subassociation.

Plot number[1]	154	155	156	157	158	159	160	161	162
Zone/subzone	ICH mw	ICH mw	ICH mw	ICH mw	ICH mw	ICH mw	IDF dm	IDF dm	IDF dm
Soil moisture regime*	4/F	4/F	4/F	4/F	4/F	4/F	6/F	5/SD	5/SD
Soil nutrient regime*	R	R	VR	R	R	R	M	R	M
Elevation (m)	795	795	800	800	805	805	1210	1210	1285
Slope gradient (%)	48	18	32	27	30	21	4	0	0
Aspect*	S	S	S	S	S	S	E	F	F
Forest floor thickness (cm)	7	10	10	8	10	9.5	8	8	9
Textural class*	SL	L	L	L	L	SL	LS	SCL	S
Actual rooting depth (cm)	50	50	70	70	70	60	65	45	50
Potential rooting depth (cm)	50	50	70	70	70	60	65	55	50
Seepage depth (cm)	N/A	N/A	N/A	N/A	N/A	N/A	65	55	60
Soil drainage*	W	W	W	W	W	W	P	I	I
Humus form group*	VL	VL	TD	VL	VL	VL	TD	VL	RD
Soil great group*	EB	EB	EB	EB	EB	EB	GL	GL	DYB
Stand age (years @ bh)	76	100	59	56	65	77	65	67	66
Site index (m @ 50 yrs bh)	19.6	19.3	23.7	20.4	27	21	20.2	22.3	20
Tree layer cover (%)	85	85	70	80	70	70	68	42	93
Shrub layer cover (%)	48	72	58	23	70	28	27	84	13
Herb layer cover (%)	16	28	19	45	27	48	30	35	13
Moss layer cover (%)	0	0	0	0	0	0	0	0	0

1 Plot numbers have been simplified in this report. See Appendix 32 on page 112 for original plot codes.

* Abbreviations defined in Appendix 17 on pag e96.

Appendix 30. Selected environmental characteristics for plots of the 424 Populus tremuloides – Rosa nutkana: Senecio pseudoaureus subassociation.

Plot number[1]	163	164	165	166	167	168	169	170	171
Zone/subzone	IDF dm	MS dk	MS dk	MS dk	MS dx	IDF dw	IDF xm	IDF xm	IDF xm
Soil moisture regime*	4/MD	3/SD	2/MD	2/MD	2/MD	4/MD	4/MD	4/MD	4/MD
Soil nutrient regime*	VR	R	R	M	R	R	R	R	M
Elevation (m)	1005	1025	1035	1040	1055	1010	1050	1215	1220
Slope gradient (%)	0	8	45	5	59	48	5	12	15
Aspect*	F	E	S	W	S	W	E	E	E
Forest floor thickness (cm)	7	3	2.5	9	3	9	4	13	9
Textural class*	SL	SL	SL	SL	LS	LS	S	SCL	SL
Actual rooting depth (cm)	100	90	100	40	40	80	80	70	40
Potential rooting depth (cm)	100	90	100	40	40	80	80	70	40
Seepage depth (cm)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	75	N/A
Soil drainage*	W	W	W	W	W	W	W	M	W
Humus form group*	VL	VL	VL	VL	VL	TD	VL	TD	HR
Soil great group*	EB	HFP	EB	HFP	EB	EB	EB	GL	EB
Stand age (years @ bh)	96	74	61	72	57	89	75	69	86
Site index (m @ 50 yrs bh)	20.2	24.9	20.7	17.9	15.2	24.6	20.6	23.8	19.1
Tree layer cover (%)	70	63	88	75	41	56	41	90	80
Shrub layer cover (%)	9	23	3	6	28	59	77	55	69
Herb layer cover (%)	13	19	78	16	18	10	5	22	18
Moss layer cover (%)	0	1	0	1	0	0	0	0	0

1 Plot numbers have been simplified in this report. See Appendix 32 on pag e112 for original plot codes.

* Abbreviations defined in Appendix 17 on page 96.

Appendix 31. Selected environmental characteristics for plots of the 425 Populus tremuloides – Rosa nutkana: Shepherdia canadensis subassociation.

Plot number[1]	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186
zone/subzone	IDF xm	IDF xm	IDF xm	IDF xm	IDF xm	SBPS dc	SBPS dc	SBPS dc	MS dk	MS dk	IDF dm	IDF dm	IDF dm	IDF dm	IDF dm
Soil moisture regime*	2/VD	2/VD	2/VD	3/VD	3/VD	4/MDf	4/MDf	2/VD	1/VD	1/VD	2/VD	2/VD	2/VD	2/VD	4/MD
Soil nutrient regime*	M	M	R	M	P	M	R	R	M	P	P	M	P	P	P
Elevation (m)	1095	1100	1040	965	980	960	960	970	1060	1060	1040	1080	1065	1285	1210
Slope gradient (%)	0	14	48	0	0	0	0	4	35	85	38	38	67	0	2
Aspect*	F	E	W	F	F	F	F	W	S	S	S	S	S	F	F
Forest floor thickness (cm)	5	7	3	9	5	9	3	6	9	4	5	10	4	6	4
Textural class*	L	SL	SL	L	LS	SCL	SCL	CL	LS	L	SL	SL	S	LS	SL
Actual rooting depth (cm)	80	45	40	70	45	70	70	65	40	120	25	55	80	30	70
Potential rooting depth (cm)	80	45	45	70	45	70	70	65	40	120	25	55	80	30	70
Seepage depth (cm)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Soil drainage*	W	R	R	W	R	W	W	M	R	R	R	R	R	R	W
Humus form group*	TD	RD	VL	TD	HR	VL	TD	TD	TD	TD	TD	TD	TD	TD	HR
Soil great group*	EB	EB	EB	EB	EB	SB	EB	GL	DYB	EB	EB	EB	DYB	DYB	EB
Stand age (years @ bh)	70	63	63	122	113	95	65	117	61	62	86	95	75	68	74
Site index (m @ 50 yrs bh)	12.6	13.1	8.7	10.2	9.8	10.2	11.2	10.3	14.1	12.7	14.6	10.2	14.8	N/D	16.2
Tree layer cover (%)	60	30	50	82	40	25	25	80	44	25	70	95	25	66	60
Shrub layer cover (%)	62	1	0	1	4	53	51	18	15	69	42	33	5	13	37
Herb layer cover (%)	4	51	12	1	2	16	7	14	35	9	22	74	0	4	25
Moss layer cover (%)	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0

1 Plot numbers have been simplified in this report. See Appendix 32 on pag e112 for original plot codes.

* Abbreviations defined in Appendix 17 on page96.

Appendix 32. Conversion of the plot numbers used in this report to the plot codes used in the original data set (AtKK.MDB) on file with the British Columbia Ministry of Forests, Research Branch, in the VENUS data base.

plot number	plot code
1	97--040
2	97--068
3	97--107
4	97--111
5	97--015
6	97--036
7	97--037
8	97--042
9	97--047
10	97--048
11	97--051
12	97--053
13	97--059
14	97--089
15	97--102
16	97--103
17	97--109
18	98--093
19	97--008
20	97--056
21	97--063
22	97--065
23	97--066
24	97--067
25	97--069
26	97--076
27	97--082
28	97--116
29	97--117
30	97--121
31	98--096
32	95--119
33	95--120
34	95--121
35	95--122
36	95--123
37	95--126
38	95--127
39	95--132
40	95--133
41	95--134
42	95--108
43	95--110
44	95--111
45	95--112
46	95--113
47	95--114

plot number	plot code
48	95--115
49	95--118
50	95--124
51	95--125
52	98--114
53	95--101
54	95--102
55	95--103
56	95--104
57	95--107
58	95--109
59	95--116
60	95--117
61	95--129
62	95--131
63	95--201
64	95--202
65	95--203
66	95--204
67	95--205
68	95--206
69	95--207
70	95--208
71	95--212
72	95--213
73	95--214
74	95--215
75	95--216
76	95--217
77	95--301
78	95--302
79	95--303
80	95--304
81	95--306
82	95--307
83	95--309
84	95--105
85	95--106
86	95--128
87	95--130
88	95--209
89	95--210
90	95--211
91	95--305
92	95--308
93	98--075
94	97--120

plot number	plot code
95	98--007
96	98--026
97	98--095
98	98--097
99	98--099
100	98--100
101	98--102
102	98--104
103	98--111
104	97--003
105	97--005
106	97--007
107	97--009
108	97--010
109	97--011
110	97--017
111	97--018
112	97--019
113	97--020
114	97--023
115	98--063
116	98--067
117	98--068
118	98--071
119	98--073
120	98--103
121	97--024
122	97--025
123	97--026
124	97--027
125	97--028
126	97--029
127	97--031
128	97--032
129	98--203
130	98--253
131	97--034
132	98--216
133	98--219
134	98--220
135	98--223
136	98--224
137	98--225
138	98--228
139	98--230
140	98--251
141	98--252

plot number	plot code
142	98--254
143	98--277
144	98--278
145	98--217
146	98--218
147	98--221
148	98--222
149	98--235
150	98--236
151	98--237
152	98--283
153	98--286
154	98--206
155	98--207
156	98--209
157	98--210
158	98--211
159	98--213
160	98--279
161	98--280
162	98--281
163	98--010
164	98--226
165	98--227
166	98--229
167	98--232
168	98--267
169	98--275
170	98--285
171	98--287
172	98--002
173	98--003
174	98--008
175	98--023
176	98--024
177	98--025
178	98--027
179	98--028
180	98--233
181	98--234
182	98--269
183	98--270
184	98--276
185	98--282
186	98--284