Climate The Montane Spruce Zone has a cool, continental climate characterized by cold winters and moderately short, warm summers (Hope *et al.* 1991). Although there are no long-term climatic data from this zone in the Cariboo Forest Region, the location of the MS Zone above the SBPS and, to a lesser extent, above the IDF, implies that temperatures are colder, growing seasons are shorter, and precipitation is greater than in these other zones. Short-term data from the Itcha–Ilgachuz area indicate that night-time subfreezing temperatures are common during the growing season (Steen *et al.* 1990). Mean annual precipitation is small but probably slightly greater than the 440 mm recorded in the SBPS. Mid winter snowpack depths are commonly 60–100 cm.

The cool summers and cold winters of the MS Zone result largely from its position in the strong rainshadow of the Coast Mountains and its high elevations. The low precipitation, dry air, and clear skies in the rainshadow result in significant night-time radiation cooling and low overnight temperatures.

TABLE 10 Environmental characteristics of MS subzones and variants in the Cariboo Forest Region

	MSxv	MSxk	MSdc2	MSdv
Area (km)	8731	605	798 (MSdc2 and MSdv combined)	
Elevation range (m)	1450–1700 (S) 1250–1500 (N)	1450–1700	1200–1525	1150–1700
Climate	no data	no data	no data	no data
Soils				
Zonal soils[a]	E.DYB. (BR.GL)	E.DYB. (BR.GL)	BR.GL	BR.GL
Zonal humus form[b]	HR	HR	HR	HR

[a]E.DYB. = Eluviated Dystric Brunisol; BR.GL = Brunisolic Gray Luvisol
[b]HR = HemiMor

TABLE 11 MS vegetation table - zonal sites[a]

	Biogeoclimatic Unit	MSxv	MSxk	MSdc2	MSdv	
Tree Layer	*Pinus contorta*	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮▮▮	lodgepole pine
	Picea engelmannii x *glauca*	▮		▮		hybrid white spruce
	Abies lasiocarpa			▮▮▮▮		subalpine fir
Shrub Layer	*Vaccinium membranaceum*		▮▮			black huckleberry
	Rhododendron albiflorum		▮			white-flowered rhododendron
	Juniperus communis	▮▮▮	▮▮▮		▮	common juniper
	Shepherdia canadensis	▮	▮▮▮	▮	▮▮▮▮	soopolallie
	Rosa acicularis	▮	▮▮▮		▮▮▮	prickly rose
	Picea engelmannii x *glauca*	▮▮▮	▮▮		▮▮▮	hybrid white spruce
	Abies lasiocarpa			▮▮▮▮	▮▮▮	subalpine fir
	Lonicera involucrata				▮▮	black twinberry
Herb Layer	*Empetrum nigrum*	▮▮▮▮				crowberry
	Vaccinium scoparium	▮▮▮▮	▮▮▮		▮	grouseberry
	Cornus canadensis	▮▮▮	▮	▮	▮▮▮	bunchberry
	Vaccinium caespitosum		▮▮▮		▮▮	dwarf blueberry
	Arctostaphylos uva-ursi		▮			kinnikinnick
	Orthilia secunda	▮	▮▮	▮▮	▮	one-sided wintergreen
	Calamagrostis rubescens	▮	▮▮▮▮▮		▮▮▮▮	pinegrass
	Linnaea borealis	▮▮▮	▮▮▮	▮▮▮	▮▮▮▮	twinflower
	Arnica cordifolia	▮▮▮	▮▮▮	▮▮▮	▮▮▮	heart-leaved arnica
	Epilobium angustifolium	▮▮			▮▮	fireweed
	Aster conspicuus		▮▮▮		▮▮▮▮	showy aster
	Fragaria virginiana				▮▮	wild strawberry
	Osmorhiza chilensis				▮▮	mountain sweet-cicely
	Galium boreale				▮▮	northern bedstraw
	Thalictrum occidentale				▮▮▮	western meadowrue
	Lupinus arcticus				▮▮▮	arctic lupine
Moss Layer	*Cladina* spp.	▮▮▮				reindeer lichens
	Cladonia spp.	▮▮▮	▮▮	▮▮▮	▮	cladonia lichens
	Pleurozium schreberi	▮▮▮▮▮	▮▮▮▮▮	▮	▮▮▮▮	red-stemmed feathermoss
	Dicranum spp.	▮▮▮	▮	▮▮▮	▮▮▮	heron's-bill mosses
	Peltigera aphthosa	▮▮▮	▮▮▮		▮▮▮	freckle pelt

[a]Data are for zonal sites only.

Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%

The MSxv is the coldest and driest subzone of the MS in British Columbia and also one of the least productive biogeoclimatic units for tree growth. Winters are cold and summers are cool with frequent growing-season frost. Mature forests on zonal sites are predominantly even-aged, even-sized lodgepole pine forests with scattered hybrid white spruce. Subalpine fir is common in the southern but not the northern parts of the subzone. Vegetation succession in this climate is very slow, and pine stands more than 200 years old often have few spruce or subalpine fir trees in the canopy. In contrast to other subzones of the MS, Douglas-fir is absent from all ecosystems of the MSxv, and crowberry is common on zonal sites. The undergrowth vegetation on zonal sites is dominated by crowberry, grouseberry, a small number of low forb species (such as bunchberry), mosses, and lichens. Feathermosses, especially red-stemmed feathermoss, dominate the moss layer. Very few medium or tall shrubs are present. In contrast to the SBPSxc, mature pine stands have a relatively closed canopy and little pine regeneration in the understory. Mountain pine beetle, which has caused extensive mortality of lodgepole pine trees in the SBPS, has much less impact in the MSxv.

MSdc2 Variant The MSdc is a relatively small subzone that occurs in the valleys of the Coast Mountains in the Kamloops and Cariboo forest regions. In the Cariboo Forest Region it is represented by the MSdc2 variant, which occurs in the valleys of Chilko and Tatlayoko lakes, Mosley Creek, and Klinaklini and Atnarko rivers above the IDFdw and below the ESSFxv. The climate in this area is moderated somewhat by coastal influences and, as a result, winters are less cold and summers have less frequent frost than in the MSxv. Mature forests on zonal sites are predominantly lodgepole pine stands, often with moderate amounts of subalpine fir and trembling aspen, scattered spruce, and occasionally Douglas-fir. The undergrowth of these stands contains more species and is more productive than that of the MSxv. The undergrowth is dominated by low- to medium-height forbs and grasses with comparatively few mosses or lichens. The shrub layer is typically sparse and consists mostly of soopolallie and Sitka alder. Common herbaceous plants are heart-leaved arnica, twinflower, and bunchberry. In contrast to the MSxv, grouseberry and crowberry are seldom present.

MSdc2
MONTANE SPRUCE
DRY COLD SUBZONE
TATLAYOKO VARIANT

The MSdc2 is a very small variant that occurs on leeward slopes of the Pacific Ranges and northwestern parts of the Chilcotin Range. Specifically it occurs in the valleys of Chilko and Tatlayoko lakes, Mosley Creek, and Klinaklini and Atnarko rivers. It occurs at elevations above the IDFdw and below the ESSFxv, primarily from 1150 to 1650 m (occasionally to 1750 m).

Distinguishing Adjacent Units from the MSdc2

The **ESSFxv** occurs at elevations above the MSdc2 throughout its distribution. On slopes facing onto the Fraser Plateau, the MSdc2 is replaced at similar elevations by the **MSxv**, which has a colder, drier climate. In the Coast Mountains east of Chilko Lake, it is replaced at similar elevations by the **MSdv**. The **IDFdw** occurs below the MSdc2 on lower slopes of major valleys.

In the **MSxv**, zonal sites have:
- hybrid white spruce, grouseberry, crowberry, and common juniper;
- little or no subalpine fir in overstory.

dry sites have:
- no Douglas-fir.

In the **MSdv**, zonal sites have:
- abundant arctic lupine, pinegrass, soopolallie, and showy aster;
- uncommon subalpine fir.

dry sites have:
- no Douglas-fir.

In the **IDFdw**, zonal sites have:
- common Douglas-fir;
- showy aster and pinegrass.

In the **ESSFxv**, zonal sites have:
- white-flowered rhododendron, bracted lousewort, grouseberry, and arctic lupine.

Distribution of MSdc2 Variant in the Cariboo Forest Region

Site Units of the MSdc2

Due to access constraints, fewer ecosystem inventory data are available for the MSdc2 than for most other biogeoclimatic units in the Cariboo Forest Region. In addition, the MSdc2 encompasses significant local climatic variability resulting from varying coastal influence from valley to valley. As a result, the probability of encountering undescribed forested ecosystems and variations from the described units is generally greater in this than in most other biogeoclimatic units.

Zonal Site Series **01 Sxw - Wintergreen - Feathermoss Site Series** is the predominant site unit in the MSdc2. It occupies gentle to moderately steep upper to lower slopes on all aspects. Soils are mostly Orthic Dystric Brunisols. The climax forest canopy is dominated by subalpine fir and hybrid white spruce but, due to a history of frequent wildfires, most stands are seral stages dominated by lodgepole pine and subalpine fir. A few Douglas-fir are often present. Tree regeneration is predominantly subalpine fir together with lesser numbers of hybrid white spruce. The undergrowth vegetation consists of many species, which together form a low to moderate overall cover. Common shrubs are soopolallie, Sitka alder, and birch-leaved spirea. The herb layer usually contains twinflower, heart-leaved arnica, one-sided wintergreen, and bunchberry. Moss cover is variable.

Drier Sites Sites drier than the zonal site series occur on hill crests, steep slopes, south- and west-facing slopes, and coarse soils. They are moderately common. Compared to zonal or other mesic sites they frequently have significant amounts of Douglas-fir in both the forest canopy and tree regeneration layers. Common juniper, saskatoon, kinnikinnick, and pinegrass are also usually present.

02 FdBl - Spirea - Stonecrop Site Series occurs on moderate to steep upper slopes and ridge tops where bedrock is near (<50 cm) the surface. Soils are mostly loamy, but often contain high amounts of coarse fragments. These are generally small, localized sites. The vegetation is distinguished by dominant Douglas-fir with an under-growth containing several dry-site species, including common juniper, saskatoon, shrubby penstemon, kinnikinnick, pinegrass, lance-leaved stonecrop, and ground lichens.

03 FdBl - Soopolallie - Kinnikinnick Site Series occurs primarily on moderate to steep south- and west-facing slopes with deep, loamy soils that have a high coarse fragment content. It also occurs on gentler south- and west-facing slopes where soils are shallow (<80 cm). The forest canopy is typically dominated by Douglas-fir and lodgepole pine. Tree regeneration is predominantly Douglas-fir and subalpine fir. The shrub layer is poorly to moderately well developed and usually contains prickly rose, soopolallie, saskatoon, common juniper, and faslebox. The undergrowth is distinguished from other dry sites by the greater abundance of falsebox, showy aster, western meadowrue, and pinegrass, and by the absence of shrubby penstemon and lance-leaved stonecrop.

04 PlBl - Soopolallie - Kinnikinnick Site Series has been recorded only south of Charlotte Lake in an area that appears to be transitional to the MSxv. It occurs on moderately dry, gentle to moderate slopes in areas of relatively low relief. The forest canopy is predominantly lodgepole pine and subalpine fir. The understory is dominated by subalpine fir but often contains scattered hybrid white spruce. Scattered whitebark pine are frequently present. The shrub layer is typically dense and dominated by soopolallie and occasionally Sitka alder. The herb layer contains few species other than kinnikinnick and occasional bunchberry. Lichens and dicranum mosses have moderate cover. The lack of Douglas-fir, pinegrass, and showy aster and the abundance of lodgepole pine and subalpine fir distinguishes these sites from those of the /03 site series.

Wetter Sites Sites wetter than those of the zonal site series are moderately common in the MSdc2. They occur on lower slopes in the bottoms of small valleys, on seepage areas, and along streams and wetlands. Compared to the zonal site series, they have less lodgepole pine, soopolallie, pinegrass, and lichens, and more hybrid white spruce, black twinberry, palmate coltsfoot, and pink wintergreen.

05 Sxw - Rhododendron - Crowberry Site Series occurs on moist, intermittent-seepage sites where cold air accumulates, primarily on toe slope positions and in small, shallow depressions within cold air drainage tracts. The mature forest canopy is moderately closed and dominated by hybrid white spruce and subalpine fir. Tree regeneration is sparse to moderately abundant and predominantly subalpine fir. The undergrowth vegetation is distinguished by cold-site species such

as white-flowered rhododendron, Labrador tea, and crowberry, in addition to moist-site species such as black twinberry, palmate coltsfoot, common horsetail, and clasping twistedstalk.

06 Sxw - Twinberry - Reedgrass Site Series occurs on moist toe slope positions and flats with silty or clayey soils. The mature forest canopy consists of relatively open-grown hybrid white spruce and scattered subalpine fir. Hybrid white spruce is typically the principal species of tree regeneration. The undergrowth vegetation in mature stands is distinguished by a relatively well-developed shrub layer of black twinberry, mountain alder, and black gooseberry and a well-developed herb layer containing bluejoint, star-flowered false Solomon's-seal, and trailing raspberry.

07 Sxw - Gooseberry Site Series occurs on north- and east-facing slopes on mid, lower, and toe slope positions where soils are moistened by intermittent to permanent seepage. It often occurs along streams and where subsurface seepage is near the surface on valley slopes. The mature forest canopy is dominated by hybrid white spruce and subalpine fir with scattered lodgepole pine. Tree regeneration is predominantly subalpine fir. The undergrowth vegetation is distinguished from the /01 site series by the presence of black gooseberry and black twinberry as well as forbs indicative of moist sites.

08 Sxw - Horsetail - Leafy moss Site Series occurs on level or gently sloping sites with a near-surface (<50 cm) water table, primarily at the toe of slopes. Soils are typically Gleysols and less commonly Organics. The mature forest canopy is predominantly hybrid white spruce with a few scattered subalpine fir. Trees are often rooted on raised microsites. The undergrowth is distinguished by >25% cover of common horsetail. Other distinguishing herbs include soft-leaved sedge, palmate coltsfoot, and fringed grass-of-Parnassus. Glow moss, leafy mosses, and occasionally sphagnum moss are also present.

Non-forested Sites Wetlands are not abundant in the MSdv2 and are primarily small fens in local depressions and swamps along small streams. Grasslands are relatively rare in the MSdv2 and occur as grass- and shrub-dominated "balds" on steep south aspects. Sites dominated by bedrock with sparse vegetation are relatively common on steeply sloping valley sides.

Key to Site Units of the MSdc2

1a. Soils <50 cm deep over bedrock; bedrock outcrops often present; slope position crest or upper; moisture regime very xeric to subxeric.
MSdc2/02 FdBl - Spirea - Stonecrop

1b. Soils deeper; bedrock outcrops usually absent; slope position not crest except on subdued hills; moisture regime subxeric or wetter.

2a. Slope gradient >30%.

3a. Slope aspect SE, S, SW, or W; moisture regime subxeric or submesic; slope position upper or mid; tree layers dominated by Douglas-fir; subalpine fir usually not abundant in tree layers; pinegrass, kinnikinnick, and soopolallie usually present.
MSdc2/03 FdBl - Soopolallie - Kinnikinnick

3b. Slope aspect NW, N, NE, or E; moisture regime predominantly mesic or submesic; Douglas-fir absent or cover low; subalpine fir often well represented in canopy; pinegrass, kinnikinnick, and soopolallie absent or incidental.
MSdc2/01 Sxw - Wintergreen - Feathermoss

2b. Slope gradient <30%.

4a. Moisture regime submesic or mesic; slope position mid (rarely lower); no evidence of seepage within 50 cm of soil surface; black twinberry, palmate coltsfoot, and common horsetail absent or incidental.

5a. Moisture regime submesic; cover of kinnikinnick and cladonia lichens each >5%.

6a. Douglas-fir and pinegrass cover each >5%.
MSdc2/03 FdBl - Soopolallie - Kinnikinnick

6b. Douglas-fir and pinegrass absent or incidental.
MSdc2/04 PlBl - Soopolallie - Kinnikinnick

5b. Moisture regime mesic or occasionally submesic; kinnikinnick and cladonia lichens absent or incidental (<1% cover).
MSdc2/01 Sxw - Wintergreen - Feathermoss

4b. Moisture regime subhygric to subhydric; slope position predominantly lower, toe, depression, or level; evidence of seepage water or water table within 1 m of soil surface; black twinberry, coltsfoot, or common horsetail usually present.

7a. Common horsetail abundant (cover generally >35%); soft-leaved sedge and glow moss common.
MSdc2/08 Sxw - Horsetail - Leafy moss

7b. Common horsetail not abundant (cover generally <5%); soft-leaved sedge and glow moss usually absent or incidental.

8a. White-flowered rhododendron, crowberry, and grouseberry common.
MSdc2/05 Sxw - Rhododendron - Crowberry

8b. White-flowered rhododendron, crowberry, and grouseberry absent or incidental.

9a. Mountain alder and showy aster present.
MSdc2/06 Sxw - Twinberry - Reedgrass

9b. Mountain alder and showy aster absent or incidental.
MSdc2/07 Sxw - Gooseberry

MSdc2 Edatopic Grid

Site Series

01 Sxw - Wintergreen - Feathermoss
02 FdB1 - Spirea - Stonecrop
03 FdB1 - Soopolallie - Kinnikinnick
04 P1B1 - Soopolallie - Kinnikinnick
05 Sxw - Rhododendron - Crowberry
06 Sxw - Twinberry - Reedgrass
07 Sxw - Gooseberry
08 Sxw - Horsetail - Leafy moss

Site Features of MSdc2 Site Series

Site Series	01	02	03	04
Key Features	zonal and other gently sloping sites with mesic or near-mesic moisture regime	very dry ridge crests and upper slopes with thin soils (< 50 cm) over bedrock	moderate to steep SE, S, SW, and W aspects; soils often have abundant coarse fragments	moderately dry, gently to moderately sloping mid slope positions; soils often sandy
Soil Moisture / Nutrient Regimes	mesic, submesic / poor - rich	very xeric - subxeric / very poor - rich	subxeric, submesic / poor - rich	subxeric, submesic / poor - rich
Slope Position	mid (upper - lower)	crest, upper	upper, mid	mid (lower)
Aspect	all	all	SE, S, SW, W	all
Slope Grade (%)	0 - 30 (rarely to 65)	0 - 80	10 - 70	5 - 25
Soil Texture	gravelly loamy, sand, silty	gravelly loamy, silty	gravelly loamy, silty	gravelly loamy, sandy
Humus Form	Hemimor	Xeromor, Xeromoder	Hemihumimor, Mormoder	Mormoder, Humimor, Leptomoder
Occurrence / Size/ Distribution	common / medium - large / wide	uncommon / small / wide	common / medium / wide	common / medium - large / Charlotte Lake area

Site Features of MSdc2 Site Series (continued)

Site Series	05	06	07	08
Key Features	moist toe slope positions and shallow depressions with significant cold air accumulation	moist lower and toe slope positions with alluvial or lacustrine soils; often adjacent to streams	moist mid, lower, and toe slope sites with evidence of seepage in predominantly morainal soils	toe slope positions and depressions with near-surface (< 50 cm) water table
Soil Moisture / Nutrient Regimes	subhygric, hygric / poor, medium	subhygric, hygric / medium - very rich	subhygric, hygric / medium - very rich	hygric - subhydric / poor - rich
Slope Position	lower, toe, shallow depression	lower, toe, level	mid, lower, toe	lower, toe, depression
Aspect	mostly NW, N, NE, E	none	NW, N, NE, E	mostly NW, N, NE, E
Slope Grade (%)	0 - 15	< 5	5 - 50	0 - 10
Soil Texture	silty, clayey, organic	silty, clayey	silty, clayey, (organic)	silty, clayey, organic
Humus Form	Histomor, Hemihumimor, Saprimull	Hydromor	Hemihumimor, Saprimull	Hydromor, Histomoder
Occurrence / Size / Distribution	uncommon / small / wide	uncommon / small / known from Chesi Creek area	common / small, medium / wide	uncommon / small / wide

MSdc2 Vegetation Table[a]

	Site Unit	02	03	04	01	05	06	07	08	
Tree Layer	*Pinus contorta*	▮▮▮	▮▮▮	▮▮▮▮▮	▮▮▮▮			▮		lodgepole pine
	Pseudotsuga menziesii	▮▮▮▮	▮▮▮▮▮							Douglas-fir
	Abies lasiocarpa			▮▮▮▮	▮▮▮▮	▮▮▮▮	▮	▮▮▮▮	▮	subalpine fir
	Picea engelmannii x *glauca*			▮	▮	▮▮▮▮▮	▮▮▮▮▮	▮▮▮	▮▮▮▮▮	hybrid white spruce
Shrub Layer	*Amelanchier alnifolia*	▮▮▮	▮▮							saskatoon
	Juniperus communis	▮▮								common juniper
	Spiraea betulifolia	▮▮▮	▮				▮			birch-leaved spirea
	Shepherdia canadensis		▮▮▮	▮▮▮						soopolallie
	Rosa acicularis	▮▮	▮▮▮			▮▮▮	▮▮▮		▮▮▮	prickly rose
	Vaccinium membranaceum				▮	▮▮▮				black huckleberry
	Rhododendron albiflorum				▮	▮▮▮▮▮		▮	▮	white-flowered rhododendron
	Alnus tenuifolia						▮▮▮▮▮		▮▮▮	mountain alder
	Lonicera involucrata					▮▮▮	▮▮▮▮	▮▮	▮▮	black twinberry
Herb Layer	*Hieracium* spp.	▮▮	▮▮							hawkweeds
	Arctostaphylos uva-ursi	▮▮▮▮	▮▮▮	▮▮▮▮						kinnikinnick
	Calamagrostis rubescens	▮▮▮	▮▮▮▮▮				▮			pinegrass
	Achillea millefolium	▮▮	▮			▮▮				yarrow
	Arnica cordifolia		▮▮▮		▮▮▮	▮▮▮▮	▮	▮		heart-leaved arnica
	Thalictrum occidentale		▮▮▮				▮▮▮	▮▮▮	▮	western meadowrue
	Aster conspicuus		▮▮▮				▮▮▮▮			showy aster
	Vaccinium scoparium					▮▮▮				grouseberry
	Linnaea borealis			▮▮▮▮	▮▮▮	▮▮▮▮	▮	▮	▮▮	twinflower
	Cornus canadensis			▮	▮	▮▮▮	▮▮▮	▮	▮▮▮	bunchberry
	Empetrum nigrum					▮▮▮▮			▮	crowberry
	Petasites palmatus					▮▮▮	▮	▮	▮▮▮	palmate coltsfoot
	Equisetum arvense					▮▮▮	▮		▮▮▮▮▮	common horsetail
	Calamagrostis canadensis						▮▮▮			bluejoint
	Smilacina stellata						▮▮▮▮			star-flowered false Solomon's-seal
	Galium triflorum						▮▮▮	▮	▮	sweet-scented bedstraw
	Streptopus amplexifolius					▮▮			▮	clasping twistedstalk
	Rubus pubescens						▮▮▮		▮	trailing raspberry
	Aster foliaceus								▮▮▮	leafy aster
Moss Layer	*Peltigera* spp.	▮▮▮		▮	▮					pelt lichens
	Dicranum spp.		▮	▮▮▮▮	▮▮▮	▮▮▮	▮	▮▮▮		heron's-bill mosses
	Pleurozium schreberi				▮▮▮▮		▮▮▮▮		▮	red-stemmed feathermoss
	Mnium spp.						▮		▮	leafy mosses
	Aulacomnium palustre								▮▮▮▮▮	glow moss

[a] Species abundance: ▮ present in 40–60% of plots surveyed; ▮▮ >60% of plots, mean cover <1%; ▮▮▮ >60% of plots, mean cover 1–7%; ▮▮▮▮ >60% of plots, mean cover >7–15%; ▮▮▮▮▮ >60% of plots, mean cover >15%

Heart-leaved arnica
Arnica cordifolia

One-sided wintergreen
Orthilia secunda

TABLE A1.1. Site units (shaded) in the Cariboo Forest Region and their precorrelation equivalents (unshaded).

Current (correlated) BEC unit code												
BEC Unit		Site unit										
		/01	/02	/03	/04	/05	/06	/07	/08	/09	/10	/11
		Equivalent precorrelation code										
	BEC Unit	Ecosystem unit										
AT	AT	(site units not yet described)										
BGxh3	PPBGg	(see Iverson and Coupé 1996a)										
BGxw2	PPBGe	(see Iverson and Coupé 1996b)										
CWHds1	CWHc	see Guide for Vancouver Region (Green and Klinka 1994)										
ESSFdc2	ESSFe1	see Guide for Kamloops Forest Region (Lloyd et al. 1990)										
ESSFwc3	ESSFh2	/01	/02	/03								
ESSFwk1	ESSFh1	/01	/02	/03	/05	/04	/07 in part	/07 in part				
ESSFxc	ESSFd	see Guide for Kamloops Forest Region (Lloyd et al. 1990)										
ESSFxv1	ESSFg, ESSF undif	npe	npe	npe	npe	npe	npe	npe	npe			
ESSFxv2	ESSFg, ESSF undif	npe	npe	npe	npe	npe	npe	npe	npe			
ICHdk	ICHe3	/01	/02	/03	/04	/05	/06	/07	/08	/09		
ICHmk3	ICHe2	/01,/04	/02	/03	/05	/06	/07	/08				
ICHmw3	ICHm1	see Guide for Kamloops Forest Region (Lloyd et al. 1990)										
ICHwk2	ICHh1	/01,/05	/02	/03	/04	/06 in part	/06 in part	/07	/08			
ICHwk4	ICHh2	/01,/06	/02	/03	/04	/05	/07	/08	/09			
IDFdk3	IDFb2	/01	/03	/02	/05	/04	/06	/07	/08	/09, /10		
IDFdk4	IDFb5	/01	/02	/03	/04	/05	/06	/07	/08	/09	/10	
IDFdw	IDFundiff.	npe	npe	npe	npe	npe	npe	npe	npe			
IDFmw2	IDFj1	see Guide for Kamloops Forest Region (Lloyd et al. 1990)										
IDFxm	IDFa4	/01	/02	/03	/04	/05	/06	/07	/08	/09		
IDFxw	IDFa2	/01,/05,/07	/02	/03	/04	/06	/08	/09				

[a]No previous equivalent (npe)

TABLE A 1.1 (continued)

Current (correlated) BEC unit code												
BEC unit		Site unit										
		/01	/02	/03	/04	/05	/06	/07	/08	/09	/10	/11
	Equivalent Precorrelation Code											
	BEC unit	Ecosystem Unit										
MHmm2	MHb	see Guide for Vancouver Forest Region (Green and Klinka 1994)										
MSdc2	MS undiff	npe	npe	npe	npe	npe	npe	npe	npe	npe	npe	npe
MSdv	MS undiff	npe	npe	npe	npe	npe	npe	npe	npe	npe	npe	npe
MSxk	MSc	see Guide for Kamloops Forest Region (Lloyd et al. 1990)										
MSxv	MSd	/01	/03	/02	/04	/05	/06	/07	/08			
SBPSdc	SBSa3	/01	/02	/03,/04	/05	/06	/07	/09	/08			
SBPSmc	SBSa2	see Guide for Prince Rupert Forest Region (Banner et al 1993)										
SBPSmk	SBSb	/01	/02	/03	/04	/05	/06	/07	/08,/09			
SBPSxc	SBSa1	/01	/02,/03	/05	/04	/06	/07					
SBSdw1	SBSk1	/01	/02	/03	/04	/05	/06	/07	/08	/09		
SBSdw2	SBSk2	/01	/02	/03	/04	/05	/06	/07	/08	/09	/10	/11
SBSmc1	SBSm2	/01	/02	/03	/04	/06	/05	/07	/08			
SBSmc2	SBSe1	/01	/02	/03	/04	/05	/06	/07	/08	/09	/10	/11
SBSmh	SBSl	/01	/02	/03	/04	/05	/06	/07	/08	/09		
SBSmm	SBSm	see Guide for Kamloops Forest Region (Lloyd et al. 1990)										
SBSmw	SBSc	/01	/02	/05	/03,/04	npe	/06	/07	/08	/09	/10	
SBSwk1	SBSj1	/01	/02	/03,/04	/05	/06	npe	/07	/08	/10	/09	/11

[a]No previous equivalent (npe)

TABLE 5.3.1 *Distribution of Marsh Site Associations by biogeoclimatic zone*

	BG PP	BWBS SWB	ESSF	ICH	IDF	MS	SBPS SBS	CDF	CWH	MH
Wm01 Beaked sedge – Water sedge	x	xx	x	xxx	xxx	xx	xx		x	
Wm02 Swamp horsetail – Beaked sedge		x		x	x	x	xx			
Wm03 Awned sedge	x				x					
Wm04 Common spike-rush	x	x		xx	x	x	xx		x	
Wm05 Cattail	xxx	x		xx	xx	x	xx	xx	x[s]	
Wm06 Great bulrush	xxx	x		x	xx	xx	x	x	x	
Wm07 Baltic rush	x				xx					
Wm50 Sitka sedge – Hemlock-parsley								xx	xx	
Wm51 Three-way sedge				x				x	x	

x = incidental; < 5% of wetlands xx = minor; 5–25% of wetlands xxx = major; >25% of wetlands
s = southern subzones only

TABLE 5.3.2 *Marsh Species Importance Table*

	Species	Wm01	Wm02	Wm03	Wm04	Wm05
Herbs and Dwarf Shrubs	*Carex utriculata*	▮▮▮▮	▮▮▮▮	▮		▮▮
	Carex aquatilis	▮▮▮	▮▮	▮		
	Equisetum fluviatile	▮	▮▮▮▮▮		▮	
	Comarum palustre	▮▮	▮▮			▮
	Sium suave	▮	▮▮			
	Carex exsiccata			▮		
	Carex atherodes			▮▮▮▮▮		
	Polygonum amphibium	▮	▮	▮▮	▮	▮
	Eleocharis palustris		▮		▮▮▮▮▮	▮
	Potamogeton richardsonii				▮▮▮	
	Typha latifolia		▮			▮▮▮▮▮
	Schoenoplectus acutus					▮
	Menyanthes trifoliata					
	Utricularia macrorhiza	▮	▮	▮	▮	▮
	Juncus balticus	▮		▮		
	Hordeum jubatum				▮	
	Potentilla anserina			▮		
	Calamagrostis canadensis	▮▮	▮	▮▮	▮	
	Cicuta douglasii		▮			▮
	Lysichiton americanus					▮
	Oenanthe sarmentosa					▮
	Galium trifidum	▮				
	Spiraea douglasii					▮
	Carex sitchensis					
	Nuphar lutea ssp. *polysepala*				▮	▮
	Dulichium arundinaceum					
Mosses	*Drepanocladus* spp.	▮▮	▮▮	▮▮	▮	▮
	Warnstorfia spp.	▮	▮	▮	▮	▮

Carex utriculata – Carex aquatilis

General Description

Beaked sedge – Water sedge marshes constitute the most common and widespread Marsh Site Association in the province. The **Wm01** occurs in all subzones from low to sub-alpine elevations on sites that are inundated by shallow, low-energy floodwaters and that experience some late-season drawdown. These marshes are found in a wide variety of landscape positions including flooded beaver ponds, lake margins, floodplains, and palustrine basins.

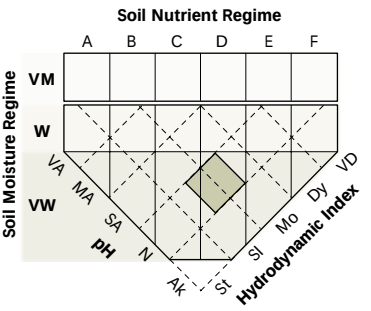
Species diversity is low and plant cover is strongly dominated by *Carex utriculata* and *C. aquatilis* with scattered forbs, aquatics, and mosses. On sites experiencing significant surface drying, species diversity increases and sites become more meadow-like. Species such as *Calamagrostis canadensis*, *Geum macrophyllum*, or *Deschampsia cespitosa* can become prominent.

The **Wm01** occurs over a wide range of site conditions on mineral substrates with thin peat veneers. Common soil types include Gleysols and Terric Humisols.

Characteristic Vegetation

Tree layer (0 - **0** - 0)
Shrub layer (0 - **0** - 5)
Herb layer (13 - **80** - 100)
Carex aquatilis*, *C. utriculata
Moss layer (0 - **5** - 100)

Wetland Edatopic Grid



Comments

*The **Wf01** and **Wm01** have similar plant communities, but, because these units are species-poor and the two dominant sedge species have a wide ecological amplitude, the plant community poorly differentiates between sites on peat (**Wf01**) and those on mineral soil (**Wm01**). In general, the **Wm01** is more deeply flooded, has more dynamic hydrology, and has a higher cover of* C. utriculata.

*The **Wm02** is another similar community that occurs on more hydrologically dynamic locations such as lake margins or floodplains. In cooler climates the **Wm01** frequently develops into **Wf01** on sites with less dynamic hydrology.*

*Some **Wm01** sites have scattered tall shrubs; those sites supporting > 10% shrub cover are described by Swamp Site Associations (Section 5.4).*

TABLE 5.2.1 *Distribution of Fen Site Associations by biogeoclimatic zone*

		BG PP	BWBS SWB	ESSF	ICH	IDF	MS	SBPS SBS	CDF	CWH	MH
Wf01	Water sedge – Beaked sedge		xx	x	xx	xxx	xxx	xxx		x[i]	
Wf02	Scrub birch – Water sedge		xxx	x	xx	xx	xx	xx			
Wf03	Water sedge – Peat-moss			xx				x			
Wf04	Barclay's willow – Water sedge – Glow mosss		x	xxx			x	x			
Wf05	Slender sedge – Common hook-moss		x		xx	xx	xx	xx			
Wf06	Slender sedge – Buckbean		x		x	x		x			
Wf07	Scrub birch – Buckbean – Shore sedge		x		x	x		x			
Wf08	Shore sedge – Buckbean – Hook-moss		x	x		x	x	x			
Wf09	Few-flowered spike-rush – Hook-moss			x			x	x			
Wf10	Hudson Bay clubrush – Red hook-moss							x			
Wf11	Tufted clubrush – Star moss		x	x	x		x	x			
Wf12	Narrow-leaved cotton-grass – Marsh-marigold			xxx							
Wf13	Narrow-leaved cotton-grass – Shore sedge			xx			x				
Wf50	Narrow-leaved cotton-grass – Peat-moss									x	xxx
Wf51	Sitka sedge – Peat-moss				x				xx	xx	
Wf52	Sweet gale – Sitka sedge								xx	xx[s]	
Wf53	Slender sedge – White beak-rush								x	xx[s]	

x = incidental; < 5% of wetlands xx = minor; 5–25% of wetlands xxx = major; >25% of wetlands
i = inland areas only s = southern subzones only

TABLE 5.2.2 *Fen Species Importance Table*

	Species	Wf01	Wf02	Wf03	Wf04	Wf05	Wf06	Wf07	Wf08
Shrubs	*Betula nana*								
	Salix barclayi								
	Salix pedicellaris								
	Spiraea douglasii								
	Myrica gale								
Herbs and Dwarf Shrubs	*Carex utriculata*								
	Carex aquatilis								
	Comarum palustre								
	Calamagrostis canadensis								
	Carex lasiocarpa								
	Menyanthes trifoliata								
	Carex limosa								
	Carex chordorrhiza								
	Eleocharis quinqueflora								
	Trichophorum alpinum								
	Trichophorum cespitosum								
	Eriophorum angustifolium								
	Caltha leptosepala								
	Carex anthoxanthea								
	Equisetum fluviatile								
	Carex magellanica								
	Carex sitchensis								
	Rhynchospora alba								
	Carex livida								
	Eriophorum chamissonis								
	Vahlodea atropurpurea								
	Drosera anglica								
	Hypericum anagalloides								
	Triantha glutinosa								
	Schoenoplectus tabernaemontani								
	Fauria crista-galli								
	Senecio triangularis								
	Andromeda polifolia								
	Kalmia microphylla								
	Oxycoccus oxycoccos								
	Triglochin maritima								
	Drosera rotundifolia								
	Leptarrhena pyrolifolia								
	Platanthera dilatata								
	Sanguisorba canadensis								
	Utricularia intermedia								
	Viola palustris								
Lichens and Mosses	*Sphagnum* Group I								
	Aulacomnium palustre								
	Drepanocladus spp.								
	Sphagnum Group II								
	Tomentypnum nitens								
	Philonotis fontana								
	Calliergon stramineum								
	Scorpidium spp.								
	Campylium stellatum								
	Warnstorfia spp.								
	Meesia triquetra								

General Description

The Scrub birch – Water sedge Fen Site Association is one of the most common peatland Site Associations throughout the Interior and is absent only from PP/BG and wet ESSF subzones. It is frequently a major component of large peatlands where there is some watertable fluctuation and the surface becomes aerated by mid-season. These sites are often hummocked, with shrubs rooting on elevated microsites.

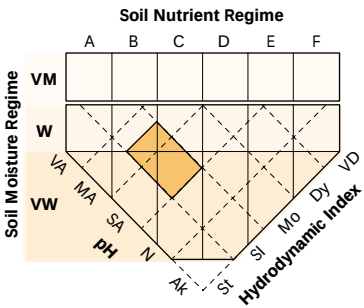
Betula nana and *Carex aquatilis* are the characteristic species but *Salix pedicellaris* and *Carex utriculata* dominate on wetter sites. The moss layer is variable and can be diverse, absent, or dominated by *Tomentypnum nitens*, *Sphagnum*, or *Drepanocladus*. Some drier sites will have scattered, stunted trees (spruce or black spruce most commonly).

Common soil types are terric and typic Mesisols and Fibrisols. Peat depths are frequently between 1 and 2 m but deep sedge-derived peat to 4 m occurs; this Site Association can occassionally occur on thin organic veneers.

Characteristic Vegetation

Tree layer (0 - **0** - 10)
Shrub layer (10 - **35** - 100)
Betula nana, *Salix pedicellaris*
Herb layer (5 - **60** - 100)
Carex aquatilis, ***C. utriculata***, *Comarum palustre*
Moss layer (0 - **70** - 100)
Aulacomnium palustre, Drepanocladus aduncus, Sphagnum Group I, ***Tomentypnum nitens***

Wetland Edatopic Grid



Comments

*The **Wf02** Site Association often occurs around the periphery of the wetter **Wf01** or adjacent to the drier **Wb05**. These three Site Associations may represent a sequence of long-term peatland succession. Many sites have a moss layer with rich and poor site indicators, suggesting that they are in transition from fen to bog conditions.*

*The **Wf02** is one of the most common Interior peatland community types at low to subalpine elevations. It is probably only absent from the AT, BG, and PP zones. In coastal areas, similar sites are occupied by the **Wf52**.*

TABLE 5.3.1 *Distribution of Marsh Site Associations by biogeoclimatic zone*

		BG PP	BWBS SWB	ESSF	ICH	IDF	MS	SBPS SBS	CDF	CWH	MH
Wm01	Beaked sedge – Water sedge	x	xx	x	xxx	xxx	xx	xx		x	
Wm02	Swamp horsetail – Beaked sedge		x		x	x	x	xx			
Wm03	Awned sedge	x				x					
Wm04	Common spike-rush	x	x		xx	x	x	xx		x	
Wm05	Cattail	xxx	x		xx	xx	x	xx	xx	x[s]	
Wm06	Great bulrush	xxx	x		x	xx	xx	x	x	x	
Wm07	Baltic rush	x				xx					
Wm50	Sitka sedge – Hemlock-parsley								xx	xx	
Wm51	Three-way sedge				x				x	x	

x = incidental; < 5% of wetlands xx = minor; 5–25% of wetlands xxx = major; >25% of wetlands
s = southern subzones only

TABLE 5.3.2 *Marsh Species Importance Table*

	Species	Wm01	Wm02	Wm03	Wm04	Wm05
Herbs and Dwarf Shrubs	*Carex utriculata*	▮▮▮▮	▮▮▮▮	▮		▮▮
	Carex aquatilis	▮▮▮	▮▮	▮		
	Equisetum fluviatile	▮	▮▮▮▮▮		▮	
	Comarum palustre	▮▮	▮▮			▮
	Sium suave	▮	▮▮			
	Carex exsiccata			▮		
	Carex atherodes			▮▮▮▮▮		
	Polygonum amphibium	▮	▮	▮▮	▮	▮
	Eleocharis palustris		▮		▮▮▮▮▮	▮
	Potamogeton richardsonii				▮▮▮	
	Typha latifolia		▮			▮▮▮▮▮
	Schoenoplectus acutus					▮
	Menyanthes trifoliata					
	Utricularia macrorhiza	▮	▮	▮	▮	▮
	Juncus balticus	▮		▮		
	Hordeum jubatum				▮	
	Potentilla anserina			▮		
	Calamagrostis canadensis	▮▮	▮	▮▮	▮	
	Cicuta douglasii		▮			▮
	Lysichiton americanus					▮
	Oenanthe sarmentosa					▮
	Galium trifidum	▮				
	Spiraea douglasii					▮
	Carex sitchensis					
	Nuphar lutea ssp. *polysepala*				▮	▮
	Dulichium arundinaceum					
Mosses	*Drepanocladus* spp.	▮▮	▮▮	▮▮	▮	▮
	Warnstorfia spp.	▮	▮	▮	▮	▮

General Description

The Swamp horsetail – Beaked sedge Marsh Site Association is uncommon at lower elevations throughout the Interior. Common locations are in back-levee depressions along sediment-laden, low-gradient streams, protected bays of large lakes, or hydrologically modified (flooded) fens. The **Wm02** also occurs along the Coast in tidal reaches of large rivers above saltwater influence.

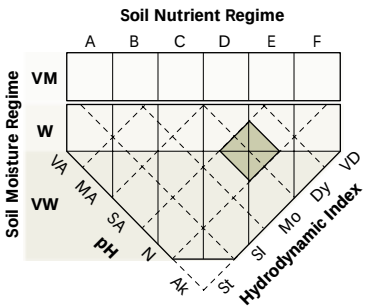
Plant diversity is low. Sites are dominated by *Equisetum fluviatile* with *Carex utriculata* sometimes co-dominating; often there are scattered aquatics such as *Potamogeton* and *Myriophyllum* spp. The **Wm02** is similar to the **Wm01** but is distinguished by its higher hydrodynamic index and by the dominance of *E. fluviatile*.

Soils are derived from silty or fine-sandy fluvium, deep limnic deposits at open margins of lakes, or recently flooded peat. Rego Gleysols and Terric Humisols are common soil types.

Characteristic Vegetation

Tree layer (0 - **0** - 0)
Shrub layer (0 - **0** - 4)
Herb layer (18 - **85** - 100)
C. utriculata*, *Equisetum fluviatile
Moss layer (0 - **0** - 90)

Wetland Edatopic Grid



Comments

E. fluviatile *is tolerant of extreme variations in water depth and high rates of sedimentation and can colonize exposed mineral or peat soils. It has been used to revegetate the extreme environment of the drawdown zone in reservoirs.*

*On fluvial sites, the **Wm02** is usually adjacent to tall-willow swamps or low bench communities. In lake systems, **Wm02** commonly adjoins open water and other marsh communities.*