



Canadian National Vegetation Classification (CNVC) Classification nationale de la végétation du Canada

<http://cnvc-cnvc.ca>

Central Rocky Mountain Dry Lower Montane – Foothill Forest

Macrogroup M501

Forêts sèches des montagnes de faible altitude et du piémont du centre des Rocheuses

Cool Temperate Forest & Woodland

D194 Rocky Mountain Forest & Woodland

M890 Rocky Mountain Intermontane Subboreal Forest

M020 Rocky Mountain Subalpine – High Montane Forest

M500 Central Rocky Mountain Mesic Lower Montane Forest

M501 Central Rocky Mountain Dry Lower Montane – Foothill Forest

CM501a Warm Dry Rocky Mountain Low Montane Forest

CM501b Cool Dry Rocky Mountain Low Montane Forest



Concept

M501 describes foothill, lower montane and plateau forests and woodlands of warm, dry, continental temperate climates of the North American Western Cordillera. The Canadian range includes continuous forests as well as woodlands and forest patches of the Cordilleran Dry Forest and Rocky Mountain Foothills Parkland CNVC vegetation zones in south-central British Columbia (BC) and southwestern Alberta. In the warmest and driest areas, the climate is moist enough to support tree growth only under certain conditions and the natural vegetation is often a landscape mosaic comprising patches of grassland or shrub-steppe and groves of forest and woodland (i.e., parkland). In cooler and moister areas, forest cover can be continuous. In parkland landscapes, M501 describes only the treed portion of the vegetation mosaic. In BC, these are primarily coniferous forests and woodlands; in Alberta, cold-deciduous broad-leaved species dominate. In BC, communities are generally dominated or co-dominated by Ponderosa pine (*Pinus ponderosa*) or Rocky Mountain Douglas-fir (*Pseudotsuga menziesii* var. *glauca*), although lodgepole pine (*Pinus contorta* var. *latifolia*) often occurs with Douglas-fir. In Alberta, most occurrences of M501 are pure stands of trembling aspen (*Populus tremuloides*), sometimes accompanied by balsam poplar (*Populus balsamifera*), white spruce (*Picea glauca*), Douglas-fir and/or lodgepole pine. Understorey composition is variable, depending on site conditions and degree of canopy closure. Typical shrubs include saskatoon (*Amelanchier alnifolia*), snowberries (*Symphoricarpos albus*; *S. occidentalis*), holly-leaved barberry (*Berberis aquifolium*), shiny-leaved meadowsweet (*Spiraea lucida*), wild roses (*Rosa* spp.), soapberry (*Shepherdia canadensis*) and common juniper (*Juniperus communis*). Grass species are often important in the understorey, including pine reedgrass (*Calamagrostis rubescens*), bluebunch wheatgrass (*Pseudoroegneria spicata*), mountain rough fescue (*Festuca campestris*), Idaho fescue (*F. idahoensis*) and prairie junegrass (*Koeleria macrantha*). Other common understorey species include common yarrow (*Achillea millefolium*), wild strawberry (*Fragaria virginiana*), common bearberry (*Arctostaphylos uva-ursi*), arrow-leaved balsamroot (*Balsamorhiza sagittata*), heart-leaved arnica (*Arnica cordifolia*) and northern bedstraw (*Galium boreale*). Red-stemmed feathermoss (*Pleurozium schreberi*) is the most frequent moss. Fire and insect infestations are the most common forms of natural disturbance, often amplified by drought. The forests and woodlands of M501 are adapted to frequent low- to moderate-intensity surface fires that maintain relatively open stands of fire-resistant species (especially in BC) as well as restricting the size of forest patches in parkland landscapes. With fire suppression, stands have become denser, forest groves have encroached into grasslands, and high intensity stand-replacing fires are more prevalent.

In Canada, M501 occurs in a dry, continental temperate climate with warm summers and cool winters. Mean annual temperature varies from 2° to 9°C, and precipitation typically varies from 350 to 600 mm. Elevations seldom exceed 1400 mASL, and can be as low as 150 mASL. All parts of the range experienced Pleistocene glaciation; soils are mostly Luvisols, Brunisols and, in Alberta, Chernozems, developed in glacial surficial materials. A surface layer of volcanic ash occurs in some areas. Two subtypes distinguish regional variation in the Canadian range of M501: CM501a [Warm Dry Rocky Mountain Low Montane Forest] describes Ponderosa pine – Douglas-fir forests and woodlands in the driest valleys and plateaux of southern BC, and CM501b [Cool Dry Rocky Mountain Low Montane Forest] characterizes forests and woodlands of higher elevations in BC as well as the parkland areas of the Rocky Mountain foothills in southwestern Alberta.



Parkland landscape comprising woodland and forest stands of Rocky Mountain Douglas-fir (*Pseudotsuga menziesii* var. *glauca*) in association with grassland areas characterized by bluebunch wheatgrass (*Pseudoroegneria spicata*). Southcentral British Columbia.

Source: British Columbia Forest Service



Rocky Mountain Douglas-fir (*Pseudotsuga menziesii* var. *glauca*) stand with open understorey dominated by pine reedgrass (*Calamagrostis rubescens*). Southcentral British Columbia.

Source: British Columbia Forest Service



Canadian National Vegetation Classification (CNVC) Classification nationale de la végétation du Canada

<http://cnvc-cnvc.ca>

Central Rocky Mountain Dry Lower Montane – Foothill Forest

Macrogroup M501

Forêts sèches des montagnes de faible altitude et du piémont du centre des Rocheuses

Vegetation

Physiognomy and Structure

M501 includes structurally diverse upland forests and woodlands, typically comprising evergreen coniferous tree species in the British Columbia (BC) portion of the Canadian range and cold-deciduous broad-leaved (“hardwood”) species in Alberta. In BC, hardwood species are occasionally intermixed with the conifers on mesic or moist sites or in seral communities. M501 forests and woodlands are generally adapted to regular low intensity ground fires that maintain open stand structure and, in many areas, a parkland landscape mosaic; however, stand-replacing fires also occur. Vertical stand structure can be both simple and multi-storied. Canopy closure varies from sparse patches of trees to open woodlands to extensive closed canopy forests, generally in relation to site moisture availability (determined by either climatic or edaphic conditions). Open woodland stands are most common in subtype CM501a [Warm Dry Rocky Mountain Low Montane Forest] in BC. Alberta occurrences of CM501b [Cool Dry Rocky Mountain Low Montane Forest] are all in parkland landscapes. Understories have low to high cover and are typically dominated by shrub and/or grass species. Shrubs can be cold-deciduous broad-leaved, evergreen needle-leaved or evergreen microphyllous. Graminoids are primarily bunchgrasses and rhizomatous grasses. Riparian and wetland forests and woodlands within the range of M501 are described by M034 [Rocky Mountain-Great Basin Montane Riparian & Swamp Forest].

Floristics

In the Canadian range of M501, *Pseudotsuga menziesii* (see Comments) is the characteristic tree species. In the British Columbia (BC) portion of the range, its main overstory associates are *Pinus ponderosa* (subtype CM501a [Warm Dry Rocky Mountain Low Montane Forest]) and *Pinus contorta* (subtype CM501b [Cool Dry Rocky Mountain Low Montane Forest]). In CM501b, *Populus tremuloides* occurs occasionally in BC, but is the overwhelmingly dominant tree species in the Alberta portion of the range. *Picea engelmannii* x *glauca* (BC) and *Picea glauca* (Alberta) co-occur with *P. menziesii* or *P. tremuloides*, respectively, on moister and cooler sites in CM501b. In BC, *Juniperus scopulorum* is common in some areas; *Larix occidentalis* and *Pinus flexilis* occur incidentally. In the warmest parts of the BC range, *P. ponderosa* occupies the driest locations that support tree growth, often forming open woodland stands. *P. menziesii* is found in slightly moister and cooler areas, often in mixed stands with *P. ponderosa* at low to mid-elevations in southern parts of the Canadian range (CM501a) or with *P. contorta* (see Comments) at higher elevations and/or in more northern parts of the range (CM501b). In Alberta, CM501b stands occur in a landscape mosaic with grassland and shrubland patches, on sites with sufficient moisture to support tree growth.

Both *Pinus ponderosa* and *Pseudotsuga menziesii* can benefit from frequent (5-30 year) low to medium intensity surface fires that reduce litter thickness and competing understory vegetation while preparing suitable seedbeds. Mature individuals of both species have thick corky bark that facilitates surviving surface fires, thus maintaining them in the post-fire stand as seed sources. *P. ponderosa*, *Pinus contorta* and *Populus tremuloides* are shade intolerant early seral species, but *P. menziesii* can be moderately tolerant, depending on site-scale temperature, moisture and competition. Of the 3 main conifer species in M501 (*P. menziesii*, *P. ponderosa* and *P. contorta*), *P. ponderosa* has the highest drought and heat tolerance, and *P. contorta* has the lowest heat tolerance. In BC, *P. ponderosa* dominates at the lowest elevations in very dry climates. In these situations, however, *P. menziesii* can seed into *P. ponderosa* stands with moderate canopy closure where its seedlings benefit from shade. *P. menziesii* and *P. ponderosa* co-occur over mid-elevations where their species interactions are influenced by fire history and susceptibility to insect outbreaks. Where *P. menziesii* occurs with *P. contorta*, the former is favoured by a higher frequency of surface fires while *P. contorta* is better adapted to stand-replacing fire because of its serotinous cones.

Understory species diversity within M501 forests and woodlands is moderate, especially when compared to surrounding moister montane and subboreal forests. Common understory species include *Amelanchier alnifolia*, *Symphoricarpos albus*, *S. occidentalis*, *Rosa* spp. (including *R. acicularis*, *R. gymnocarpa*, *R. nutkana*, *R. woodsia*), *Spiraea lucida*, *Berberis aquifolium*, *Achillea millefolium*, *Arctostaphylos uva-ursi* and *Fragaria virginiana*.

The understory of open *Pinus ponderosa* stands in subtype CM501a is characterized by bunchgrasses, primarily *Pseudoroegneria spicata*, *Festuca campestris* and *F. idahoensis*. Other characteristic species include *Aristida purpurea* var. *longiseta*, *Selaginella densa* and *Opuntia fragilis*. On moist sites, *Philadelphus lewisii*, *Rhus glabra* and *Toxicodendron rydbergii* may be abundant. On sites adjacent to shrub-steppe, *Ericameria nauseosus*, *Purshia tridentata* or *Artemisia tridentata* var. *tridentata* can be significant components. Stands with a history of heavy grazing usually contain *Bromus tectorum*. Mixed *P. ponderosa* – *Pseudotsuga menziesii* stands in CM501a share many species with the pure *P. ponderosa* woodlands, but can have a greater variety of herbs including *Balsamorhiza sagittata*, *Lithospermum ruderales*, *Crepis atribarba*, *Collinsia parviflora* or *Lomatium* spp. *Calamagrostis rubescens* is the predominant grass at higher elevations and on cool low elevation sites. Ground cover is primarily dominated by lichens (e.g., *Cladonia* spp., *Cladina* spp. and *Peltigera* spp.). *Polytrichum juniperinum* and *P. piliferum* are common mosses; *Pleurozium schreberi* occurs in moister locations.

Stands in subtype CM501b are characterized by *Calamagrostis rubescens* and a greater variety of shrubs and herbs than in stands of CM501a. In addition to the common species noted above, shrubs include *Juniperus communis*, *Shepherdia canadensis* and *Paxistima myrsinites*. *Acer glabrum* (BC) and *Elaeagnus commutata* (Alberta) are also important on some sites. Additional herbs/dwarf shrubs include *Linnaea borealis*, *Eurybia conspicua*, *Galium boreale*, *Osmorhiza berteroi* and *Cornus canadensis*. *Leymus innovatus* and *Danthonia parryi* are important grass species in the Alberta range. Feathermosses, mostly *Pleurozium schreberi*, occur on cool slopes throughout the Canadian range and in more northerly BC forests.



Canadian National Vegetation Classification (CNVC) Classification nationale de la végétation du Canada

<http://cnvc-cnvc.ca>

Central Rocky Mountain Dry Lower Montane – Foothill Forest

Macrogroup M501

Forêts sèches des montagnes de faible altitude et du piémont du centre des Rocheuses

Dynamics

Environmental site characteristics, plant species autecology, seed/propagule availability, and disturbance history (i.e., type, severity and frequency) influence secondary succession trends within the forests of M501. Wildfires and insect infestations are the most widespread forms of natural disturbance throughout the range of M501. Forest harvesting, agricultural conversion and livestock grazing, settlement clearance and other industrial activities (e.g., mining) are also significant disturbance factors in some areas. Natural fire cycles are short (<100 years); most of the Associations in M501 are fire-dependent types comprising fire-adapted plant species. Burn severity is variable within each fire, so a spatial mosaic of burned and residual patches is typical on the post-fire landscape. The *Pinus ponderosa* forests and woodlands of subtype CM501a [Warm Dry Rocky Mountain Low Montane Forest] rely on frequent low to moderate intensity surface fires to maintain open stands of widely spaced mature trees. The forests of CM501b [Cool Dry Rocky Mountain Low Montane Forest], especially those containing *Pinus contorta* and *Populus tremuloides*, result from stand-replacing fires that kill the mature trees. Following fire, *P. tremuloides* produces abundant root suckers and *P. contorta* releases seeds from serotinous cones. *Pseudotsuga menziesii* occurs in both of these subtypes; the relative fire resistance of long-lived mature individuals facilitates seed availability for immediate post-fire colonization and for gradual invasion of early seral stands over time.

For CM501a forests, historical fire regimes primarily consisted of frequent (5 to 30 year average return intervals) low intensity surface fires. *Pinus ponderosa* is able to survive surface fires at an earlier age than is *Pseudotsuga menziesii*, so dominance of *P. ponderosa* is maintained in stands under these fire regimes. Likewise, frequent surface fires can facilitate continued codominance of *P. ponderosa* in mixed stands dominated by *P. menziesii*. European settlement and fire suppression have resulted in denser and structurally more complex stands in CM501a forests. Many contemporary stands contain understories of more shade tolerant species, such as *P. menziesii*, and accumulations of litter on the forest floor. Under fire suppression, altered stand structures and increased fuel loads have resulted in less frequent, but more intense, fires that kill mature individuals of both *P. ponderosa* and *P. menziesii*. Similarly, in mid-elevation *P. menziesii* dominated forests of CM501a&b, longer fire return intervals and high intensity, stand-replacing fires are more prevalent now than historically.

Prior to European settlement, where CM501b stands occurred in parkland landscapes (i.e., the Alberta portion of the range as well as the driest portions of the British Columbia [BC] range), areal proportions of forest/woodland and grassland or shrub-steppe fluctuated over time. During moister climatic periods and on sites with sufficient soil moisture, *Populus tremuloides* and *Pseudotsuga menziesii* groves encroached into neighbouring grassland/shrub-steppe areas. During periods of drought, increased fire frequency and poor tree regeneration contributed to reducing the size of forest groves. With fire suppression, forest/woodland expansion has been significant in some areas, regardless of climatic periodicity.

Currently, most landscapes containing M501 stands are used for livestock grazing. Heavy grazing within stands eliminates taller shrubs and herbs, and selectively removes the most palatable species. Grazing also causes soil disturbance that fosters invasion by ruderal plant species. In CM501a, cover of bunchgrasses such as *Pseudoroegneria spicata*, *Festuca* spp. and *Koeleria macrantha* decreases following heavy grazing while less palatable species such as *Hesperostipa comata* and *Artemisia frigida* often become more abundant. In CM501b stands, *Calamagrostis rubescens* is sensitive to overgrazing in spring and early summer; in Alberta unpalatable species like *Rosa* spp. and *Symphoricarpos* spp. increase their relative abundance with sustained grazing pressure. In all stands of M501, heavy grazing promotes the introduction of non-native species such as *Poa pratensis*, *Phleum pratense*, *Bromus tectorum*, *B. inermis*, *Cynoglossum officinale*, *Centaurea biebersteinii* and *Cirsium vulgare*. In some parts of the range, conversion to agriculture has reduced the extent of M501 forests and woodlands.

In addition to fire and grazing, insect outbreaks play a role in the stand dynamics of M501 forests and woodlands. Western spruce budworm (*Choristoneura occidentalis*), Douglas-fir tussock moth (*Orgyia pseudotsugata*) and Douglas-fir beetle (*Dendroctonus pseudotsugae*) attack *Pseudotsuga menziesii* and have a history of regular outbreaks in these forests. Mountain pine beetle (*D. ponderosae*) attacks both *Pinus contorta* and *P. ponderosa*; western pine beetle (*D. brevicomis*) attacks only *P. ponderosa*. Forest tent caterpillar (*Malacosoma disstria*) is a defoliator of *Populus tremuloides*. High-severity outbreaks of any of these insects are influential in stand development and succession, especially if they occur in association with periods of drought and/or fire.

In recent years, mountain pine beetle has caused significant economic and ecological impacts to *Pinus contorta* forests in British Columbia (BC), including much of the range of M501 where it has also caused mortality of *P. ponderosa*. Within its historic range in interior BC, beetle cycles occur every 20-40 years. At low population densities, the insect preferentially attacks and kills older, less vigorous trees, creating canopy gaps. At epidemic levels however, mass attacks can extend over large areas and overwhelm the defenses of vigorously growing immature pines. Climate change and forest management practices, including fire suppression, have likely contributed to these unprecedented beetle densities.

A variety of diseases are endemic to these forests. Typically, mortality is limited to individual or small groups of trees within stands, but occasional broad-scale infestations are capable of creating changes in tree species dominance at both the stand and landscape levels. Douglas-fir dwarf mistletoe (*Arceuthobium douglasii*), lodgepole pine dwarf mistletoe (*A. americanum*), larch dwarf mistletoe (*A. laricis*), Schweinitzii butt rot (*Phaeolus schweinitzii*), laminated root rot (*Phellinus weirii*), Douglas-fir western gall rust (*Endocronartium harknessii*) and armillaria root disease (*Armillaria ostoyae*) are widespread in forests of M501, causing mortality of young trees and increasing the susceptibility of older trees to windthrow and insect attack.



Canadian National Vegetation Classification (CNVC) Classification nationale de la végétation du Canada

<http://cnvc-cnvc.ca>

Central Rocky Mountain Dry Lower Montane – Foothill Forest

Macrogroup M501

Forêts sèches des montagnes de faible altitude et du piémont du centre des Rocheuses

Environment

Climate

In Canada, M501 develops at low to mid-elevations in southern British Columbia (BC) and southwestern Alberta in the lee of the Coast, Cascade, Columbia and Rocky Mountains, where rain shadow effects on Pacific air masses create relatively dry conditions within the continental temperate climate of the Western Cordillera. In general terms, summers are warm and winters are cool; annual precipitation is typically low.

The primary climatic driver of vegetation patterns is moisture. In the Canadian range, mean annual precipitation typically varies between approximately 350 and 600 mm, with higher amounts (>1000 mm) in the lee of the Coast Mountains. Summer precipitation varies from 150 to 350 mm throughout the range; however, sometimes these vegetation communities occur on steep, warm aspects in climatic areas with higher precipitation. In some locations, up to half of the precipitation falls as snow. Winter snowpacks typically melt in early spring, especially at lower elevations, leaving sites prone to summer drought; in the BC portion of the range, most sites supporting M501 stands are subject to growing season moisture deficits. Mean annual temperatures vary from approximately 2 to 9°C, the warmest being in areas with *Pinus ponderosa* (CM501a [Warm Dry Rocky Mountain Low Montane Forest]). The growing season averages between approximately 1200 and 1900 growing degree days above 5°C (GDD).

Physiography, Geology, Topography and Soils

In Canada, M501 occurs in the southern Interior System of the Cordilleran physiographic region in British Columbia (BC) and in the Rocky Mountain foothills of the Eastern System of the Cordilleran region. In BC, it dominates the southern portion of the Interior Plateau and fingers into lower elevations of valleys in the eastern Cascade and Coast Mountains, the Columbia Highlands, and the southern Rocky Mountain Trench. In Alberta, M501 occurs at lower foothill elevations approximately south of the Bow River. Elevations across the range vary from approximately 150 m (along the lower Fraser River valley) to about 1400 m.

The terrain of the Cordilleran physiographic region is a complex mixture of high mountains (up to 3000 mASL), plateaux, hill systems, valleys and trenches. The Coast Mountains consist predominantly of crystalline igneous and metamorphic rocks, while the Interior Plateau (the primary range of M501) is mostly underlain by geologically recent lava deposits. The Cascade, Columbia and Rocky Mountains comprise mostly faulted and folded Paleozoic, Mesozoic or Tertiary sedimentary, and often carbonate-rich, rocks.

The entire Canadian range of M501 experienced Pleistocene glaciation. The predominant surficial material on the Interior Plateau of BC is glacial till derived from basaltic bedrock, thus it is reasonably rich in basic cations. In the valleys, fluvial and glaciofluvial materials occur along with thin till and colluvial materials on steeper slopes. Volcanic ash often forms a thin upper soil layer. Similarly, in the Alberta foothills, calcareous tills constitute the majority of upland surficial materials, with glaciolacustrine sediments in some lower valley locations. Soils are variable but are commonly well to imperfectly drained Luvisols, Brunisols and, in Alberta, Chernozems.



Canadian National Vegetation Classification (CNVC) Classification nationale de la végétation du Canada

<http://cnvc-cnvc.ca>

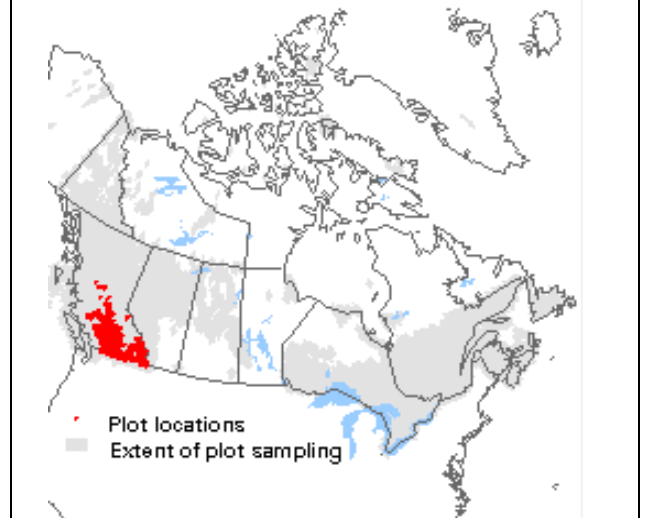
Central Rocky Mountain Dry Lower Montane – Foothill Forest

Macrogroup M501

Forêts sèches des montagnes de faible altitude et du piémont du centre des Rocheuses

Distribution and Geographic Range

In Canada, M501 includes low to mid-elevation forests and woodlands in the dry south-central interior of British Columbia (BC), in the Kootenay and Columbia River drainages of southeastern BC, and in the Rocky Mountain foothills in southwestern Alberta. The Canadian range is the northern portion of the global range of dry lower montane forests of the central North American Cordillera, extending south to Colorado and Utah.



Related Concepts

M501 includes upland forests and woodlands that have been described in provincial publications for the Interior Douglas-Fir and Ponderosa Pine biogeoclimatic zones in British Columbia, and the Foothills Parkland natural subregion in Alberta.

USNVC M501 [Central Rocky Mountain Dry Lower Montane – Foothill Forest] describes the rangewide characteristics of dry lower montane forests of the central North American Cordillera. This CNVC factsheet describes the Canadian expression of this vegetation, which includes conditions treated (at least in part) in USNVC Groups G209 [Rocky Mountain Foothill – Rock Outcrop Limber Pine – Juniper Woodland], G210 [Central Rocky Mountain Douglas-fir – Pine Forest] and G213 [Central Rocky Mountain Ponderosa Pine Open Woodland].

Riparian and wetland forests and woodlands within the range of M501 are described by M034 [Rocky Mountain-Great Basin Montane Riparian & Swamp Forest].

Comments

M501 characterizes lower montane, foothill and plateau forests and woodlands of the warm, dry, continental temperate climates (and dry sites of moister climates) in the Western Cordillera of North America. Low montane forests of moister climates (and moist sites of drier climates) in the warm interior of British Columbia (BC) are included in M500 [Central Rocky Mountain Mesic Lower Montane Forest]. Low elevation subboreal forests in central BC are described by M890 [Rocky Mountain Intermontane Subboreal Forest]. Low elevation forests of maritime temperate climates near the Pacific coast are described by M024 [Vancouverian Coastal Rainforest]. Higher elevation montane and subalpine forests contiguous with the range of M501 are characterized by M020 [Rocky Mountain Subalpine – High Montane Forest].

The CNVC Cordilleran Dry Forest and Rocky Mountain Foothills Parkland vegetation zones are geographic areas comprising, at least in part, a landscape mosaic of grassland or shrub-steppe patches and groves of forest and woodland. They occupy the northernmost limit of the North American dry lower montane region of the central Rocky Mountains and reflect an ecoclimatic transition from temperate grassland and shrub-steppe desert (at lower elevations) to high montane forest vegetation. The treed component of the natural parkland vegetation complex in Canada is represented by some of the forests and woodlands in M501 and is described in this factsheet. Grassland and shrub-steppe components of the parkland mosaic are described in USNVC factsheets for M048 [Central Rocky Mountain Montane – Foothill Grassland & Shrubland] (for M501b) & M169 [Great Basin-Intermountain Tall Sagebrush Steppe & Shrubland] (for M501a), respectively, representing non-treed plant communities that occur in spatial relationship with treed communities across the east to west range of M501.

Pseudotsuga menziesii here refers to variety *glauca* (Rocky Mountain Douglas-fir).

Pinus contorta here refers to variety *latifolia* (lodgepole pine).



Canadian National Vegetation Classification (CNVC) Classification nationale de la végétation du Canada

<http://cnvc-cnvc.ca>

Central Rocky Mountain Dry Lower Montane – Foothill Forest

Macrogroup M501

Forêts sèches des montagnes de faible altitude et du piémont du centre des Rocheuses

Source Information

Number of Source Plots for M501: 2627 (BECMaster ecosystem plot database [VPro13/MSAccess 2010 format]).

Information Sources (data):

Biogeoclimatic Ecosystem Classification Program of British Columbia. 2015. BECMaster ecosystem plot database [VPro13/MSAccess 2007 format]. W.H. MacKenzie, ed. B.C. Min. For., Lands, and Nat. Resour. Ops., Smithers, BC. Available: www.for.gov.bc.ca/hre/becweb/resources/information-requests. (accessed June 2015). (2627 plots)

Concept Authors: D. Meidinger, W. MacKenzie, K. Baldwin, USNVC

Description Authors: D. Meidinger and K. Baldwin

Date of Concept: April, 2015

Date of Description: July, 2017

References

- Abrahamson, I. 2015. *Picea glauca*. In: Fire Effects Information System [online]. U.S. Dept. Agric., For. Serv., Rocky Mt. Res. Stn., Fire Sci. Lab., Missoula, MT, US. Available: <http://www.fs.fed.us/database/feis/plants/tree/picgla/all.html> (accessed: October 2, 2015).
- Anderson, M.D. 2003. *Pinus contorta* var. *latifolia*. In: Fire Effects Information System [online]. U.S. Dept. Agric., For. Serv., Rocky Mt. Res. Stn., Fire Sci. Lab., Missoula, MT, US. Available: <http://www.fs.fed.us/database/feis/plants/tree/pinconl/all.html> (accessed: August 13, 2015).
- Arsenault, A.; Klenner, W. 2005. Fire regime in dry-belt forests of British Columbia: Perspectives on historic disturbances and implications for management. Pages 105-121 in L. Taylor, ed. *Mixed Severity Fire Regimes: Ecology and Management*. November 17-19, 2004. Washington State Univ. Assoc. Fire Ecol., Pullman, WA, US.
- Bostock, H.S. 1970. Physiographic subdivisions of Canada. *Geol. Surv. Can. Econ. Geol. Rep. No. 1*. Pages 10-30 in: R.J.W. Douglas (ed.) *Geology and economic minerals of Canada*. *Geol. Surv. Can.*, Ottawa, ON.
- Boulanger, Y.; Gauthier, S.; Burton, P.J. 2014. A refinement of models projecting future Canadian fire regimes using homogeneous fire regime zones. *Can. J. For. Res.* 44(4):365-376.
- Braumandl, T.F.; Curran, M.P. 1992. A field guide for site identification and interpretation for the Nelson Forest Region. B.C. Min. For., Research Branch, Victoria, BC. *Land Manage. Handb.* No. 20.
- British Columbia Ministry of Forests, Lands and Natural Resources Operations. 1996. Pine stem rust management guidebook [online]. BC Min. For., Lands and Nat. Resour. Op., Resources Practices Branch. Victoria, BC. Available: <https://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/PINESTEM/pine1.htm#rust> (accessed: July 31, 2017).
- British Columbia Ministry of Forests, Lands and Natural Resources Operations. 1995. Root disease management guidebook [online]. BC Min. For., Lands and Nat. Resour. Op., Resources Practices Branch. Victoria, BC. Available: <https://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/root/rootoc.htm> (accessed: July 31, 2017).
- British Columbia Tree Species Selection Working Group. 2017. Tree species silvics and comparisons [online]. BC Min. For., Lands and Nat. Resour. Op., Victoria, BC. Available: <http://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/silviculture/tree-species-selection/tool-introduction/tree-species-silvics-and-comparisons> (accessed: July 31, 2017).
- Brouillet, L.; Coursol, F.; Meades, S.J.; Favreau, M.; Anions, M.; Bélisle, P.; Desmet, P. 2010+. VASCAN, the database of vascular plants of Canada [online]. Available: <http://data.canadensys.net/vascan/search> (accessed: September 2015).
- Campbell, R.; Smith, D.J.; Arsenault, A. 2006. Multicentury history of western spruce budworm outbreaks in interior Douglas-fir forests near Kamloops, British Columbia. *Can. J. For. Res.* 36(7):1758-1769.
- Canadian National Vegetation Classification. 2018. *Vegetation Zones of Canada* [map]. Scale: 1:5,000,000. *Nat. Resour. Can., Can. For. Serv., Sault Ste. Marie, ON*.
- Church, M.; Ryder, J.M. 2010. Physiography of British Columbia. Pages 17-45 in R.G. Pike, T.E. Redding, R.D. Moore, R.D. Winker and K.D. Bladon (eds.) *Compendium of forest hydrology and geomorphology in British Columbia*. B.C. Min. For. Range, For. Sci. Prog. and FORREX Forum for Res. and Ext. in Nat. Resour., Victoria & Kamloops, BC.
- Cooper, S.V.; Neiman, K.E.; Steele, R.; Roberts, D.W. 1987. Forest habitat types of northern Idaho: A second approximation. U.S. Dept. Agric., For. Serv., Intermountain Res. Stn., Ogden, UT, US. General Technical Report INT 236.
- Daigle, P. 1996. Fire in the dry interior forests of British Columbia. B.C. Min. For., Research Branch, Victoria, BC. *Ext. Note* 08.



Canadian National Vegetation Classification (CNVC) Classification nationale de la végétation du Canada

<http://cnvc-cnvc.ca>

Central Rocky Mountain Dry Lower Montane – Foothill Forest

Macrogroup M501

Forêts sèches des montagnes de faible altitude et du piémont du centre des Rocheuses

References (cont'd)

- DeMaere, C.; Alexander, M.; Willoughby, M. 2012. Range plant communities and range health assessment guidelines for the Foothills Parkland Subregion of Alberta: First approximation. AB Min. Environ. & Sustain. Resource Dev., Lands Div., Pincher Creek, AB. Pub. No. T/274.
- Ecological Stratification Working Group. 1995. A national ecological framework for Canada. Agric. and Agri-Food Can., Res. Branch, Centre Land and Biol. Resour. Res., and Environ. Can., State of Environ. Direct., Ecozone Analysis Branch, Ottawa/Hull, ON/QC.
- Ecoregions Working Group. 1989. Ecoclimatic regions of Canada. W. Strong and S.C. Zoltai (compilers). Sustain. Dev. Branch, Can. Wildlife Serv., Conserv. and Prot., Environ. Can., Ottawa, ON. ELC Series No. 23.
- Environment Canada. 2015. Canadian climate normal [online], 1961-1990. Gov. Canada. Available: http://climate.weather.gc.ca/climate_normals/index_e.html (accessed: January 29, 2015).
- Flora of North America Editorial Committee. 2007+. Flora of North America north of Mexico [online], vols 27, 28, 29. Oxford University Press, New York and Oxford. Available: <http://www.mobot.org/plantscience/bfna/BFNAMenu.htm> (accessed: November, 2015).
- Franklin, J.; Dyrness, C.T. 1973. Natural vegetation of Oregon and Washington. U.S. Dept. Agric., For. Serv., Pac. NW For. & Range Exp. Stn., Portland, OR, US. General Technical Report PNW 8.
- Fryer, Janet L. 2016. Fire regimes of Northern Rocky Mountain ponderosa pine communities. In: Fire Effects Information System [online]. U.S. Dept. Agric., For. Serv., Rocky Mt. Res. Stn., Fire Sci. Lab. Missoula, MT, US. Available: www.fs.fed.us/database/feis/fire_regimes/Northern_RM_ponderosa_pine/all.html (accessed: July 31, 2017).
- Gadd, B. 2014. Geology of the Canadian Rockies and Columbia Mountains (summary), plus geological time scale [online]. Available: <http://www.bengadd.com/BenGaddDownloads.htm> (accessed: July 31, 2017).
- Green, R.N.; Klinka, K. 1994. A Field Guide for site identification and interpretation for the Vancouver Forest Region. B.C. Min. For., Research Branch, Victoria, BC. Land Manage. Handb. No. 28.
- Hare, F.K.; Hay, J.E. 1974. The climate of Canada and Alaska. Vol. 11, pages 49-192 in: R.A. Bryson and F.K. Hare (eds.) World survey of climatology. Elsevier Scientific Publishing Company, Amsterdam, The Netherlands.
- Heyerdahl, E.K.; Lertzman, K.; Wong, C.M. 2012. Mixed-severity fire regimes in dry forests of southern interior British Columbia, Canada. Can. J. For. Res. 42(1):88-98.
- Howard, J.L. 1996. Populus tremuloides. In: Fire Effects Information System [online]. U.S. Dept. Agric., For. Serv., Rocky Mt. Res. Stn., Fire Sci. Lab., Missoula, MT, US. Available: <http://www.fs.fed.us/database/feis/plants/tree/poptre/all.html> (accessed: May 27, 2015).
- Howard, J.L. 2003. Pinus ponderosa var. brachyptera, P. p. var. scopulorum. In: Fire Effects Information System [online]. U.S. Dept. Agric., For. Serv., Rocky Mt. Res. Stn., Fire Sci. Lab. Missoula, MT, US.. Available: <http://www.fs.fed.us/database/feis/plants/tree/pinpons/all.html> (accessed: July 31, 2017).
- Iverson, K.E.; Gray, R.W.; Blackwell, B.A.; Wong, C.; MacKenzie, K.L. 2002. Past fire regimes in the Interior Douglas-fir dry cool subzone Fraser variant (IDFdk3). Iverson & MacKenzie Biological Consulting Ltd., R.W. Gray Consulting Ltd., B.A. Blackwell and Associates Ltd. and Senlin Ecological Consulting.
- Li, T.; Hélie, R. (compilers). 2014. Ecozones of Canada / Écozones du Canada [map]. Canadian Council on Ecological Areas / Conseil Canadien des Aires Écologiques, CA. Scale 1:25,000,000.
- Lloyd, D.; Angove, K.; Hope, G.; Thompson, C. 1990. A guide to site identification and interpretation for the Kamloops Forest Region. B.C. Min. For., Research Branch, Victoria, BC. Land Manage. Handb. No. 23.
- MacKenzie, W.H. 2015. Climate summaries for biogeoclimatic zones and subzones. BC Min. For., Lands and Nat. Resour. Op., Research Branch. Smithers, BC. Unpublished data.
- Mathews, R.F. 2000. Calamagrostis rubescens. In: Fire Effects Information System [online]. U.S. Dept. Agric., For. Serv., Rocky Mt. Res. Stn., Fire Sci. Lab., Missoula, MT, US. Available: <http://www.fs.fed.us/database/feis/plants/graminoid/calrub/all.html> (accessed: July 31, 2017).
- McLean, J.A.; van der Kamp, B.; Behannah, A.L. 2005. Forest pest management. pp. 527- 557 in: S.B. Watts & L. Tolland (eds.) Forest Handbook for British Columbia. 5th ed. Faculty of Forestry, University of British Columbia. Vancouver, BC. Available: http://web.forestry.ubc.ca/fetch21/FirstPestMgmtCh/First_Pest_Mgmt_Chapter.pdf (accessed: May 27, 2017).
- Meidinger, D.; Pojar, J. (eds.). 1991. Ecosystems of British Columbia. B.C. Min. For., Research Branch, BC. Spec. Rep. Series No. 6.



Canadian National Vegetation Classification (CNVC) Classification nationale de la végétation du Canada

<http://cnvc-cnvc.ca>

Central Rocky Mountain Dry Lower Montane – Foothill Forest

Macrogroup M501

Forêts sèches des montagnes de faible altitude et du piémont du centre des Rocheuses

References (cont'd)

- Natural Regions Committee. 2006. Natural regions and subregions of Alberta. D.J. Downing, and W.W. Pettapiece, compilers. Gov. AB, Min. Environ., AB. Pub. No. T/852.
- Nealis, V.G. 2015. Comparative ecology of conifer-feeding spruce budworms (Lepidoptera: Tortricidae). *Can. Entomol.* 00:1-25.
- Pfister, R.D.; Kovalchik, B.L.; Arno, S.F.; Presby, R.C. 1977. Forest habitat types of Montana. U.S. Dept. Agric., For. Serv., Intermountain Res. Stn., Ogden, UT, US. General Technical Report INT 34.
- Reid, M.S. 2014. Macrogroup Detail Report: M501 *Pinus ponderosa* var. *ponderosa* - *Pseudotsuga menziesii* - *Pinus flexilis* Central Rocky Mountain Dry Forest Macrogroup [15 Oct 2014]. United States National Vegetation Classification. Fed. Geogr. Data Comm., Washington DC, US.
- Safranyik, L.; Wilson, B. (eds.). 2006. The mountain pine beetle: a synthesis of biology, management and impacts on lodgepole pine. Pac. For. Centre, Can. For. Serv., Nat. Resour. Can., Victoria, BC.
- Soil Classification Working Group. 1998. The Canadian system of soil classification. NRC Research Press, Ottawa, ON. Agric. and Agri-Food Can. Pub. 1646.
- Soil Classification Working Group. 2001. Soils of Canada [map]. Scale 1:6,500,000. Agric. and Agri-Food Can. Res. Br., Available: sis.agr.gc.ca/cansis (accessed: May 12, 2016).
- Steele, R.; Pfister, R.D.; Ryker, R.A.; Kittams, J.A. 1981. Forest habitat types of central Idaho. U.S. Dept. Agric., For. Serv., Intermountain Res. Stn., Ogden, UT, US. General Technical Report INT 114.
- Steen, O.A.; Coupé, R.A. 1997. A field guide to forest site identification and interpretation for the Cariboo Forest Region. B.C. Min. For., Research Branch, Victoria, BC. Land Manage. Handb. No. 39.
- Steinberg, P.D. 2002. *Pseudotsuga menziesii* var. *glauca*. In: Fire Effects Information System [online]. U.S. Dept. Agric., For. Serv., Rocky Mtn. Res. Stn., Fire Sci. Lab., Missoula, MT, US. Available: <http://www.fs.fed.us/database/feis/plants/tree/psemeng/all.html> (accessed: June 26, 2017).
- USDA, Forest Service. 2017. Western forest insects & diseases – rots and decays [online]. U.S. Dept. Agric., For. Serv., Pac. NW Reg. Available: https://www.fs.usda.gov/detail/r6/forest-grasslandhealth/?cid=fsbdev2_027359#rtop (accessed: July 31, 2017).
- USNVC [United States National Vegetation Classification] Database. 2016. United States National Vegetation Classification Database Ver. 2.0. Fed. Geogr. Data Comm., Veg. Subcomm., Washington DC, US. Available: <http://usnvc.org> (accessed: March 10, 2016).
- Wong, C.; Sandmann, H.; Dormer, B. 2004. Historical variability of natural disturbances in British Columbia: A literature review [online]. FORREX – Forest Research Extension Partnership, Kamloops, BC. FORREX Series 2. Available: www.forrex.org/publications/forrexseries/fs12.pdf.

The information contained in this factsheet is based on data and expert knowledge that is current to the date of description. As new information becomes available, the factsheet will be updated.

Suggested Citation: Meidinger, D.; Baldwin, K. Central Rocky Mountain Dry Lower Montane – Foothill Forest [online]. Sault Ste. Marie, Ontario, Canada: Canadian National Vegetation Classification. July, 2017; generated 31-October-2017; cited **ENTER DATE ACCESSED**. 10 p. Canadian National Vegetation Classification Macrogroup: M501. Available from <http://cnvc-cnvc.ca>. System Requirements: Adobe Acrobat Reader v. 7.0 or higher. ISSN 1916-3266.



Canadian National Vegetation Classification (CNVC) Classification nationale de la végétation du Canada

<http://cnvc-cnvc.ca>

Central Rocky Mountain Dry Lower Montane – Foothill Forest

Macrogroup M501

Forêts sèches des montagnes de faible altitude et du piémont du centre des Rocheuses

Comparison of Vegetation Characteristics for Rocky Mountain Forest Macrogroups

Lifeform	Species Name	n=2509				n=2627				n=1821				n=5225				Species Common Name
		M500 Mesic Low Montane				M501 Dry Low Montane				M890 Subboreal				M020 Subalpine				
Tree	<i>Tsuga heterophylla</i>	■ ■ ■ ■ ■														western hemlock		
	<i>Thuja plicata</i>	■ ■ ■ ■ ■														western red cedar		
	<i>Pinus ponderosa</i>				****											ponderosa pine		
	<i>Pseudotsuga menziesii</i> var. <i>glauca</i>	■ ■ ■ ■ ■			■ ■ ■ ■ ■			****								Rocky Mountain Douglas-fir		
	<i>Pinus contorta</i> var. <i>latifolia</i>	****			■ ■ ■ ■ ■			■ ■ ■ ■ ■		■ ■ ■ ■ ■						lodgepole pine		
	<i>Picea engelmannii</i> x <i>glauca</i>	■ ■ ■ ■ ■			****			■ ■ ■ ■ ■		****						interior spruce		
	<i>Abies lasiocarpa</i>	■ ■ ■ ■ ■						■ ■ ■ ■ ■		■ ■ ■ ■ ■						subalpine fir		
	<i>Picea engelmannii</i>									■ ■ ■ ■ ■						Engelmann spruce		
Shrub	<i>Acer glabrum</i>	■ ■ ■ ■ ■			***											Rocky Mountain maple		
	<i>Oplopanax horridus</i>	■ ■ ■ ■ ■						****								devil's club		
	<i>Rubus parviflorus</i>	■ ■ ■ ■ ■						■ ■ ■ ■ ■								western thimbleberry		
	<i>Paxistima myrsinites</i>	■ ■ ■ ■ ■			■ ■ ■ ■ ■											falsebox		
	<i>Berberis aquifolium</i>				■ ■ ■ ■ ■											holly-leaved barberry		
	<i>Symphoricarpos albus</i>				■ ■ ■ ■ ■											thin-leaved snowberry		
	<i>Shepherdia canadensis</i>				■ ■ ■ ■ ■			■ ■ ■ ■ ■								soapberry		
	<i>Amelanchier alnifolia</i>	**			■ ■ ■ ■ ■			■ ■ ■ ■ ■								saskatoon		
	<i>Spiraea lucida</i>	**			■ ■ ■ ■ ■			■ ■ ■ ■ ■								shiny-leaved meadowsweet		
	<i>Rosa acicularis</i>				■ ■ ■ ■ ■			■ ■ ■ ■ ■								prickly rose		
	<i>Lonicera involucrata</i>							■ ■ ■ ■ ■								bracted honeysuckle		
	<i>Vaccinium membranaceum</i>	■ ■ ■ ■ ■						■ ■ ■ ■ ■		■ ■ ■ ■ ■						mountain huckleberry		
	<i>Rhododendron albiflorum</i>									■ ■ ■ ■ ■						white-flowered rhododendron		
	<i>Menziesia ferruginea</i>	***								****						false azalea		
Herb / Dwarf Shrub	<i>Gymnocarpium dryopteris</i>	■ ■ ■ ■ ■						****	****							common oak fern		
	<i>Tiarella trifoliata</i>	■ ■ ■ ■ ■						**	■ ■ ■ ■ ■							three-leaved foamflower		
	<i>Clintonia uniflora</i>	■ ■ ■ ■ ■						■ ■ ■ ■ ■	**	***						single-flowered clintonia		
	<i>Chimaphila umbellata</i>	■ ■ ■ ■ ■			**			**								common pipsissewa		
	<i>Orthilia secunda</i>	■ ■ ■ ■ ■			*			■ ■ ■ ■ ■		■ ■ ■ ■ ■						one-sided wintergreen		
	<i>Linnaea borealis</i>	■ ■ ■ ■ ■			■ ■ ■ ■ ■			■ ■ ■ ■ ■		■ ■ ■ ■ ■						twinflower		
	<i>Pseudoroegneria spicata</i>				■ ■ ■ ■ ■			■ ■ ■ ■ ■								bluebunch wheatgrass		
	<i>Calamagrostis rubescens</i>				■ ■ ■ ■ ■			■ ■ ■ ■ ■								pine reedgrass		
	<i>Eurybia conspicua</i>				■ ■ ■ ■ ■			■ ■ ■ ■ ■								western showy aster		
	<i>Fragaria virginiana</i>				■ ■ ■ ■ ■			■ ■ ■ ■ ■								wild strawberry		
	<i>Arctostaphylos uva-ursi</i>				■ ■ ■ ■ ■			■ ■ ■ ■ ■		**						common bearberry		
	<i>Arnica cordifolia</i>				***			■ ■ ■ ■ ■		■ ■ ■ ■ ■						heart-leaved arnica		
	<i>Rubus pubescens</i>				■ ■ ■ ■ ■			■ ■ ■ ■ ■								dwarf raspberry		
	<i>Pyrola chlorantha</i>				■ ■ ■ ■ ■			■ ■ ■ ■ ■								green-flowered pyrola		
	<i>Chamerion angustifolium</i>				■ ■ ■ ■ ■			■ ■ ■ ■ ■								fireweed		
	<i>Cornus canadensis</i>	■ ■ ■ ■ ■						■ ■ ■ ■ ■		■ ■ ■ ■ ■						bunchberry		
	<i>Rubus pedatus</i>	■ ■ ■ ■ ■						■ ■ ■ ■ ■		■ ■ ■ ■ ■						five-leaved dwarf bramble		
	<i>Valeriana sitchensis</i>									■ ■ ■ ■ ■						Sitka valerian		
<i>Vaccinium scoparium</i>									■ ■ ■ ■ ■						grouseberry			
Bryophyte / Lichen	<i>Rhytidiopsis robusta</i>	■ ■ ■ ■ ■											***			pipecleaner moss		
	<i>Hylocomium splendens</i>	■ ■ ■ ■ ■			***			■ ■ ■ ■ ■	■ ■ ■ ■ ■				****			stairstep moss		
	<i>Pleurozium schreberi</i>	■ ■ ■ ■ ■			■ ■ ■ ■ ■			■ ■ ■ ■ ■	■ ■ ■ ■ ■				■ ■ ■ ■ ■			red-stemmed feathermoss		
	<i>Ptilium crista-castrensis</i>	■ ■ ■ ■ ■						■ ■ ■ ■ ■		***						knight's plume moss		
	<i>Cladonia</i> spp.				■ ■ ■ ■ ■			■ ■ ■ ■ ■		■ ■ ■ ■ ■						clad and reindeer lichens		

Legend

Constancy:
Black bar >= 50%
Grey bar >= 30%
Asterisk >= 20%

Cover:
5 bars >= 25%
4 bars >= 10%
3 bars >= 3%
2 bars >= 1%
1 bar < 1%



Canadian National Vegetation Classification (CNVC) Classification nationale de la végétation du Canada

<http://cnvc-cnvc.ca>

Central Rocky Mountain Dry Lower Montane – Foothill Forest

Macrogroup M501

Forêts sèches des montagnes de faible altitude et du piémont du centre des Rocheuses

Comparison of Vegetation Characteristics for Macrogroup Subtypes in M501

Lifeform	Species Name	n=777		n=1850		Species Common Name
		CM501a Warm Dry Low Montane		CM501b Cool Dry Low Montane		
Tree	<i>Pinus ponderosa</i>	■■■■				ponderosa pine
	<i>Pseudotsuga menziesii</i> var. <i>glauca</i>	■■■■■		■■■■■		Rocky Mountain Douglas-fir
	<i>Pinus contorta</i> var. <i>latifolia</i>			■ ■ ■ ■		lodgepole pine
	<i>Populus tremuloides</i>			****		trembling aspen
	<i>Picea engelmannii</i> x <i>glauca</i>			****		interior spruce
Shrub	<i>Purshia tridentata</i>	***				antelope-brush
	<i>Ericameria nauseosa</i>	**				rubber rabbitbrush
	<i>Juniperus scopulorum</i>	***		***		Rocky Mountain juniper
	<i>Symphoricarpos albus</i>	■■■		■ ■ ■		thin-leaved snowberry
	<i>Amelanchier alnifolia</i>	■■		■■		saskatoon
	<i>Spiraea lucida</i>	■ ■ ■		■■■		shiny-leaved meadowsweet
	<i>Berberis aquifolium</i>	■ ■		■ ■		holly-leaved barberry
	<i>Rosa</i> spp.	**		■■		rose species
	<i>Shepherdia canadensis</i>			■■■		soapberry
	<i>Paxistima myrsinites</i>			■ ■ ■		falsebox
	<i>Juniperus communis</i>			■ ■ ■		common juniper
	<i>Acer glabrum</i>			■ ■ ■		Rocky Mountain maple
Herb / Dwarf Shrub	<i>Lomatium</i> spp.	*				desert-parsleys
	<i>Festuca idahoensis</i>	***				Idaho fescue
	<i>Selaginella densa</i>	***				prairie spikemoss
	<i>Festuca campestris</i>	***				mountain rough fescue
	<i>Collinsia parviflora</i>	*				small-flowered blue-eyed Mary
	<i>Bromus tectorum</i>	**				downy brome
	<i>Crepis atriobarba</i>	*				slender hawkbeard
	<i>Lithospermum ruderale</i>	■				western puccoon
	<i>Balsamorhiza sagittata</i>	■ ■ ■				arrow-leaved balsamroot
	<i>Koeleria macrantha</i>	■ ■				prairie junegrass
	<i>Pseudoroegneria spicata</i>	■■■■■				bluebunch wheatgrass
	<i>Achillea millefolium</i>	■		■		common yarrow
	<i>Calamagrostis rubescens</i>	■■■■■		■■■■■		pine reedgrass
	<i>Arctostaphylos uva-ursi</i>	■ ■ ■		■ ■ ■		common bearberry
	<i>Eurybia conspicua</i>	**		■ ■ ■		western showy aster
	<i>Linnaea borealis</i>			■ ■ ■		twinflower
	<i>Goodyera oblongifolia</i>			■		Menzies' rattlesnake-plantain
	<i>Orthilia secunda</i>			■ ■		one-sided wintergreen
<i>Chimaphila umbellata</i>			**		common pipsissewa	
Bryophyte / Lichen	<i>Syntrichia ruralis</i>	**				sidewalk screw moss
	<i>Cladonia</i> spp.	■ ■ ■		■ ■		clad and reindeer lichens
	<i>Pleurozium schreberi</i>			■■■■■		red-stemmed feathermoss
	<i>Hylocomium splendens</i>			■ ■ ■		stairstep moss
	<i>Peltigera aphthosa</i>			■ ■		common freckle pelt lichen
	<i>Rhytidiadelphus triquetrus</i>			***		electrified cat's-tail moss

Legend

Constancy:	Black bar >= 50%	Cover:	5 bars >= 25%	2 bars >= 1%
	Grey bar >= 30%		4 bars >= 10%	1 bar < 1%
	Asterisk >= 20%		3 bars >= 3%	