



Great Plains Mixedgrass Prairie

Macrogroup CM051

Prairies de graminées mixtes des Grandes Plaines

Temperate Grassland & Shrubland

D023 Central North American Grassland & Shrubland

CM051 Great Plains Mixedgrass Prairie

M054 Central Lowlands Tallgrass Prairie

CM332 Great Plains Rough Fescue Prairie



Concept

CM051 describes the Canadian expression of North American Great Plains mixedgrass prairie, including the grasslands of the dry climate of southern Alberta and Saskatchewan. The name "mixedgrass" refers to the characteristic mixture of mid-height grasses (mid-grasses) and short grasses. In Canadian mixedgrass prairie, the mid-grass component is generally dominant, but the short grass component becomes more conspicuous in the drier portions of the range. The dominant mid-grasses include needle-and-thread grass (*Hesperostipa comata*), northern porcupine grass (*H. curtisetata*), thick-spike wildrye (*Elymus lanceolatus*) and western wheatgrass (*Pascopyrum smithii*). The most important short graminoids are prairie junegrass (*Koeleria macrantha*), blue grama (*Bouteloua gracilis*) and several upland sedges (*Carex* spp.). Abundant forbs and dwarf shrubs are scattered throughout the grassland.

CM051 occurs in a dry continental temperate climate with cold winters and warm summers. Mean annual temperatures average approximately 3.6°C, and precipitation varies from approximately 300 to 430 mm. CM051 stands occur on a variety of well-drained soils, including Chernozems on sandy, loamy and clayey parent materials, Solonchetsic soils with a dense hardpan layer and Regosols on dune sands. Mixedgrass prairie, in its broad definition, ranges southward to northern Texas and northeastern New Mexico, but the Canadian expression is somewhat distinctive in species composition.



Dry mixedgrass prairie with soil blowouts. Patches of needle-and-thread grass (*Hesperostipa comata*) develop between eroded pits dominated by blue grama (*Bouteloua gracilis*), prairie junegrass (*Koeleria macrantha*), western wheatgrass (*Pascopyrum smithii*) and thick-spike wild rye (*Elymus lanceolatus*). Dinosaur Provincial Park, Alberta.

Source: L. Allen



Mixedgrass prairie on loamy glacial till, dominated by needle-and-thread grass (*Hesperostipa comata*) and western porcupine grass (*H. curtisetata*). South-central Saskatchewan.

Source: J. Thorpe



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Vegetation

Physiognomy and Structure

In Canada, mixedgrass prairie is dominated by a layer of mid-height grass species (approximately 20-40 cm high). Beneath the mid-grasses, or in gaps between them, are shorter grasses and sedges (approximately 10 cm high). Interspersed among the graminoids is a variety of forbs and dwarf shrubs. Many stands have a ground layer of *Selaginella densa*. Low shrubs are infrequent on most sites, but may become important on moist sites or dune sands. Dominance of the mid-grass layer is greatest in the northern, climatically moister parts of the range, while the short grass component becomes more conspicuous in the driest areas.

Floristics

The most important mid-grass species in the CM051 range are *Hesperostipa comata*, *Elymus lanceolatus* and *Pascopyrum smithii*. In parts of the range with a moister climate, *H. curtisetata* becomes one of the dominant species. In these areas, *Festuca hallii* may appear on north-facing aspects. Stands at the eastern end of the range may be dominated by *H. spartea*. Other mid-grasses that can be important on some sites are *Nassella viridula*, *Calamagrostis montanensis*, *Schizachyrium scoparium* and, on sandy sites, *Sporobolus rigidus* [see Comments] and *S. cryptandrus*. The most important short graminoids are *Koeleria macrantha*, *Bouteloua gracilis* and the upland sedges *Carex duriuscula*, *C. inops* [see Comments], *C. filifolia* and *C. obtusata*. Other short grasses that can become abundant on some sites include *Poa secunda*, *Muhlenbergia cuspidata* and *Distichlis spicata*.

Important forbs and dwarf shrubs include *Artemisia frigida*, *A. ludoviciana*, *Sphaeralcea coccinea*, *Pulsatilla nuttalliana*, *Thermopsis rhombifolia*, *Astragalus* spp., *Oxytropis* spp., *Pediomelum* spp., *Vicia americana*, *Heterotheca villosa*, *Solidago missouriensis*, *Krascheninnikovia lanata*, *Achillea millefolium*, *Phlox hoodii* and *Antennaria* spp. Many stands have a ground layer of *Selaginella densa*. With the exception of *Rosa arkansana*, shrubs are infrequent although *Symphoricarpos occidentalis* and *R. woodsii* can be important on moist sites. In climatically drier areas, *Artemisia cana* is an important shrub on alluvial sites and dune sands. The prostrate shrub *Juniperus horizontalis* is also important on sandy soils as well as on steep valley slopes.

Canadian mixedgrass prairie is distinctive from similar vegetation extending southward into the United States (see Comments) with respect to the importance of *E. lanceolatus* and *H. curtisetata* and the near-absence of southern species, such as *Bouteloua dactyloides* and *Artemisia tridentata*.

Dynamics

Historically, fires occurred frequently in mixedgrass prairie but have been greatly reduced with agricultural settlement. When fire does occur, it tends to reduce productivity for several years because of removal of plant and litter cover that protects the soil surface against direct evaporation. However, most prairie plant species have adaptations for regeneration following fire, and community structure and species composition are quickly restored.

Prolonged drought, which happens more often in mixedgrass prairie than in other Canadian Great Plains grasslands, results in shorter vegetation height by reducing foliage growth and by discriminating against taller species. In the Canadian range, because of the relatively dry climate, stands of CM051 tend to be less susceptible to encroachment by woody species and invasion by non-native plant species than are CM332 [Great Plains Rough Fescue Prairie] or M054 [Central Lowlands Tallgrass Prairie]. However, invasions of non-native forage species such as *Agropyron cristatum* and weeds such as *Euphorbia esula* occur in some areas.

Prior to agricultural settlement, grazing by native herbivores was an important aspect of prairie grassland dynamics. Bison (*Bison bison*), elk (*Cervus canadensis*) and other animals grazed an area and then moved elsewhere. In the process they fertilized stands and dispersed seeds. Currently, most mixedgrass prairie is used for livestock grazing. Overgrazing tends to discriminate against the mid-grasses, which are both palatable and accessible to grazing animals. Overgrazed stands may become dominated by short graminoids such as *Bouteloua gracilis*, *Koeleria macrantha* and *Carex* spp., which receive some protection from grazing by their low stature. Forbs and dwarf shrubs (e.g., *Artemisia frigida*), most of which are unpalatable to cattle, also tend to increase with grazing. Conversion to annual cropland has decreased the extent and range of natural occurrences of mixedgrass prairie in Canada.



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Environment

Climate

CM051 occurs in the dry continental temperate climate of southeastern Alberta and southern Saskatchewan. Winters are cold and summers are warm; mean annual temperatures average approximately 3.6°C, with extreme minimum temperatures below -40°C. Growing degree days above 5°C (GDD) vary between about 1550 and 1860. This is the driest climatic area in the Prairie provinces, with annual precipitation of approximately 300 to 430 mm. There is pronounced precipitation variation within the Canadian range of mixedgrass prairie, with the driest conditions occurring at low elevations in southeastern Alberta and southwestern Saskatchewan. Somewhat moister climates occur in the Cypress Hills and to the west, north and east of this core area. Both structure and species composition of mixedgrass prairie communities change in response to this climatic variation. Drought-years with extremely low precipitation occur more frequently in the area occupied by mixedgrass prairie than in surrounding regions with more humid climates, and adaptation to drought is an important feature of the vegetation.

Physiography, Geology, Topography and Soils

The Canadian range of mixedgrass prairie primarily occupies portions of the Alberta and Saskatchewan Plains, subdivisions of the Interior Plains physiographic region. This area is underlain by level Mesozoic and Tertiary sedimentary rocks. Elevations are generally <1000 mASL, although some mixedgrass prairie occurs at lower elevations in the Cypress Hills. The entire range was affected by Pleistocene glaciation and although topography is mostly an undulating plain, local relief is provided by postglacial valley complexes, hummocky moraines and sand dunes. Mixedgrass prairie occurs on well-drained Chernozemic soils in sandy, loamy and clayey parent materials as well as on Solonchic soils with a dense hardpan layer and on Regosols in dune sands. It occurs on upland sites, slope complexes and valley bottoms but not on poorly drained or strongly saline sites, which support meadow and marsh communities. Site variation can have a pronounced effect on species composition. Clay soils tend to support higher frequency and abundance of *Elymus lanceolatus* and *Pascopyrum smithii*. These species, together with *Bouteloua gracilis* and *Koeleria macrantha*, also dominate blowout features in Solonchic soils. Sandy soils tend to support higher frequency and abundance of *Hesperostipa comata*, *Sporobolus rigidus* and *S. cryptandrus*, and to have greater shrub cover. On slightly saline soils, *Distichlis spicata* appears along with the usual mixedgrass prairie species. On alluvial sites in the climatically drier part of the range, shrub-grassland with *Artemisia cana* appears. On steep valley slopes, a variety of shrubs become more prominent while eroded grasslands may be high in *Muhlenbergia cuspidata* and *Carex filifolia*.



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Distribution and Geographic Range

CM051 occurs in southern Alberta and Saskatchewan. This is the northern portion of the global range of North American Great Plains mixedgrass prairie, which extends southward to northern Texas and northeastern New Mexico.

Related Concepts

CM051 includes shrub and herbaceous plant communities that have been described in provincial publications for the Mixedgrass and Dry Mixedgrass natural subregions in Alberta, and the Moist Mixed Grassland, Mixed Grassland and Cypress Upland ecoregions in Saskatchewan.

USNVC M051 [Great Plains Mixedgrass & Fescue Prairie] describes the rangewide characteristics of Great Plains mixedgrass prairie vegetation in North America. CM051 describes the Canadian expression of conditions that are treated in USNVC Groups G331 [Northern Great Plains Dry Mixedgrass Prairie] and G141 [Northern Great Plains Mesic Mixedgrass Prairie].

In addition to describing mixedgrass prairie, USNVC M051 also includes Great Plains rough fescue prairie, which CNVC treats as a separate Macrogroup (CM332 [Northern Great Plains Rough Fescue Prairie]).

Comments

Vegetation similar to mixedgrass prairie is also found in the somewhat moister climate of the Great Plains Parkland CNVC vegetation zone (see M151 [Great Plains Forest & Woodland] & CM332 [Great Plains Rough Fescue Prairie]) in Alberta, Saskatchewan and Manitoba, where it results from grazing impacts on rough fescue or tallgrass prairie communities.

CNVC may recognize subtypes of CM051 in the future (e.g., the dry vs moist mixedgrass conditions), but this is pending development of Associations from ground plot data.

Carex inops here refers to subspecies *heliophila* (sun sedge, carex héliophile).

Sporobolus rigidus here refers to variety *rigidus* (prairie sandreed, calamovilfa à feuilles longues).



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Source Information

Number of Source Plots for CM051:

Information Sources (data):

Concept Authors: Ken Baldwin, Lorna Allen

Description Authors: Jeff Thorpe, Ken Baldwin, Lorna Allen

Date of Concept: February, 2015

Date of Description: December, 2015

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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: Thorpe, J.; Baldwin, K.; Allen, L. Great Plains Mixedgrass Prairie [online]. Sault Ste. Marie, Ontario, Canada: Canadian National Vegetation Classification. December, 2015; generated January-21-2020; cited **ENTER DATE ACCESSED**, 6 p. Canadian National Vegetation Classification Macrogroup: CM051. Available from <http://cnvc-cnvc.ca>. System Requirements: Adobe Acrobat Reader v. 7.0 or higher. ISSN 1916-3266.