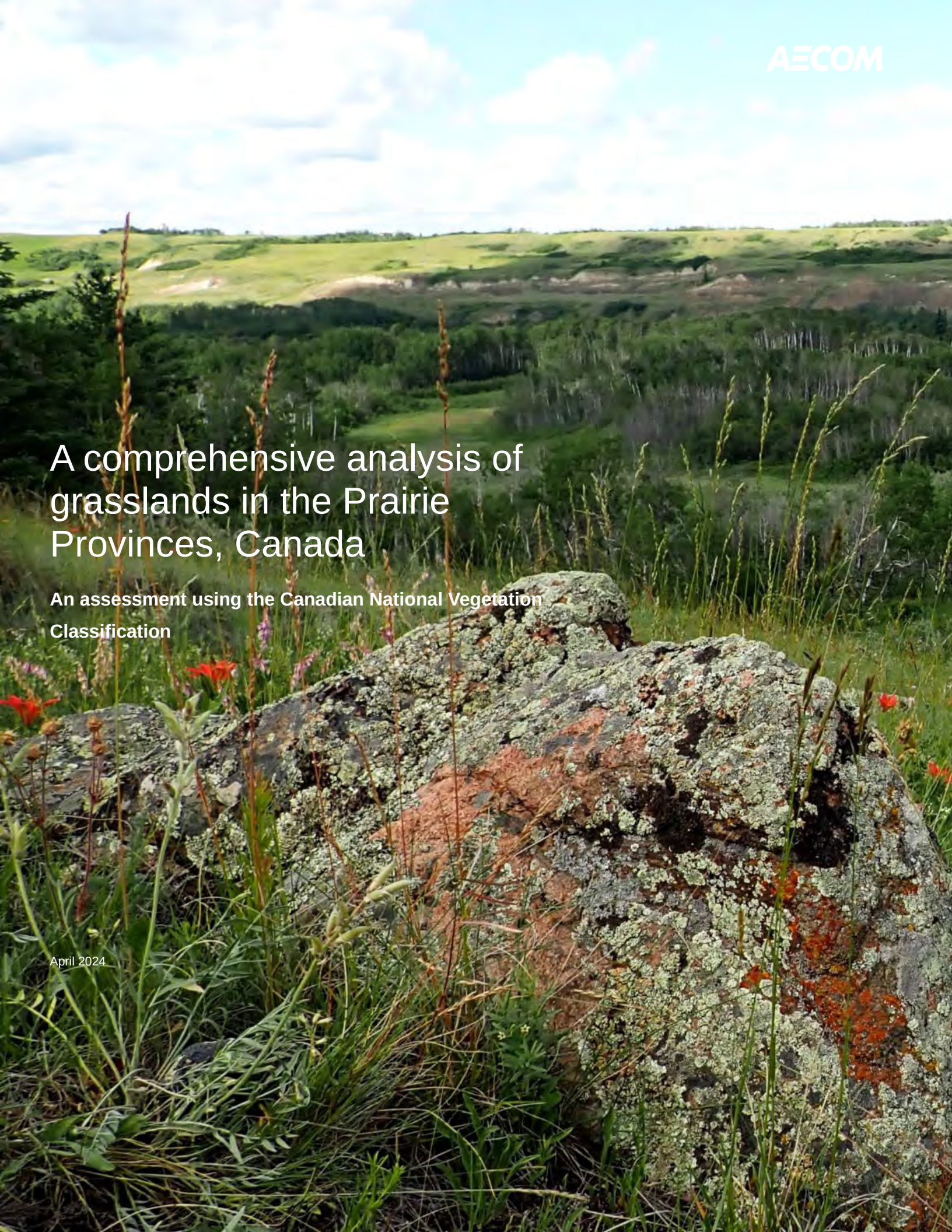

A comprehensive analysis of grasslands in the Prairie Provinces, Canada

An assessment using the Canadian National Vegetation Classification

April 2024

Cover photo: Plains rough fescue (*Festuca hallii*) with wood lily (*Lilium philadelphicum*) in the Aspen Parkland ecoregion of Alberta, Canada. Photo by Lysandra Pyle.

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A comprehensive analysis of grasslands in the Prairie Provinces, Canada: An assessment using the Canadian National Vegetation Classification

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Study Area: Temperate grassland region of Alberta, Manitoba, and Saskatchewan.

Methods: We compiled 6,925 grassland plots from across the region, all collected by rangeland ecologists in each province. Plots were labelled with a provincial plant community type name, of which there were 408 types, including wetlands, grasslands, shrublands, and woodlands. We generated type-based summaries of those plots and analyzed them using the types as the unit of analysis using cluster analysis, ordination, and indicator species analysis. Species taxonomy was standardized across all plots using VASCAN (Canadian taxonomic standard), and their abundance in the type was standardized using a prominence value (abundance * square root of constancy). Environmental data and ecosite information were also included in the data compiled. Types were separated into reference condition (including minor alteration) and altered conditions, and then further classified into ruderal types.

Results: Our analyses confirmed 7 native prairie groups across the Prairie Provinces. 1) tallgrass prairie 2) mesic mixedgrass prairie, 3) dry mixedgrass prairie, 4) foothills fescue prairie, 5) northern fescue prairie, 6) northern sand prairie, and 7) badlands complex. Each of the 7 groups has newly described alliances that account for finer-scale variation in moisture, soil texture, and shrub **abundance**. In addition,

we verified that some grasslands are in such an altered state that they are placed in a separate “ruderal” group, because they contain a mix of exotics (often well over 50% relative cover) and natives. These invaded prairies are so altered that recovery to reference conditions is unlikely.

Conclusions: Our study confirmed the CNVC grassland types at the group level and provided novel insights regarding the fine-grained patterns at the alliance level. The detailed data available from provincial rangeland plant community manuals, in which plant community types and ecosites are characterized within ecoregions, can now be summarized at a regional scale, and allows provincial grassland data to be interpreted across the provinces. Previous studies have shown that, apart from the badlands complex, these grasslands are all at risk, with tallgrass prairie Critically Imperiled (G1) northern rough fescue Imperiled (G2), and the others Vulnerable (G3). Recent completion of a native grassland map for the Prairie Provinces (produced for the Canadian Forage and Grassland Association) provides the opportunity for refining the extent and at-risk status of these grassland types. Our study also highlights the threat of invasive plant species in further degrading native prairie, such that restoration of mixed native-invasive (ruderal) stands is likely to be extremely challenging. Further study is needed of the Aspen Woodlands, part of the Northern Fescue grassland, and northern tallgrass prairie landscapes.

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Thanks to CFGA, ECCC, and NatureServe Canada for funding support. Thanks to Mat Young with AECOM Canada and Chris Murphy with AECOM U.S. for assisting with writing the soils and geomorphology section and providing a critical review of this report, respectively. Stephanie Clarke and Paige Crossman with AECOM Canada provided GIS support. Thanks also to Tyler Hodgson and Tessa Giroux for managing this project for AECOM Canada. Thanks to Mary Harkness and Kristin Snow of NatureServe for facilitating the integration of our revisions to the Canadian National Vegetation Classification and International Vegetation Classification into Biotics, where the CNVC and IVC type descriptions are currently managed.

Introduction

The western Canadian Prairie Provinces are characterized by a wide diversity of grasslands, from the northern extension of tallgrass prairie in southeastern Manitoba, across the wide expanse of mesic and dry mixedgrass prairies from southwestern Manitoba and southern Saskatchewan to southeast Alberta, into the foothills fescue grasslands of Alberta's Rocky Mountains (Sims and Risser 2000). North of the mixedgrass prairies, the plains rough fescue grasslands form a mosaic of grassland and aspen forests in the Aspen Parkland, just south of the boreal region (Coupland 1992). These zonal prairies are interfingered with sand prairies, badlands, and wetlands. A distinguishing feature of these prairie grasslands is the dominance of cool-season (C3) rhizomatous grasses. These grasslands extend south into the U.S.A. forming the broad belt of the Great Plains between the tallgrass prairie to the east, and either Rocky Mountain Foothills grassland or shortgrass prairie to the west. There have been no comparative studies of these grasslands across this entire region in Canada, though individual studies have been conducted for Manitoba tallgrass prairie (Koper et al. 2010), mesic and dry mixedgrass prairie (Coupland 1950, 1961, 1973), and plains rough fescue grassland (Looman 1969, Coupland 1992).

Further there has been disagreement on the placement of these grasslands in the larger context of the Great Plains grasslands, with Dry Mixedgrass prairie sometimes placed within the Shortgrass Prairie region to the south, in part because of the dominance of short warm-season bunchgrasses such as *Bouteloua gracilis* (blue grama) (Adams et al. 2013). It is thought that heavy grazing during the early decades of the 1900s and the severe droughts of the 1930s impacted the grassland plant communities observed by ecologists at the time by decreasing diversity and promoting warm-season grasses (Adam et al. 2013). Coupland (1961, 1973) noticed that, with the subsequent recovery of these prairies in the decades that followed, mixedgrass prairie species became far more abundant, and the region is now typically included as part of the mixedgrass prairie region because of differences in vegetation, soils, and climate (Commission for Environmental Cooperation 2006).

Canadian grasslands continue to be impacted by extensive agricultural development that has converted large tracts of prairie to wheat, canola, other crops and seeded pastures. For instance, the World Wildlife Fund estimates that between 2016 and 2021 an average of 223,000 ha per year of prairie grasslands in the Northern Great Plains were lost due to agricultural development (WWW 2023). The continued loss of

these grasslands parallels the loss of prairies across the entire North American Great Plains (Comer et al. 2018).

Concern over management of the remaining grasslands has led provincial rangeland experts to conduct detailed studies of this vegetation in relation to ecological site (ecosite) factors, both under natural reference conditions and in response to grazing pressures and invasive plants. For example, Adams et al (2004) provides information on the grazing history of the dry mixedgrass region since European settlement. These studies use plot-based assessments that provide detailed information on plant communities within ecoregions. However, no province-wide synthesis of these grassland data has been attempted.

In this study, we use available plant community and ecological site condition data to assess vegetation patterns across the Canadian prairie and parkland ecoregions and characterize grassland ecosystems at a regional scale. We worked with NatureServe Canada to complete type-based analyses of vegetation data from prairie ecosystems in Alberta, Manitoba, and Saskatchewan. We summarize our findings using the Canadian National Vegetation Classification (CNVC), in conjunction with the International Ecological Vegetation Classification (IEVC). This report summarizes the results of these analyses from work completed in December 2023–March 2024.

Canadian National Vegetation Classification

The Canadian National Vegetation Classification (CNVC) is an ecological classification of natural and semi-natural Canadian vegetation types (Faber-Langendoen et al. 2014). The classification is hierarchical, describing vegetation conditions at different levels of generalization from global biomes to local plant communities (Figure 1). Units are described for Canada, and through collaborative peer review, are integrated into the International Vegetation Classification (IVC) (Faber-Langendoen et al. 2018). Baldwin et al. (2019) provided a comprehensive set of confirmed and provisional macrogroups for all of Canada, and Faber-Langendoen et al. (2022) compiled all described groups, alliances, and associations across Canada, including grasslands.

Previous CNVC work has largely focused on plot-based analytical approaches applied at the association level, but data compilation efforts are demanding at this scale and the data are not always available. For that reason, complementary alternative approaches have been identified for use at the alliance and group levels; namely:

- Type-based analyses using summary data of plant community types available from the provinces and territories. By working with existing type concepts, analyses are guided by the local interpretations of species composition and ecosite factor relationships.
- Plot-based analyses. Plot-based analyses can be used to both refine alliance and group concepts, where such data exist and are publicly available.

The type-based approach uses methods like those used by Harris et al. (1996) and may be used in tandem with plot-based analyses. Here we apply the type-based approach, drawing from dozens of publications and hundreds of plant community types published for the Canadian Prairie Provinces.

Objectives

The objectives of this study were as follows:

- Compile, aggregate, and quality control the plant community plot data from the Prairie Provinces of Alberta, Manitoba, and Saskatchewan (see next section for details)
- Create a complete list of all plant communities by province
- Assign each plot to a published plant community type and attribute site factors for each plot.
- Use type-based analyses to develop and refine the dry and mesic grassland groups and alliances of the CNVC for the Prairie Provinces in combination with expert review.
- Prepare revisions to the CNVC and IVC dry and mesic grassland group and alliance units for Prairie Provinces vegetation in Canada, including descriptions.
- Help inform the regional conservation and sustainable management of Prairie Province grasslands.

Study Area

Biogeography and Climate

The Prairie Provinces of Canada encompass a wide range of climatic and topographic gradients, from mountains to badlands. Ecological land classifications are widely used to delineate ecoregions (Figure 2). The degree to which climate, physiography, vegetation, and soils define a particular ecoregion depends on its geographic location. For example, in Alberta, “Soils and climate tend to be most important in the southeastern plains; elevation, topography and vegetation are most important along the foothills and mountains; latitude, physiography and vegetation are most important in the northern plains and forests” (Natural Regions Committee 2006). Across the Prairie Provinces, climate shapes the larger scale

patterns. Mean annual precipitation ranges from 521 mm in southeast Manitoba (Winnipeg) to 331 mm in southeast Alberta (Medicine Hat, Table 1). Being in the rain shadow of the Rocky Mountains, Alberta is also subject to strong, warm winds known as Chinooks, reducing snow cover during winter months. Mean annual temperatures across the Prairie Provinces range latitudinally from 6°C in the Dry Mixedgrass ecoregion (Figure 2) in southeast Alberta (Medicine Hat) to 2°C in the northern portion of the Central Parkland ecoregion (Lloydminster and Edmonton, Alberta) (Table 1). Mean annual temperature also varies by longitude with the coolest temperatures in Tallgrass Prairie ecoregion in southern Manitoba. Temperature gradients also follow elevation with the warmest temperatures at the lowest elevations and cooler temperatures at higher elevations in the foothills and Cypress uplands (Figure 2).

Geomorphology and Soils

The vegetation zones of the Prairie Provinces of Canada include a wide range of soil and landscape types, (Baldwin et al. 2020) and these are summarized below. The topography across much of Canada's prairies is gently undulating plains characterized by extensive glacial till, glaciolacustrine, and glaciofluvial deposits. Exceptions to this are in the Foothills Parkland ecoregion in the Great Plains Parklands zone and portions of the Rocky Mountain Foothills Fescue Grassland ecozone which are characterized by hummocky hills and low ridges formed from sandstone, mudstone, and shales, and bisected by drainages. In addition, dissected badlands, characterized by sparse, exposed bedrock to bare rock and clay on eroding surfaces, and abundant hoodoos, occur most commonly in portions of the Dry Mixedgrass, Northern Fescue, and Central and Aspen Parkland ecoregions (Government of Canada 2021). The Cypress Hills zone consists of eroded bedrock mountains and hills with flat plateaus capped with gravels and conglomerate bedrock in the unglaciated upper reaches and a thick mantel of till on lower elevation slopes. Forests and woodlands occur in this zone at the highest elevations in mosaic with fescue grasslands. The highest elevation areas of the prairies occur in the Cypress Hills zone, the Foothills Parkland portion of the Great Plains Parklands zone, and the Rocky Mountain Foothills Fescue Grassland Zone.

Soils across the prairies are most commonly deep Chernozems (i.e., dark soils rich in humus), but also include Gleysols (i.e., hydric soils with a reduced matrix) on poorly drained sites (Soil Classification Working Group 1998). Luvisols and Dark Grey Chernozems can occur within the black soil zone on sites which support aspen forests. Solonetzic soils also occur, particularly in climatically warmer areas, such as the Dry Mixedgrass and Mesic Mixedgrass ecoregions. Solonetzic soils have high clay content, excessive

sodium, low CA^{2+} to Na^{+} ratio, and high alkalinity. Solonetzic soils are characterized by an impervious hardpan layer with very low permeability and extremely hard consistency when dry (Soil Classification Working Group 1998). These soils form on saline parent materials with an abundance of salts high in sodium. Saline soils have high enough accumulation of soluble salts to interfere with the growth of salt-intolerant plants (Government of Canada 2021). Lastly, dunes and other deep sand deposits occur across most of the prairie ecoregions and may form extensive dune complexes particularly in drier ecoregions, for instance, the Great Sand Hills in southwestern Saskatchewan (Wolfe and Ollerhead 2004). Young soils of dune sites, with poorly developed horizons are classified as Regosols and are common on sites with active soil movement. In Manitoba's Aspen Parkland and Assiniboine Delta Rangeland Ecoregions, sandy ridges and dunes occur frequently on or near the pre-historic shoreline of glacial Lake Agassiz.

Regional Grassland Vegetation

Vegetation patterns in the northern prairies can be described in the context of the ecoregions, as provided by the Vegetation Zones of Canada, a Biogeoclimatic Perspective (Baldwin et al. 2020), which integrates federal ecozone units with grassland and parkland ecoregional units mapped at the provincial level in Alberta (Natural Regions Committee, 2006), Saskatchewan (Acton et al., 1998) and Manitoba (Manitoba Protected Areas Initiative 2005). The Manitoba Protected Area Initiatives classification was chosen because it was thought to best represent the extent of Tallgrass Prairie (Baldwin et al., 2020). Thorpe (2014a) provided a brief description of the Tallgrass Prairie and mapped it as a slightly larger area than what is shown on the Manitoba Protected Areas Initiative map.

Within the Grassland, Parkland and Steppe Level 1 Zone, there are seven Level 2 Zones. Grassland, Parkland and Steppe vegetation occupies areas that are too dry to support expansive forest and woodland vegetation on zonal sites, and forests and woodlands are limited to riparian areas, coulees, and sheltered north- and east-facing slopes. Five Level 2 subzones are relevant to the current investigation:

- Higher elevations to the west—Rocky Mountain Foothills Fescue (Alberta);
- Three latitudinally-influenced zones that span the three provinces—Great Plains Mixedgrass Grassland (most southerly, warmest), Great Plains Fescue Grassland (intermediate temperature and precipitation), and the Great Plains Parkland (most northerly, coolest);
- One longitudinal- and elevation-influenced (<300 m) zone—the Central Tallgrass Grassland (Manitoba).

Detailed descriptions of each Level 2 zone (vegetation, climate, physiography, geology, topography, soils) are provided in Baldwin et al. (2020). Appendix A summarizes the main characteristics of each Level 2 zone. Azonal vegetation types that cross these zones include xeric sand prairies on sandhills and inland dunes, badlands vegetation, and wetlands.

Existing Prairie Classifications

Several classification systems currently applied to grassland management in Alberta, Saskatchewan and Manitoba were used as frameworks that provided insights into cross-provincial trends and guided the interpretation of pooled plot data (the type-based and plot-based approaches discussed previously).

Ecoregions and Ecosites

Ecoregions are defined largely by climate and secondarily by vegetation physiognomy and dominant lifeforms (Thorpe 2014b). An ecological site (herein, ecosite) is distinguished by physical site characteristics, differing from other sites in its ability to produce vegetation and to respond to management (SRM 1989). Ecosite classifications have been prepared for the three Prairie Provinces and are organized within the broader ecoregions and guided by edaphic factors and climate, ranging from xeric badlands and inland sand dune/sandhills to subirrigated wetland site (Table 2). For each province, plant community types were defined and summarized for each ecosite, providing an important linkage between the plant community types and site conditions. Although Manitoba's rangeland ecosites have been defined, the vegetation patterns of some ecosites remain data deficient; vegetation and ecosite relationships are well defined for Alberta and Saskatchewan.

Reference and Successional Communities

For each province, the plant communities that can potentially occur on an ecosite were refined using a state-and-transition approach that specified the successional relationships between unaltered community types representing pristine condition (or nearly so) and successional and altered types that developed with the lack of fire, heavy grazing or exotic species invasion. The rangeland plant community classifications assign communities representing an unaltered state to reference condition, while all other communities were assigned to one of several successional or altered (i.e., non-reference) states. State-and-transition models define the successional relationships between reference, successional, and altered communities, and each non-reference community is assigned a parent reference community based on the models (example in Appendix B). The models conceptualize the pathway back to reference

given sufficient time in the absence of disturbance (successional) or following management action (altered). Table 3 provides a cross-reference table between the successional state classes from the three provinces used in the dataset and the aggregated successional class used for analysis purposes.

Alberta

Alberta's grassland and parkland community classifications are based on the Natural Regions and Subregions and ecosite framework (Natural Regions Committee, 2006). Plant community types represent species composition at the plot scale (typically an aggregate of several small (20 by 50cm) sampling frames along a transect), summarized using species statistics (average cover, range and constancy by layer) and assigned to classes according to their successional status (reference condition to modified by heavy grazing). Their ecological characteristics (established soil series, micro to macro landscape features, interpreted moisture and nutrient status, slope, aspect, elevation) are also summarized. The community type descriptions provide sufficient information to enable their use in mapping applications because they are tied to photo interpretable ecosite features, e.g., sandhills, steep thin-soil slopes, bedrock exposures, loam soils, solonetzic soils and pitted till plains. Community types and the plots that comprise them were used in this analysis. Detailed publications of each plant community type are available for the following natural subregions: Dry Mixedgrass (Adams et al. 2013a); the Mixedgrass (Adams et al. 2013b); the Foothills Fescue (Adams et al. 2005); the Northern Fescue (Adams et al. 2019); and the Central Parkland (Kupsch et al. 2013).

Saskatchewan

The description of grassland ecoregions and ecosites began in Saskatchewan with the development of the publication *Range Plan Development: a Practical Guide to Planning for Management and Improvement of Saskatchewan Rangeland* (Abouguendia 1990). Originally, soil zones were used to organize and predict grassland ecoregions within Saskatchewan. Following the publication of Abouguendia (1990), Padbury and Acton (1994) developed an ecoregion classification for the province that was compatible with Canada's national ecological land classification (ESWG 1996). The authors defined four Grassland Ecoregions: Aspen Parkland (or Fescue Grassland), which is closely correlated to the Black Soil Zone, Moist Mixedgrass analogous to the Dark Brown Soil Zone, (Dry) Mixedgrass – corresponding with the Brown Soil Zone, and Cypress Upland. Cypress Upland has marked elevation changes, resulting in local variation in soil zone across relatively short distances.

Manitoba

Manitoba's prairie plant community classifications are limited to a first approximation of xeric to mesic grasslands in the Aspen Parkland and Assiniboine Delta rangeland ecological regions (Pyle et al. 2018; Thorpe 2014a). Of the Prairie Provinces, Manitoba's grasslands have relatively darker soils and receive greater precipitation. These grasslands were also colonized earlier and more widely than Alberta and Saskatchewan, resulting in significant loss of grasslands in Manitoba. For the first approximation of grassland communities, supplemental data was used from eastern Saskatchewan to aid in the description of expected plant communities in SW Manitoba. Remaining native grasslands in the province tend to be on sites undesirable for cultivation like dunes, sandy plains, steep slopes, etc. In south central Manitoba there is a transition between rough fescue grasslands and aspen typical of western Canadian Aspen Parkland to Tallgrass Prairie, including greater cover of warm-season grasses and aspen-oak woodlands. Plant communities in Manitoba's Tallgrass Prairie remain undescribed across the ecological region, an area in which >99% of native prairie is estimated to be lost (Joyce & Morgan 1989). Grassland plant community types were defined and summarized for all common ecosites in the region, but some remain data deficient.

Methods

Data Compilation

We compiled existing vegetation data for grassland plots originating from across the prairie ecoregions of Alberta, Manitoba, and Saskatchewan, all collected by rangeland ecologists in each province (Figure 2). For Alberta, Ross Adams, Area Range Management Specialist, Forestry and Parks, Alberta Government, provided publicly accessible plot data (32,621 discrete plots) that included vegetation composition and abundance (canopy cover), location (latitude, longitude), ecosite, site and soil data, and successional state for each plot. For this analysis, he provided a cross-reference table for a subset of 4,308 plots. This included 3,240 plots located in the four grassland ecoregions, Dry Mixedgrass, Mixedgrass, Northern Fescue, and Foothills Fescue and 1,068 from the Central Parkland ecoregion. The cross-reference table contained key variables common to the entire plot file to enable a database join with the vegetation plot data using the plot unique identifier. The cross-reference table also included a field that assigned each plot to a vegetation community type described in the most recently published range site guides for the abovementioned subregions.

For Manitoba, we obtained data from 1,300 vegetation plots used in Pyle et al. (2018) for the Aspen Parkland ecoregion and Assiniboine Delta area which consisted of data from numerous sources, with the permission of the Manitoba Forage and Grassland Association. Vegetation data included foliar cover, relative biomass, and line-point-intercept data transformed to relative abundance. For each plot in (Pyle et al. 2018) the dataset also included the determined ecosite, plant community type, successional state, latitude and longitude (20 plots), and the ecodistrict number (AAFC 2024a). Latitude and longitude were provided for only 20 plots in Manitoba due to privacy concerns, and instead we were provided the ecodistrict that each plot was located in; therefore, the location of Manitoba plots in Figure 2 are random locations within the ecodistrict that each plot occurs.

For Saskatchewan, we obtained data for 2,750 vegetation plots from Jeff Thorpe, rangeland ecologist with the Saskatchewan Research Council. In addition to vegetation composition and abundance (mix of canopy cover and biomass), the dataset included ecosite, plant community type, successional state, latitude and longitude, and site and soil data.

The vegetation plot data from the three provinces were obtained in spreadsheet format from the data originator. The spreadsheet data was imported into a PostgreSQL database and archived for reference.

Lastly, we derived climate and topographic data values using a Geographic Information System (GIS) for each plot with latitude/longitude data available. Data attributes derived from GIS were growing degree days (AAFC 2024b), climate moisture index (Natural Resources Canada 2024a), and elevation (Government of Alberta 2024, Natural Resources Canada 2024b).

Data QC

The data were then subject to quality control (QC) review to identify and correct any errors and ensure the data were standardized in preparation for analysis. We reviewed each column for consistency in the spelling and capitalization of codes and titles. To address inconsistencies within datasets, we created new columns (e.g., ecosite_adjusted) and copied the data from the original column into the new column. We then updated the new column to create consistent codes/titles, while leaving the original column unchanged for archival purposes. We also QC reviewed and standardized the environment data attributes across the 3 datasets when applicable to ensure class codes and titles were consistent throughout. For instance, the ecosite classifications for the three provinces were standardized into an aggregated ecosite classification for analysis purposes (Table 2). Note that in the combined dataset the plant species

abundance metric was a mix of canopy cover and relative percent biomass by weight. This inconsistency was addressed by using prominence value for the analysis (see below).

We then standardized scientific names to the most recent Database of Vascular Plants of Canada (VASCAN, Brouillet et al. 2010+) accepted names using a database view (i.e., saved query) . Scientific names that did not match a VASCAN scientific name were reviewed and corrected. In all cases, the unmatched names were spelling inconsistencies in the scientific name from the original data. To address the spelling inconsistencies, we created a “scientific_name_adjusted” column, copied the data from the “scientific_name” column into the new column, and made corrections in the new column. Following the spelling corrections, all adjusted scientific names matched a taxonomic name in VASCAN. The complete species list contains 782 vascular plant species of which 683 are native, 98 are introduced, and one has no ranking (Appendix C).

Data Transformations

In addition to the standardization of scientific names, we performed the following data transformations in a database view for the plot-level data:

- Aggregated subspecies and varieties to species level,
- Created an "analysis_name" field which combined the genus and species separated by an underscore,
- Removed all genus only and all unknown records (e.g., unknown forb), except for Carex spp.
- Calculated natural log transformed abundance and included both raw and natural log transformed abundance.
- Lastly, we withheld from the analysis all plots with the following characteristics after the transformations described above:
  - Less than three plant species
  - Total live plant abundance less than 5%
  - Combined abundance of unknown taxa and genus only records > 35%

Following QC review and after applying the criteria listed above 6,925 plots were used in the analysis: 3,796 from Alberta, 524 from Manitoba, and 2,605 from Saskatchewan.

Plant Community Type Summary Data

Vegetation Data

Because our goal was to identify regional patterns of grassland types (i.e., alliance and group levels of the CNVC), we conducted our analyses using a “type-based” approach, where we retained the provincial

plant community types as the unit of analysis. We maintained the plant community scientific name titles in the project database as written in the provincial rangeland guides, and in some cases, the scientific names in the titles include currently unaccepted taxonomic names. Appendix C provides a cross-reference between the unaccepted names and the accepted synonym. Thus, we used the QC reviewed plot-level data, as described above, to summarize the vegetation data to the plant community type level. We performed the following transformations to the plot-level data before aggregating to plant community type.

For each species in each community type, we calculated the average abundance, average natural log abundance, and constancy. Constancy is a measure of the frequency of a species occurring in a plant community type and was calculated for each species as:

$$Constancy = \left(\#\ of\ \frac{occurrences}{plots\ per\ community}\right) * 100$$

We then used constancy and average abundance to calculate prominence value (PV) for each species as:

$$PV = average\ abundance * \sqrt{\frac{constancy}{100}}$$

PV was used in the vegetation community-type summary analysis in place of average abundance because PV incorporates both abundance and constancy. This feature of PV provides a higher weighting to species with high constancy and low to moderate cover which are often diagnostic of a plant community. The final aggregated dataset consisted of 200 reference and minor alteration communities, and 208 non-reference communities.

Environment Data

We aggregated the environment data for each plant community type. For continuous data attributes (e.g., elevation), we calculated the average value. The environment data also included the plant community metadata, including plant community code, common name title, scientific name title, ecosite, state and transition status (e.g., reference), and a preliminary expert-based assignment of the type to a CNVC group and alliance classification, as provided in Faber-Langendoen et al. (2022). For analysis purposes, we used the aggregated ecosite classification (Table 2). The aggregated ecosite classification facilitated analysis at the group and alliance level by making it easier to identify patterns of similar site conditions across the plant communities.

Data Analysis

The data from the type-level vegetation and environment database views were imported in R: A language and environment for statistical computing (R Core Team 2024). All code files were stored using a version control system in a code repository on GitHub. We used functions from the labdsv, optpart, and vegan libraries for sorted table analyses, non-metric multidimensional scaling (NMDS) ordination. and partition analysis (Oksanen 2022, Roberts 2023).We used the vegclust and indicspecies libraries to analyze the type-level data using noise clustering and indicator species analysis (De Cáceres 2022 2023a). The indicator species analysis method multipatt from the indicspecies R library is based on De Cáceres, Legendre, and Moretti (2010) and which we used to determine indicator species of both individual groups and alliances and combinations thereof.

Noise clustering was used to make preliminary assignments of plant community types to groups and alliances, and to iteratively refine these classifications through the expert review process. Noise clustering was also used to quantitatively assess the final group and alliance classifications for the dry and mesic grasslands within three groups by performing a cluster analysis and comparing the resulting clusters against the group and alliance classifications using contingency table analysis as follows. We first ran noise cluster with the number of clusters equal to the number groups or alliances to be assessed. Second, we summarized the floristic attributes of the clusters by calculating average abundance and constancy of plant species by cluster and running an indicator species analysis. Third, we quantified the consistency of each group or alliance across the clusters by calculating the proportion of communities assigned to the single cluster with the most communities assigned for each respective group or alliance (i.e., primary cluster), excluding communities assigned to the noise cluster. Groups or alliances with greater than or equal to 75% percent consistency were considered internally consistent. Fourth, we calculated the proportion of each group or alliance assigned to the noise cluster as a measure of the floristic variability and number of potential floristic outliers in each group or alliance. Groups or alliances with greater than 25% outliers were considered to have a considerable number of outliers. Fifth, we quantified the consistency of each cluster across the groups and alliances by calculating the proportion of communities assigned to the single group or alliance with the most communities assigned for each respective cluster (i.e., primary group/alliance). Clusters with greater than or equal to 75% percent consistency were considered internally consistent.

We used partition analysis to assess the strength of each cluster and to determine which clusters were most floristically like one another, based on the within-to-between cluster similarity. Partition analysis evaluates the within-cluster to among-cluster similarity of classifications as a measure of cluster validity. The results of partition analysis also provide a quantitative approach for aggregating clusters up to broader groupings (e.g., macrogroup). We cross-referenced the results of the cluster analysis to the ecosites, groups, and alliances assigned to each community, to assess the relationship between the ecosites and CNVC types. We fit Generalized Additive Models (GAMs) to the ordination axis scores for continuous attributes (e.g., growing degree days), and plotted the smoothed surfaces over the NMDS (Roberts 2023). We also used functions in the rgl (Murdoch et al. 2024)and vegan3d (Oksanen 2024) libraries to create three-dimensional, dynamic NMDS plots that could be rotated graphically and viewed from multiple perspectives. Clusters, groups, alliances, and ecosites were also symbolized in the NMDS ordinations to assess the relationship between the clusters, ordination axis scores, and environmental gradients, and to identify outliers. For the type-level analysis we began by clustering the plant communities with a state-and-transition status of reference and minor alteration. Exploratory analyses of the plot-level data were conducted to gain a sense for the plot-level data's structure in preparation for potential future plot-level analyses. However, given the condensed analysis schedule, we focused on the type-based analysis. Lastly, when the classification of groups and alliances was completed following expert review (see below), we used the plot-level data to prepare constancy/abundance summary tables by alliance to aid in updating the descriptions for existing alliances and for writing descriptions for newly classified alliances.

To quantitively assess the dry and mesic grassland group classification, we compared the group classification prepared using a combination of quantitative analysis and expert review with the results of a purely quantitative approach using fuzzy noise clustering (De Cáceres and Wiser 2022) with a target of seven clusters to match the number of groups. We then prepared a summary table of the floristics attributes of the clusters and a contingency table to quantify how well the groups aligned with the clusters. The fuzzy membership values were reviewed to determine the next best fit cluster for those communities that had a fuzzy membership value in the assigned cluster of less than 0.80 and that did not classify into the cluster with most of the other communities in their assigned group.

Analysis and Classification of Non-Reference Communities

When the classification of reference communities was completed as described above, and following expert review (see below), we then added the non-reference communities to the analysis. To begin we assigned 12 altered plant communities dominated by introduced species (e.g., communities in the Tame Pasture ecosite) to the ruderal grassland class, Northern & Central Great Plains Ruderal Grassland & Shrubland (G679). We then used the supervised classification tools in the vegclust R library to prepare a supervised classification of the non-reference community vegetation data using the reference community vegetation data and group classification as the training data. The supervised classification assigned a group to each non-reference community and the initial results were reviewed to determine the fidelity of non-reference communities to the group that their respective parent reference communities were assigned to. Non-reference communities classified into G679 were further evaluated by assessing the ratio of introduced species abundance to total live vascular species abundance (i.e., non-native ratio) calculated as:

$$\text{Non-native Ratio} = \frac{\text{non-native abundance}}{\text{non-native} + \text{native abundance}}$$

We considered communities with a non-native ratio >0.50 to be ruderal and assigned them to group G679. We then completed a second supervised classification to classify the non-reference communities there were not assigned to G679 using the reference community data plus the data from the communities assigned to G679 as the training data. The results were then evaluated to determine the fidelity of non-reference communities to the respective parent reference group. Lastly, for the purposes of the classification, non-reference communities not assigned to G679 based on their non-native ratio were assigned to their parent reference group. Non-reference communities were not assigned to alliances as part of this study.

Expert Review

Experts from Alberta, Manitoba, and Saskatchewan were asked to review the cluster analysis outputs. The experts had considerable experience in plant community data collection in prairie ecosystems and the classification of grasslands and had familiarity (through personal knowledge or GIS analysis) of the general geographic distribution of community types.

Expert review was undertaken in two phases. The first phase involved assisting the analyst with database management issues to ensure that data were free of errors or duplication prior to analysis, that plots were correctly assigned to successional classes, and that every plot was assigned a community type label to facilitate comparisons at that level.

The second phase involved reviewing the outputs of an initial cluster analysis to determine which clusters best aggregated community types into groups that possessed internal consistency with respect to diagnostic species indicators and the environmental conditions under which these typically occurred. Clusters that did not possess internal consistency were identified and ways to improve the classification were suggested. The analyst then adjusted the cluster analysis parameters and prepared a second analysis that was reviewed again by the expert. This did result in improvements in internal consistency, and it also gave the experts some insights into the broader-level relationships between community types that had not yet been assigned to higher levels of the CNVC/IVC classification. Subsequently, the experts discussed the process and the cluster analysis with the project manager who confirmed or modified existing assignment of community types to CNVC/IVC groups or alliances or made tentative assignments of unassigned community types. This result was then taken forward to meetings involving the analyst, experts, and the project manager.

Results

All Vegetation

We assigned the reference and minor alteration prairie communities to nine macrogroups, 13 groups, and 32 alliances (Appendix D). Descriptions of the macrogroups, groups, and alliances are available on the NatureServe Explorer website[1] (NatureServe 2024). Eight macrogroups occur in the temperate zone within the following divisions: Eastern North American Temperate Freshwater Marsh, Wet Meadow & Shrubland (D323), North American Great Plains Forest & Woodland (D332), and Central North American Grassland & Shrubland (D023). A single community in the Subirrigated and Overflow ecosite, *Salix bebbiana / Carex - Deschampsia cespitosa* (FFC2), was tentatively assigned to North American Boreal Shrubland & Grassland division (D340) and North American Boreal Shrubland & Grassland macrogroup (M537). This community was represented by six plots located in Alberta's Foothills Fescue ecoregion,

[1] As of the publication of this report in April 2024 descriptions for groups and alliances are currently under revision based on the results presented here. When revisions are completed the NatureServe Explorer website will update with the revised descriptions.

was identified as an outlier in the ordination analysis, and was withheld from further analysis. Figure 3A shows the eight macrogroups that occur in the temperate zone in an NMDS ordination. The ordination analysis indicated that the macrogroups were well differentiated ($p < 0.001$) based on plant species composition. Forest and woodlands in Northern Great Plains Forest & Woodland (M545) and freshwater wetlands in Great Plains Marsh, Wet Meadow, Shrubland & Playa (M071) were well differentiated from the dry and mesic grasslands in Great Plains Mixedgrass & Fescue Prairie (M051), Great Plains Sand Grassland & Shrubland (M052), Central Lowlands Tallgrass Prairie (M054), Great Plains Badlands Vegetation (M115), and Rocky Mountain Grassland & Meadow (M547) corresponding to a pronounced ($D^2 = 0.70$, $p < 0.001$) moisture gradient along NMDS 1 (Figure 3B).

The results of a correlation analysis between the species scores and NMDS axes (Table 4) revealed that species typical of wet meadows and marshes, including *Galium trifidum*, *Epilobium palustre*, *Sium suave*, and *Carex utriculata* were strongly correlated with the upper end of NMDS 1 (right side of the ordination), while species typical of dry prairies, including *Hesperostipa comata*, *Bouteloua gracilis*, *Elymus lanceolatus*, *Artemisia frigida*, and *Koeleria macrantha* were strongly correlated with the lower end of NMDS 1 (left side). The correlation of species along NMDS 1 indicates that this axis represents a soil moisture gradient from wetlands on the right side and dry uplands on the left (Figure 3C). Species typical of woodlands and shrublands, including *Populus tremuloides*, *Amelanchier alnifolia*, *Prunus virginiana*, and *Symphoricarpos occidentalis* were strongly correlated with the upper end of NMDS 2 (top of the ordination), while species typical of saline soils, including *Atriplex gardneri*, *Distichlis spicata*, and *Sarcobatus vermiculatus* were strongly correlated with the lower end of NMDS 2 (bottom). Saline wetlands in M077 are located in the lower half of NMDS 2 but span across much of NMDS 1 indicating that this macrogroup is floristically diverse and spans a soil moisture gradient from saline wet meadow and marsh ecosites on the right side of NMDS 1 to transitional sites in saline upland and saline lowland ecosites, including saline shrublands, on the left side of NMDS 1 (Figure 3A).

The correlation of species along NMDS 2 indicates that this axis represents a salinity gradient (Figure 3C). NMDS 1 and 2 combined represent gradients in vegetation physiognomy from wetlands in the lower right corner to dry and mesic grasslands in the upper left, and shift from grasslands to shrublands and forest and woodlands on the upper end of NMDS 2 and left to right along NMDS 1 (Figure 3D). Species typical of coarse, sandy soils, including *Carex duriuscula*, *Sporobolus rigidus*, and *Ladeania lanceolata* were strongly correlated with the upper end of NMDS 3 (not shown), while species typical of fine-textured

soils, including *Festuca hallii* and *Geum triflorum,* were strongly correlated with the lower end of NMDS 3. The correlation of species along NMDS 3 indicates that this axis represents a gradient in soil texture. Together the NMDS and correlation analyses showed that the primary environmental gradients shaping the vegetation composition at the macrogroup level were soil moisture, salinity, and soil texture.

Grasslands

Ordination

In addition to elucidating the environmental gradients driving prairie vegetation composition, the NMDS analysis of all vegetation confirmed that plant communities in the dry and mesic grassland macrogroups were more similar to each other than to the forest and woodland and wetland macrogroups. This pattern is evidenced by the tight grouping of communities in the upper left corner of Figure 3A. To explore the floristic and ecological patterns of dry and mesic grasslands, we took the subset of dry and mesic grassland communities in macrogroups M051, M052, M054, M115, and M547 and explored these in greater detail using ordination analysis (Figure 4A), noise clustering, and indicator species and partition analysis. We identified seven dry and mesic grassland groups (Figures 5 and 6) within which 18 alliances are nested (Appendix D). The group classification differentiates dry and mesic grasslands based on moderately narrow sets of diagnostic plant species, including dominants and co-dominants, broadly similar composition, and diagnostic growth forms, as well as regional mesoclimate and geomorphology (USNVC 2024).

The NMDS analysis indicated that the seven groups were well differentiated ($p < 0.001$) based on plant species composition (Figure 4A). The two alliances in Northern Great Plains Sand Prairie (G889) are symbolized separately and demonstrate the floristic differences between the northern sand prairies located in central and northern Saskatchewan and Alberta versus the northeastern sand prairies located in southeast Saskatchewan and southwest Manitoba (Figure 2). The seven groups were also well differentiated along pronounced gradients in climate moisture index ($D^2 = 0.73$ $p < 0.001$) (Figure 4B) and growing degree days ($D^2 = 0.69$, $p < 0.001$) (Figure 4C) from the dry mixed and sandy grasslands in upper right corner of the NMDS, to mesic grasslands in the center, to lower montane grasslands in the lower left corner.

The results of a correlation analysis between the species scores and NMDS axes (Table 5) revealed that species typical of dry mixedgrass prairie, including *Hesperostipa comata*, *Bouteloua gracilis*, *Elymus*

lanceolatus, and *Sphaeralcea coccinea* were strongly correlated with the upper end of NMDS 1 (right side of the ordination), while species characteristic of rough fescue prairies, including *Festuca hallii,* were correlated with the lower end of NMDS 1 (left side). The correlation of species along NMDS 1 corresponds with to the gradient in climate moisture index displayed in Figure 4B indicating that this axis represents a moisture gradient from dry mixedgrass prairie on the right side and mesic and rough fescue prairies in the center and left side. Species typical of coarse, sandy soils and warmer climates, including *Sporobolus rigidus, Carex obtusata*, and *Prunus virginiana* were strongly correlated with the upper end of NMDS 2, while species typical of cooler climates in foothills and montane ecoregions and fine-textured soil, including *Festuca campestris*, *F. idahoensis*, and *Danthonia parryi* were strongly correlated with the lower end of NMDS 3. The correlation of species along NMDS 2 corresponds with the gradient in growing degree days displayed in Figure 4C indicating that this axis represents a gradient in temperature and growing season from cooler, higher elevation grasslands in the foothills and lower montane region in Central Rocky Mountain Lower Montane, Foothill & Valley Grassland (G273) on the lower end of NMDS 2 to warmer, lower elevation grasslands in the six other groups on the upper end. NMDS 2 also represents a gradient in soil texture from fine-textured soils on the lower end and coarse, sandy soils on the upper end corresponding to the sand prairies in G889, respectively. Species typical of tallgrass prairies, including *Hesperostipa spartea*, *Schizachyrium scoparium*, and *Andropogon* gerardii, were strongly correlated with the upper end of NMDS 3 (not shown), while species typical of mesic mixedgrass prairies, including namely *Hesperostipa curtiseta*, were strongly correlated with the lower end of NMDS 3. The correlation of species along NMDS 3 indicates that this axis represents a gradient from mesic mixedgrass in Northern Great Plains Mesic Mixedgrass Prairie (G141) to tallgrass prairies in Northern Tallgrass Prairie (G075) corresponding to regional shifts in dominant species and an increase in precipitation from west to east across the transition from mesic mixedgrass to tallgrass prairie.

Together the NMDS and correlation analyses showed that the primary environmental gradients shaping the dry and mesic prairie grassland vegetation composition at the group level were soil moisture, growing degree days, soil texture, and biogeographic shifts in dominant species. The dry and mesic grassland groups all showed tight aggregations of points in the ordination except G889, which spans across much of NMDS 1.

Indicator Species Analysis

Table 6 provides the results of the indicator species analysis, including the scientific name for indicators with a p-value ≤0.01, a list of other non-indicator species with high (≥5) prominence values, and diagnostic environmental characteristics for each group. It is important to note that the indicator species listed are only valid for distinguishing between the groups included in this subset of the data. The indicator species metrics include the scientific name, specificity, fidelity, overall indicator value (Dufrêne and Legendre 1997), and significance of each indicator species. Specificity is the likelihood that a species belongs to the group given that the species occurs in it, fidelity is the likelihood of finding the species in a community belonging to the group, and the overall indicator value provides a single value to measure the association between species and groups (De Cáceres 2023b). We focused primarily on the indicators specific to each group; however, G141 and Northern Great Plains Dry Mixedgrass Prairie (G331) both had no significant indicators except when combined with other groups suggesting that there are no diagnostic species for these groups individually. For these two groups, we listed the significant indicators when combined with other groups in Table 6 and have listed the group combinations in the table footnote. G141 had one significant indicator, *Sphaeralcea coccinea*, when combined with G331 and Great Plains Badlands Vegetation (G566). *Sphaeralcea coccinea* was a significant indicator of G331 when combined with G141+G566, and *Poa secunda* was significant when combined with G566. The remaining five groups had on average 4 significant indicators at the p ≤ 0.01 threshold. Groups with notably few significant indicators were Northern Great Plains Rough Fescue Prairie (G332) and G889. In addition, several groups had at least one of the significant indicators that was also dominant as indicated by prominence values greater than 15, including G075 (*Andropogon gerardii*), G273 (*Festuca campestris* and *F. idahoensis*), and G332 (*Festuca hallii*). Lastly, G566 had eight significant indicators, however, four of these were shared with combinations of other groups. The two most important indicators of G566 unique to this group were *Atriplex gardneri* and *Distichlis spicata*.

Noise Clustering

Table 7 shows the prominence, average abundance, constancy, and significant (≤0.01) indicator species for the dry and mesic grassland clusters generated using noise cluster analysis, and Appendix E shows the noise clustering results. Cluster M1 was dominated by *Hesperostipa comata* with *Koeleria macrantha* and *Bouteloua gracilis* as subdominants and *Ladeania lanceolata* as the single significant indicator species. Cluster M2 was dominated by *Festuca campestris* with moderate to high prominence of

Danthonia parryi and *Festuca idahoensis* and several significant indicators similar to those for G273 (Table 6). Cluster M3 was codominated by *Hesperostipa curtiseta* and *Elymus lanceolatus* and had no significant indicator species. Cluster M4 was dominated by *Festuca hallii* and *Hesperostipa curtiseta* and had several significant indicators, namely *Symphyotrichum laeve*. Cluster M5 was dominated by *Elymus lanceolatus* and *Hesperostipa comata* and had no significant indicator species. Cluster M6 had no species with a constancy greater than 66 percent. The most prominent species in M6 were *Festuca hallii*, *Hesperostipa comata*, and *Hesperostipa curtiseta*, and the three significant indicator species were all shrubs: *Elaeagnus commutata*, *Rosa woodsii*, and *Prunus virginiana*. Cluster M7 was dominated by *Pascopyrum smithii* with moderately high prominence of *Koeleria macrantha* and *Elymus lanceolatus*, and the four significant indicator species in M7 were all salt-tolerant species: *Gutierrezia sarothrae*, *Atriplex gardneri*, *Hordeum jubatum*, and *Grindelia squarrosa*.

Table 8 shows the contingency table comparing the group classification to the clusters. Excluding communities that were classified into the noise cluster, two of the groups, G141 and G273 had at least 75% of their respective communities classified into one cluster (M3 and M2, respectively). Of these two groups, G141 had the fewest (12%) of its respective communities assigned to the noise cluster, while G273 had 23% assigned to the noise cluster, the third lowest across all groups. G332 had 64% of its communities assigned to the dominant cluster (M4) with most remaining communities classified into cluster M6 (six) and four (13%) that were classified into the noise cluster. Two groups G331 and G566, showed little affinity with any single cluster, while 100 percent of the communities in G075 were assigned to the noise cluster. Based on the fuzzy membership values, the next best cluster fit for all G075 communities assigned to the noise cluster was M6. The communities in G331 were split approximately evenly across M1, M5, and M7. Of the 13 G331 communities assigned to cluster M1, seven had a fuzzy membership value in M1 of less than 0.80 indicating a moderate to poor fit, and the next best fit for all seven was cluster M5 (Appendix E). Of the 13 G331 communities assigned to cluster M5, nine had a fuzzy membership value in M5 of less than 0.80 indicating a moderate to poor fit, and the next best fit for these 9 communities was M1 (4 communities), Noise (3) and M7 (2). Of the 12 G331 communities assigned to cluster M7, two had a fuzzy membership value in M7 of less than 0.80 indicating the most communities in this cluster had high fit. Of the two G331 communities with a fuzzy fit value of less than 0.80, the next best for one was M5 and the other the noise cluster. G566 is composed of only three communities, each assigned to a different cluster. All groups had communities assigned to the noise

cluster and just over half of the groups had fewer than 25% of their respective communities assigned to the noise cluster. Five of the seven clusters, M2, M3, M4, M5, and M7 aligned primarily with one group, and of these M2 and M3 were perfectly aligned with only one group (G273 and G332, respectively).

Partition Analysis

The results of the partition analysis for the dry and mesic grassland groups are presented by group in Table 9 and demonstrate the distinctness of each group. All the groups were most similar to themselves as indicated by the highest within to between cluster similarities along the diagonal in Table 9, which is to be expected for a robust group classification. G075 had the highest ratio followed by G141, while G889 had the lowest ratio followed by G273. Groups within macrogroup M051 were next most similar to another group within the same macrogroup, except for G331, which was next most similar to G566 in macrogroup M115, followed by G889 (M052) and G141 (M051). G331 was the next most similar group for G889 and G566. M075 was next most similar to G141, G332, and G889, and M547 was next most similar to G141; however, the similarity ratios were low.

Shrubland Alliances

Shrubland communities in the dry and mesic grassland groups are symbolized by evergreen and deciduous in Figure 4D. In general, the shrubland communities displayed a high degree of floristic variability, with two loosely aggregated sets of deciduous shrub communities on the far right and center left of NMDS 1, a small set of evergreen shrub communities that spans the upper end of NMDS 2, and one deciduous shrubland that is an outlier located at the center of NMDS 1 and top of NMDS 2. Shrublands are uncommon (29 communities) in the dataset that we compiled; therefore, it was not possible to analyze the shrublands separately. In addition, shrub abundances in shrubland communities were sometimes low (10–20%), resulting in the shrublands often not being sharply differentiated in the cluster analyses. In addition, the few communities with high shrub abundances were flagged as outliers in the ordination and noise clustering. For instance, A4095 is a shrubland alliance in G273 consisting of a single community and was identified as an outlier in the ordination analysis and this alliance, and several additional communities in other shrub alliances also identified as outliers, were withheld from the ordination diagrams presented in this report.

Given the low sample size and floristic variability of shrublands, we highlighted shrublands in the context of the seven dry and mesic grassland groups by symbolizing each of the shrubland alliances and then

symbolizing the grasslands all the same neutral color in the NMDS. Figure 6 shows the shrubland alliances in the dry and mesic grasslands NMDS. The *Juniperus horizontalis - Arctostaphylos uva-ursi / Calamovilfa longifolia* Sand Grassland Alliance (A2407) is the most diverse floristically, including both evergreen and deciduous shrublands, and consisting of two loosely aggregated groupings of communities in the upper right and upper center of the ordination, and one community near the center of the ordination. The *Artemisia cana / Hesperostipa comata - Pascopyrum smithii* Shrubland Alliance (A3586) includes deciduous shrublands and occurs on the upper end of NMDS 1 and center of NMDS 2 corresponding to the dry end of the moisture gradient (Figure 4B) and high end of a gradient in growing degree days (Figure 4C). The *Symphoricarpos occidentalis - Elaeagnus commutata / Festuca hallii Shrub Grassland Alliance* (A2405) spans across the left side of NMDS 1 corresponding to moister and cooler ends of the moisture and growing degree gradients. The *Sarcobatus vermiculatus* Great Plains Badlands Alliance (A3978) and *Prunus virginiana - Symphoricarpos occidentalis* Northern Plains Shrubland Alliance (A2309) both consist of one community each in the NMDS.

An additional shrubland alliance occurs within the saline wetlands group (G984). The *Sarcobatus vermiculatus* Great Plains Wet Shrubland Alliance (A3905) is associated with the drier end of the soil moisture spectrum in G984 (Figure 3A), and for this reason we included this alliance with the other dry and mesic shrubland alliances in the indicator species analysis. Shrubland communities and alliances identified as outliers in the ordination analysis were also included in the indicator species analysis. Additional shrubland alliances occur in the freshwater wetland groups in M071 (Appendix D); however, given how different wetland vegetation is from dry and mesic uplands these shrublands were not further considered here. Significant indicators of individual alliances and pairwise combinations of alliances are listed in Table 10 along with dominant species and diagnostic environmental characteristics for the shrubland alliances. Given the paucity of significant indicator species for the shrubland alliances we have displayed indicators with significance values of less than 0.05. The alliances A2309, A2407, A3905, and A3978 had no significant indicator species except when combined with other alliances. *Elymus trachycaulus* was a significant indicator for A2309 when combined with A2405. *Sporobolus rigidus* and *Heterotheca villosa* were significant indicators of the combination of A2407 and A3978. *Artemisia cana* was a significant indicator for A3586 + A3978, and *Poa secunda* was a significant indicator for A3586+A3905, respectively. Lastly, *Sarcobatus vermiculatus* and *Distichlis spicata* were significant indicators of the combination of A3905 and A3978. Of the remaining three alliances, all had only one

significant indicator species unique to each alliance, and the indicators all had high (>0.70) specificity and fidelity.

Mixedgrass and Sand Prairie Grassland Alliances

Ordination

We explored the floristic and ecological patterns of the dry mixedgrass, mesic mixedgrass, and sand prairie alliances in groups G141, G331, and G889, identified indicator species, and quantified the within-to-between cluster similarity as a measure of the strength and floristic similarity of the grassland alliances in these groups. We identified five grassland alliances in these three groups: *Calamovilfa longifolia - Hesperostipa comata - Andropogon hallii* Sand Prairie Alliance (A1201) and *Hesperostipa spartea - Bouteloua gracilis - Juniperus horizontalis* Sand Prairie Alliance (A2409) in G889, *Bouteloua gracilis - Pascopyrum smithii* Solonetzic Grassland Alliance (A2300) and *Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis* Grassland Alliance (A4389) in G331, and *Hesperostipa curtiseta - Elymus lanceolatus* Grassland Alliance (A4029) in G141 (Appendix D). Figure 7A shows the NMDS with the three groups which were well differentiated ($p < 0.001$) based on plant species composition. The groups correspond to a weak pattern ($D^2 = 0.34$) of predicted climate moisture index along NMDS 1 from drier in the upper right corner to moister in the lower right corner (Figure 7A). Despite the weak fit of the GAM, the areas in the ordination predicted to have a higher climate moisture index corresponded to group G141 (mesic mixedgrass prairie), and the areas predicted to be drier corresponded to G331 (dry mixedgrass) and most of G889 (sand prairie communities) . Four communities in G889 occur on the left side of NMDS 1 disjunct from the main cluster of points. Figure 7B shows the group classification in NMDS dimensions 1 and 3 and shows that five communities in G889 located high on NMDS far from G141, G331, and the majority of G889. Figure 7C displays the grasslands alliances nested within these three groups, which were also well differentiated ($p < 0.001$) based on plant species composition. The subset of G889 high on NMDS are five of the six communities in A2409, which are distinct from the other alliance in this group, A1201, which are partially overlapping with A4389 in G331. G331 has two grassland alliances located on the lower end of NMDS 3 and center (A4389) and just left of center (A2300) along axis one. One of the groups (G141) has only one alliance in this data subset and thus the distribution of alliance points matches the groups. Ecosite was factored in when developing the classification of alliances illustrated in Figure 7D in which ecosites are symbolized on the NMDS. The ecosite Dunes occurs only in A1201 and A2409, while Sand & Sandy occurs primarily in A1201 and A2409, and less frequently in A4389. The

ecosite Thin occurs most frequently in A4389, while Loam occurs frequently across both A4389 and A4029. The Clay & Solonetizic ecosite corresponded to all vegetation communities in A2300 and two communities in both A4029 and A4389. Lastly, the ecosite Subirrigated & Overflow has a lower sample size than many of the other ecosites in this subset and occurs across A4389, A2300, and A4029.

Indicator Species Analysis

Table 11 provides the results of the indicator species analysis, including the scientific name for indicators with a p-value ≤0.01, a list of other non-indicator species with high (≥5) prominence values, and diagnostic environmental characteristics for each alliance. It is important to note here that the indicator species listed are only valid for distinguishing between the alliances included in this subset of the data. We focused primarily on the indicators specific to each alliance; however, A4389 and A4029 had no significant indicators except when combined with other groups suggesting that there are no diagnostic species for these alliances individually. For these alliances, we listed the significant indicators when combined with other alliances in Table 11 and have listed the alliance combinations in the table footnote. A4389 had one significant indicator when combined with A2300 (*Poa secunda*), while A4029 had two significant indicators when combined with A2409. Significant indicators of A4029 + A2409 were *Hesperostipa curtiseta*, which had high specificity and fidelity, and high prominence, and *Pulsatilla patens* which had high specificity but low fidelity. The alliance with the greatest number of significant indicators was A2409 with 24 indicators, namely *Elymus trachycaulus* and *Hesperostipa spartea* which both had high specificity and fidelity, and moderate to high prominence. Additional significant indicators were identified for A2409 + A1201 (*Sporobolus rigidus)* and A2409 + A4029 (H*esperostipa curtiseta* and *Pulsatilla patens*). *Atriplex gardneri* was the indicator with the highest indicator value for A2300; however, while specificity was high, fidelity was only moderate, and prominence was low. Lastly, *Hesperostipa comata, Elymus lanceolatus*, *Pascopyrum smithii* ,and *Bouteloua gracilis* are common across most of the alliances thus reducing their importance as indicators, with the relative abundance of these species being more indicative of each alliance than their presence.

Partition Analysis

The results of the partition analysis showed that all alliances were most similar to themselves as indicated by the highest within to between cluster similarities along the diagonal in Table 12. A4029 and A2300 had the highest within-to-between cluster similarity, while A2409 had the lowest. Alliances within G331 were most similar to one another than to alliances in other groups. Whereas the alliances in G889 were most

similar to an alliance in another group, A4389 for A1201, and A4029 for A2409. Lastly, A4029 was most similar to the two alliances in G331.

Non-reference Communities

Thirty-one non-reference communities had a non-native abundance ratio greater than or equal to 0.50 (Table 13). Of these, five communities had a non-native abundance ratio greater than 0.80: *Agropyron cristatum*, *Bromus riparius*, *Bromus inermis*, *Festuca rubra - Poa pratensis*, and *Poa pratensis - Bromus inermis.* Three of the communities have a ratio equal to the threshold of 0.50: *Poa pratensis - Elymus lanceolatus / Taraxacum officinale, Poa pratensis / Taraxacum officinale, and Symphoricarpos occidentalis / Poa pratensis*. These 31 communities were assigned to G679 and included in the training dataset for supervised classification of non-reference to groups. In addition, a single non-reference community, *Agropyron pectiniforme- Stipa comata / Artemisia cana* (DMGB2), was assigned to G679 but had a non-native abundance ratio of <0.50. This is because the reference community for DMGB2 is *Agropyron pectiniforme* (DMGB1) which is in the ecosite Tame Pasture, had a non-native ratio of greater than 0.50, and was assigned to G679. Appendix F shows the results of the supervised classification, including the non-reference plant community codes and titles, the group that the non-reference plant community was classified to, the parent reference community codes and groups, a logical field indicating if the classified group matched the parent reference group. Of the 190 non-reference communities included in the supervised classification, 42 were classified into G679. Of the remaining 148 non-reference communities, 83 (56%) were classified into the same group as their parent reference community, 54 (37%) were assigned to a different group than their parent reference community, and 11 (7%) could not be compared because no parent reference community was assigned and the parent reference group could not be assigned by other means (e.g., ecosite). Figure 8A displays an NMDS ordination of the reference and non-reference communities with the successional status symbolized. Non-reference communities assigned to G679 based on their nonnative abundance ratio occur together in the upper lefthand corner of the ordination, while reference communities are located across NMDS 1 in the lower half of the ordination. Non-reference communities strongly overlap the reference communities but also occur along NMDS 2 partially overlapping G679. A strong (D^2 = 0.84) in non-native ratio is predicted with nonnative ratio predicted to increase from the lower right-hand corner, corresponding to the reference communities, to the upper left corner corresponding to G679. A gradient in climate moisture index is also predicted along NMDS 1 (D^2 = 0.55) with lower moisture index predicted on the upper end of

NMDS 1 and higher moisture index predicted at the lower end of NMDS 1 (Figure 8B). The results of the supervised classification are overlaid on the ordination in Figure 8C and show that non-reference communities classified into G679 (Class. into G679) occur in the center left and upper left-hand corner corresponding to areas predicted to have higher nonnative ratios and partially overlapping with G679. Non-reference communities that were classified into the same group as their parent reference community (Match Ref. Group) overlap with the point cloud of reference communities and are intermixed with non-reference communities that were classified into a group that did not match their parent reference group (No Match Ref. Group). Lastly, Figure 8D shows the group classification with non-reference communities symbolized based on the supervised classification results. The non-reference grasslands in G679 occur in the upper left portion of the ordination with the other groups in the lower right. The reference communities and non-reference communities not classified to G679 occur on a moisture gradient from the drier, warmer groups (e.g., G331, G566, G889) on the upper end of NMDS 1 and the cooler, moisture groups (G332, G273) on the lower end of axis 1.

Discussion

All Vegetation

The macrogroup classification differentiates prairie vegetation based on vegetation physiognomy into upland forests and woodlands, shrublands and grasslands, and hydric vegetation in wetlands. A precipitation gradient is the primary ecological driver of the broad-scale patterns of prairie vegetation macrogroups, distinguishing broad expanses of upland prairie grasslands from extensive forests to the north and east. Topoedaphic and salinity gradients are the primary drivers of prairie vegetation at the mid- to local-scales, distinguishing upland prairies from wetlands and small patches of woodlands on sheltered slope aspects and positions, and differentiating salt-tolerant and salt-intolerant vegetation. The macrogroup classification is insightful for understanding the ecological context of the upland prairie grasslands which is the primary focus of the remainder of the discussion below.

Grasslands and Shrublands

Our analyses largely confirmed the groups and macrogroups previously identified in the CNVC, but the knowledge gained from the analysis and expert review of provincial rangeland types has dramatically sharpened our understanding of their geographic and ecological relationships. The most important improvement was in better characterizing the diagnostic features of dry mixedgrass prairie (G331) and

mesic mixedgrass prairie (G141). The group classification aligns with expected ecoregional patterns while also highlighting the azonal nature of some of the groups, including G889, G984, and the freshwater wetland groups G325 and G975.

The group classification of dry and mesic grasslands and shrublands differentiates prairie vegetation based on ecoregion, ecosite, soil moisture, and soil texture. Gradients in precipitation and growing degree days combined with the biogeography of some of the dominant grass species are the primary ecological drivers of the broad-scale patterns of dry and mesic grassland and shrubland prairie vegetation. For instance, distinctions between dry and mesic mixedgrass prairies in G141 and G331 are driven largely by a gradient in precipitation. Another example is the biogeographic extent in Canada of the dominant grass species that characterizes tallgrass prairie, *Andropogon gerardii.* In Canada, this species primarily occurs in the south-central prairie region of Manitoba thus differentiating the tallgrass prairie group (G075) from the other groups both floristically and geographically (Figure 2). Edaphic factors, namely soil texture, and disturbance pathways, for instance, blowouts in solonetzic soils, are the primary drivers of prairie vegetation at mid- to local-scales, and in some cases these factors correspond to azonal vegetation, for instance the sand prairies in G889. The floristic variability in G889 displayed in the ordination is explained in part by the broad moisture gradient in this group, which is represented by the two alliances, and secondarily by the evergreen shrublands, predominantly *Juniperus horizontalis*.

The indicator species analysis identified species that are diagnostic of the prairie groups and revealed that for some groups there were no significant indicator species unique to the group. Indicator species can be used to differentiate between groups and reflect the consistency of a species' occurrence in a group and the uniqueness of that species within a group relative to the other groups. For instance, *Festuca campestris* is a significant indicator in G273 with an overall indicator value of 0.877 and a specificity of 1, and a fidelity of 0.76. The specificity of 1 means there is a 100 percent probability that a vegetation community with *F. campestris* present belongs to G273; however, the fidelity value indicates that there is a 76% probability that this species is present in communities belonging to G273. Put plainly, if *F. campestris* is present in a community then it belongs to G273, but the absence of this species does not necessarily indicate another group. This is where other indicators may be helpful in differentiating a group, such as *F. idahoensis* which is also a significant indicator in G273 with high specificity and fidelity.

Festuca hallii was the primary indicator of the Northern Great Plains Rough Fescue Prairie G332. *Festuca hallii* often co-occurs with *Hesperostipa curtiseta* and includes patches of *Symphoricarpos occidentalis*. In western Alberta, the prominence of *Festuca hallii* versus *Festuca campestris* define the boundary of G273 and G332.

Significant indicator species were not identified for G141 and G331 that were unique to each group suggesting that these groups are not well differentiated from other groups based on diagnostic species. These two groups may not always be clearly identifiable in the field unless combined with environmental setting. However, significant indicators of these groups in combination with other groups were identified and represent species diagnostic across groups. For instance, *Sphaeralcea coccinea* was identified as *a* significant indicator of the combination of G141+G331+G566 with high specificity and fidelity, meaning that if it is present in a vegetation community that there is a high probability that the community occurs in one of these three groups. *Sphaeralcea coccinea* commonly exists in these groups, often at very low abundance, and is an indicator of xeric sites with fine textured soils (loam, clay). With heavy grazing or disturbance this species can increase in cover. It is likely that *Sphaeralcea coccinea* was significant for this combination of groups because these groups contain the xeric grasslands with fine textured soils. For groups with no unique indicator species, differentiating between groups requires reviewing other indicator species and relying on the relative cover of dominant species within the groups. For instance, G566 has several significant indicator species unique to this group (e.g., *Atriplex gardneri)*. However, differentiating between G141 and G331, for which no significant indicators unique to the groups were identified is less straight forward. In situations like G141 and G331, differentiating between these groups based on floristic would require a combination of reviewing the indicator species and assessing the relative abundance of the dominant and co-dominant grass species. These two groups could be differentiated by the high prominence of *Hesperostipa curtiseta* and relatively low prominence of *H. comata* in G141, and the high prominence of *H. comata* and low prominence of *H. curtiseta* in G331.

Noise Clustering

The assessment of the dry and mesic grassland groups using noise clustering revealed that two groups, G141 and G273, were each almost entirely assigned to a single cluster (M3 and M2, respectively) and had few communities assigned to the noise cluster (Table 8). Dominant and indicator species for clusters M2 and M3 were like those for the G273 and G141, respectively, (Table 6) suggesting strong alignment between the groups and associated clusters. This indicates that the classification of these groups based a

combination of expert review and quantitative analysis agrees with a purely quantitative approach and that these groups are floristically distinct and have few floristic outliers. G332 was the only group included in Cluster M4 indicating a high consistency across groups in this cluster. However, six communities in G332 were classified into M6, and into both M1 and M3, respectively, resulting in moderate consistency for this group across the clusters, and only 13% of the communities in this cluster were assigned to the noise cluster. The results for G332 indicate that there is a moderate degree of floristic variability in this group but few communities that are different enough to be flagged as outliers. Cluster M4 had similar dominant and indicator species as G332 and 18 communities from G332 were classified into it suggesting that cluster M4, characterized by abundance *Festuca hallii* and *Hesperostipa curtiseta*, aligns well with the type concept of G332. Cluster M6 had the next highest number of G332 communities assigned to it and was characterized by a mixture of grass species, namely *Festuca halli*, *Hesperostipa comata,* and *H. curtiseta*, and one significant indicator species, *Elaeagnus commutata*. Four of the six G332 communities in cluster M6 were assigned to the *Symphoricarpos occidentalis - Elaeagnus commutata* / *Festuca hallii* Shrub Grassland Alliance (A2405) indicating this cluster aligns well with this shrub alliance in G332. However, five communities from G889 were also assigned to cluster M6, indicating that a subset of communities in this group are more similar floristically to the A2405 in G332 than to the majority of G889 which classified into cluster M1 (see below). Several plant communities in M6 were characterized by dominance of codominance of *Hesperostipa spartea* which has populations throughout the Great Plains Parklands zone (less so in AB), with AB's Foothills Fescue ecoregion also having some larger populations of *H. spartea*. These communities are more similar to fescue grasslands than dry or mesic mixedgrasslands which is expressed here in the results of the cluster analysis.

All the communities in the tallgrass prairie group (G075) were assigned to the noise cluster, the highest across all groups, indicating these communities are outliers in this dataset. In the dataset we compiled, G075 has a low sample size of vegetation communities (2 communities consisting of 10 plots). This is supported by the results of the partition analysis which show that G075 has the highest within-to-between cluster ratio of all groups indicating that this a high degree internal consistency based on floristics. This group also had the lowest similarity ratios to all other groups reinforcing that it is unique in this dataset. The low sample size for this group and the unique dominant species, *Andropogon gerardii*, in the tallgrass prairies compared to the dry and mesic mixedgrass prairies explain why several of the G075 communities stand out as outliers; i.e., there are simply not enough communities in G075 for this group to stand out on

its own in the cluster analysis given the floristic variability across the communities in this group. However, based on the fuzzy cluster membership values, the next best fit for the G075 communities assigned to the noise cluster was cluster M6, which includes two communities in M075, five communities in G889, and six communities in G332. The high number of G075 outliers, combined with the affinity of G075 to M6 based on the fuzzy cluster memberships, points to a moderate degree of floristic similarity across G075 and similarities with the G332 and G889 communities in M6. Future work compiling and analyzing additional data from the tallgrass prairie region from across the border in North Dakota and Minnesota may help to refine the classification of G075 and further elucidate relationships between floristically similar groups.

G566 was split evenly across three clusters (one plot in each), including the noise cluster. This group also had a lower sample size, with three reference and minor alteration communities included in this analysis (two outliers were withheld) making comparison with the cluster results difficult. G566 is defined by the ecosite badlands which encompasses a diversity of vegetation types, many of which are sparsely vegetated, and thus the array of clusters that the communities were classified into may be related to the diverse character of badlands vegetation.

The sand prairies (G889) had a high consistency across the clusters with 70% of the communities occurring in cluster M1. However, nine communities (31%), of which five were shrubland communities, were assigned to the noise cluster indicating a moderately high number of outliers. Shrubland communities are uncommon in the dataset we compiled and thus tended to stand out as outliers in the cluster and ordination analyses (see Shrublands, below). For the remaining four G889 communities assigned to noise cluster, the next best fit for one community was M1 (to which most G889 communities were assigned), while the next best fit for the remaining three communities was M6. In addition, 13 communities in G331 were also classified into M1 resulting in low consistency across the groups (48%) for cluster M1. Cluster M1 was characterized by *Hesperostipa comata*, *Koeleria macrantha*, and *Bouteloua gracilis*, with one significant indicator *Ladeania lanceolata*, a member of the pea family (Fabaceae) with high affinity for sandy soils rangewide, which was identified as a significant indicator of G889 (Table 6). Communities in G331 make up about half of the communities in M1 and consist of communities in A3586 and A4389, the drier end of the moisture gradient in G331, which may help explain why these communities clustered with the majority of the sand prairie communities which feature coarse-textured droughty soils (Appendix E). This result also parallels the results of the ordination analysis which

showed a moderate degree of overlap between G331 and G889 indicating floristic similarities between these two groups (Figure 3A).

G331 had the lowest number of communities assigned to the noise cluster (7%) and, in addition to M1, this group had plant communities assigned to clusters M5 and M7. Cluster M5 is characterized by *Elymus lanceolatus* and *Hesperostipa comata* with no significant indicators, and M7, is characterized by *Pascopyrum smithii* and *Koeleria macrantha* with several significant indicator species. The majority of G331 vegetation communities assigned to M5 are co-dominated by *Elymus lanceolatus* and *Hesperostipa comata*, and the alliances were split approximately evenly across A2300 and A4389. The plant communities in M7 are dominated by *Pascopyrum smithii* (i.e., *Agropyron smithii* in the plant community titles in Appendix E) and are primarily in alliance A2300, which corresponds with the primary ecosite in this cluster, Solonetzic. The results suggest that G331 is floristically diverse at the group level but had few floristic outliers, and that vegetation within this group is differentiated using a purely statistical approach based on dominant species which aligns moderately well with the classification of alliances. Unlike G331, groups like G141 and G273 have a high degree of floristic consistency at the group level, a conclusion supported by the results of the partition analysis which showed G141 and G273 to have the second and third highest within-to-between cluster similarity ratios.

The comparison of the group classification and noise clustering demonstrated that a purely synthetic approach to vegetation classification aligned reasonably well with the group classification that relied on an expert-based approach that is heavily informed by quantitative analysis. The synthetic approach identified outliers and provided insights into similarities across, and distinctions within, groups. The group classification factors in ecosite for the purpose of facilitating mapping vegetation at the group level and to ensure that the group classification is consistent with successional dynamics. However, ecosite distinctions were not always captured by the cluster analysis; thus, illustrating the importance of a hybrid approach utilizing both expert review and quantitative analysis.

Partition Analysis

The results of the partition analysis revealed that G075 was the most distinct group based on floristics and the most unlike all other groups. The partition analysis also showed that not all groups within M052 were most similar to another group in this macrogroup. The macrogroup relationship held for G141 and G332, however, G331 was next most similar floristically to G566 (M115) and then G889 (M052), the

badlands and sand prairie groups, respectively. We also saw above that 13 communities in G331 clustered with G889 indicating strong similarities with the drier end of the moisture gradient thus reinforcing the results of the noise cluster analysis for M052. This result makes sense given that G331, G566, and G889 all have a strong component of *Hesperostipa comata* and *Bouteloua gracilis*, while G141 and G332 are dominated by *Hesperostipa curtiseta* and *Festuca hallii*. However, both G566 and G889 both represent azonal vegetation defined by ecosites and soils and thus it is reasonable to include these in their own macrogroups. Whereas G141, G331, and G332 represent zonal vegetation, and including these groups in their own macrogroup (M051) makes sense, particularly from a mapping perspective.

Shrubland Alliances

The seven shrubland alliances in the dry and mesic prairies occur across gradients in precipitation, soil texture, soil moisture, and salinity. In some cases, alliances were differentiated by dominant shrub species as was the case with *Artemisia cana* / *Hesperostipa comata - Pascopyrum smithii* Shrubland Alliance (A3586) which occurs in the Dry Mixedgrass prairie ecoregion. Another example is *Symphoricarpos occidentalis - Elaeagnus commutata* / *Festuca hallii* Shrub Grassland Alliance (A2405) which characterized by dominance of *Symphoricarpos occidentalis* and/or *Elaeagnus commutata* and occurs in the Northern Fescue ecoregion of Alberta and the Moist Mixed Grassland of Saskatchewan. In other cases, shrubland alliances were define by ecosite, for instance *Juniperus horizontalis - Arctostaphylos uva-ursi / Calamovilfa longifolia* Sand Grassland Alliance (A2407) which occurs on dunes and other deep sand deposits and was named after the most common shrub community types, but also includes deciduous shrublands dominated by *Rosa woodsii, Symphoricarpos occidentalis*, and *Prunus virginiana*. The classification of shrublands on dunes is less reflective of the dominant species and more reflective of the topography and soils which will allow for these communities to be mapped consistently along with adjacent dune grasslands. No significant indicator species were identified for A2407 alone, however, *Sporobolus rigidus* and *Heterotheca villosa* in combination with A3978 differentiate these two alliances from the other shrubland alliances. The indicator species combined with the unique environment and distinctive mix of species with moderate to high prominence, including *Juniperus horizontalis*, *Prunus virginiana*, *Carex siccata, C. obtusata,* and *C. inops* help to distinguish this alliance from other shrub alliances. Shrubland alliances A3905 and A3978 also did not have any significant indicators on their own, and instead significant indicators were identified for various combinations of groups. These two alliances both have high prominence of *Sarcobatus vermiculatus* and *Distichlis spicata*, which set them apart from

all other shrublands. The two alliances are distinguished by ecosite, badlands for A3978 and various saline ecosites for A3905. Shrubland communities encompass a relatively small area of Canada's prairie ecosystems and represent a small proportion of the dataset that we compiled here, often being flagged as outlier in the dataset. However, shrublands are an important component of prairie uplands, coulees, and riparian areas as they provide food, thermal and hiding cover for wildlife, trap snow and contribute to landscape diversity. Given their relative rareness compared to grasslands across the landscape in prairie ecosystems, and their contribution to biodiversity, we included them in our analysis to highlight the shrublands in context of the CNVC and applications of the classification for vegetation mapping and conservation management.

Mixedgrass and Sand Prairie Grassland Alliances

Ordination

The ordination analysis confirmed that the alliances in the mixedgrass and sand prairie grassland groups were differentiated based on floristics across a moisture gradient and by ecosite. Soils were especially important for differentiating between alliances in these groups with finer texture soils associated with dry and mesic mixedgrass prairies in A4389 and A4029, coarse sandy soils in the sand prairies of A1201 and A2409, and clay-rich and solonetzic soils in A2300. Aligning the groups and alliances with ecosites was an important consideration when developing the group and alliance classification because the ecosites in the Canadian prairies are mapped, and aligning the classifications will facilitate future mapping of groups and alliances. In addition, aligning the two classifications to the extent possible makes the group and alliance classification highly useful for rangeland managers because the ecosites represent unique landscape potentials, with each responding differently to management actions and producing unique reference communities. The ordination analysis also demonstrated that A2409 is highly floristically distinct from the other alliances, including A1201, an alliance in the same group (G889). This conclusion is supported by the results of the indicator species analysis and partition analysis which showed that A2409 had a high number (24) of significant indicator species and that the next most similar alliance to A2409 was A4029 in G141. These results suggest that the sand prairies may have two patterns reflecting a moisture gradient, one in the Dry Mixedgrass ecogion (A1201) and one in the Mesic Mixedgrass and Northern Fescue ecoregions. In the Dry Mixedgrass ecoregion sand prairies are characterized by relatively higher abundance of *Hesperostipa comata* and the presence of *Ladeania lanceolata,* a forb in the pea family common in dry, sandy soils. In the Mesic Mixedgrass and Northern Fescue ecoregion the

sand prairies are characterized by dominance of *Hesperostipa spartea* and high constancy of *H. curtiseta* (also a significant indicator of A2409 + A4029). Despite their difference, the two sand prairie alliances share a common indicator, *Sporobolus rigidus*, which can be used to differentiate the two alliances in G889 from the other alliances in this subset. This result parallels the results of the indicators species analysis for groups which showed that *Sporobolus rigidus* was a significant indicator for differentiating G889 from other groups.

Indicator Species Analysis

The indicator species analysis revealed significant indicators unique to three of the five alliances. The exceptions were A4389 and A4029 for which significant indicators were identified based on combinations of these alliances with other alliances. The lack of indicators unique to A4389 and A4029 means that differentiating these alliances from others will require using the significant indicators of the other alliances, while understanding that indicators shared across alliances are useful for differentiating between alliances only to the extent that they are indicative of the combinations of alliances for which they were identified as significant. For instance, *Poa secunda* is an important indicator of A2300 and A4389; however, its presence is only valid for differentiating these two alliances from the remaining two. Differentiating between A4389, A4029, and the other three alliances also will require reviewing the abundance of prominent species in these alliances namely, *Hesperostipa comata* and *Pascopyrum smithii* in A4389 and *Hesperostipa curtiseta* in A4029 relative to the abundance of these species in the other alliances. Ecosites may also be useful for differentiating between alliances with similar indicator species as illustrated by A4029 and A2409. Both alliances share *Hesperostipa curtiseta* as a common indicator; however, these two alliances are well differentiated by loam ecosite, and sand and sandy ecosite, respectively. Using the results of the indicator species analysis to differentiate the remaining three alliances is more straightforward because each of these alliances had significant outliers unique to them. For instance, *Hesperostipa spartea* is a significant indicator of A2409 with high specificity, fidelity, and prominence.

Partition Analysis

The partition analysis identified which alliances were most internally consistent based on floristics. Alliances with high within-to-between cluster similarity ratios like A4029 and A2300 consist of plant communities with uniform species composition, while those with lower ratios like A2409 consist of more variable plant communities. Similarity ratios are one way for vegetation ecologists to identify vegetation

classes that may require additional review. For instance, A2409 includes six communities, five grasslands and one shrubland. The shrubland community, *Juniperus horizontalis – Hesperostipa spartea – Schizachyrium scoparium / Bouteloua gracilis – Prunus pumila*, may fit better in the sandy shrubland alliance A2407 that is also part of G889. Reorganizing the above shrubland community under A2407 and rerunning the partition analysis to determine if the similarity ratio for A2409 improved would be a quantitative approach to refining the classification of this alliance. The partition analysis also showed which alliances were similar to one another floristically which is useful for understanding the relationship between alliances within a hierarchical classification such as the CNVC. For instance, one might expect that the alliances within a group are more similar to one another than to alliances in other groups. This is the case for A2300 and A4389 in G331, which are more similar than to any other alliance. The contrary case can also be useful for identifying alliances within the same group that are not most similar to one another, such as A2409 and A1201 as discussed in the previous section. Additional analysis of A2409 with mesic mixedgrass, northern fescue, and tallgrass prairie data from Manitoba, Minnesota, and North Dakota can refine the classification and placement of A2409 in the CNVC hierarchy.

Vegetation Dynamics

The results of the ordination analysis of reference and non-reference communities demonstrated that vegetation composition was strongly related to the ratio of nonnative to total abundance, and secondarily to a moisture gradient. In addition, non-reference communities that were classified into G679, despite having a nonnative ratio less than 0.50, more closely resembled non-reference communities assigned to the G679. Non-reference communities that were classified into a group that differed from their parent reference community overlapped with the reference communities in the ordination confirming that these communities, while altered, are not so far altered as to not resemble reference condition even if in another group.

The results of the supervised classification of non-reference communities showed that 41 communities with a nonnative abundance ratio less than 0.50 were classified into G679. Despite the lower nonnative ratio, the results showed that these communities were more like ruderal grassland and are altered to a degree that makes their reference condition unrecognizable based on the classifications methods used here. For instance, the community *Poa pratensis - Carex spp.* (AP-LM-E) is included in the loam ecosite in the Aspen Parkland ecoregion (Thorpe 2014c) and was assigned the reference community *Festuca altaica var. hallii - Elymus lanceolatus - Hesperostipa curtiseta* (AP-LM-A) which is in G332 (Appendix B,

Appendix F). This community represents a severely altered state relative to reference condition and was classified into G679. The results also showed that of the non-reference communities not classified into G679, the majority (56%) classified into the same group as their parent reference communities. These are non-reference communities that, while altered from reference, are similar enough floristically to their parent reference condition community that they are assigned to the same group. An example is *Symphoricarpos occidentalis - Elaeagnus commutata* / *Hesperostipa curtiseta - Carex* spp. (AP-LM-I) which is also included in the loam ecosite in the Aspen Parkland ecoregion and was assigned the reference community AP-LM-A (Thorpe 2014c). This community is a successional community and develops in the absence of frequent wildfire. The results showed that this community was classified into G332, the same group as its parent reference community. However, the results showed that many non-reference communities (37%) classified into a different group than the group assigned to their parent reference community. These communities are altered enough that the floristic composition no longer resembles their respective reference communities but that are not so far altered that they were classified into G679. Instead, the floristic composition resembles that of another reference community in a different group. For instance, *Hesperostipa curtiseta - Elymus lanceolatus - Carex* spp. - *Artemisia frigida* (AP-LM-B) is also included in loam ecosites in the Aspen Parkland ecoregion and was assigned the reference community AP-LM-A. This moderately altered non-reference community was classified into G141 due to the loss of *Festuca hallii* due to heavy grazing and the dominance of *Hesperostipa curtiseta* (Thorpe 2014c, Appendix B, Appendix F). This makes sense considering the results of the partition analysis which showed that G332 and G141 were most similar floristically than to any other groups, and therefore moderate alteration in the dominant grass species resulted in this non-reference community classifying into the most similar group (Table 9) relative to reference. Another example is *Hesperostipa comata - Elymus lanceolatus* / *Pascopyrum smithii - Artemisia frigida* (AP-LM-D) in the same ecosite and having the same reference as AP-LM-B but with significant alteration. This community was classified as G331 while its reference community was assigned to G332 (Appendix B, Appendix F) due to the loss of both *Festuca hallii* and *Hesperstipa curtiseta* through prolonged heavy grazing, and the dominance of *Hesperostipa comata*. This example illustrates that for loam ecosites in Aspen Parkland, as the degree of alteration of reference communities increases the non-reference communities are more similar floristically to reference communities in drier groups, while severely altered plant communities no longer resemble any reference communities and instead classify as ruderal vegetation in G679. The results of the

supervised classification of non-reference communities demonstrate the relationship between rangeland vegetation dynamics and the CNVC group classification and provide a quantitative approach for classifying ruderal vegetation. However, for the purposes of the CNVC classification, to ensure continuity of the group classification within the context of the ecosite and vegetation dynamics within, non-reference communities should be assigned to the same group as their respective reference communities, which is what we have done for the final classification. Otherwise, recovery or restoration of a non-reference back to its reference condition could result in a change in group classification, a consequence that should be avoided to ensure a robust group classification. For instance, a change in group classification resulting from successional dynamics would cascade into necessary changes to group map that may be prepared in the future.

Summary and Conclusions

We classified prairie communities into nine macrogroups, 13 groups, and 32 alliances. The work presented here quantified the relationship between vegetation composition in the Canadian prairies, broad-scale climatic gradients, and local-scale topoedaphic and salinity gradients which is reflected in the classification. Our analyses largely confirmed the groups and macrogroups previously identified in the CNVC, but the knowledge gained from the analysis and expert review of provincial grassland alliances has dramatically sharpened our understanding of their geographic and ecological relationships. The most important improvement was in better characterizing the diagnostic features of dry mixedgrass prairie (G331) and mesic mixedgrass prairie (G141). The group classification aligns with expected ecoregional patterns while also highlighting the azonal nature of some of the groups, including G889, G984, and the freshwater wetland groups G325 and G975. G075 had a small sample size, was shown to be highly distinct floristically, and was identified as an outlier in our dataset. Future work compiling and analyzing additional data from the tallgrass prairie region from across the border in North Dakota and Minnesota may help to refine the classification of G075 and further elucidate relationships between floristically similar groups and alliances.

Indicator species identified through our analysis provide a means of differentiating between groups and alliances using diagnostic species, while other groups lacked unique significant indicators and differentiating between these groups requires reviewing the relative abundances of prominent species and factoring in diagnostic environmental characteristics (i.e., ecosites). The alliance classification of

shrublands highlights these ecologically important components of the prairie landscape which provide food, thermal and hiding cover for wildlife, trap snow and contribute to landscape diversity. The comparison of the group classification and noise clustering demonstrated that a purely synthetic approach to vegetation classification aligned reasonably well with the group classification; and illustrated the importance of a hybrid approach to vegetation classification that utilizes both expert review and quantitative analysis. The results of the ordination analysis of reference and non-reference communities demonstrated that vegetation composition was strongly related to the ratio of nonnative to total abundance, and secondarily to a moisture gradient.

The results of the supervised classification showed that most successional and altered communities were classified into the same group as their parent reference community. Of the remaining communities, 41 with a relatively low nonnative abundance ratio (< 0.50) classified into G679. The results showed that despite the low nonnative ratio, these communities were more like ruderal grasslands, i.e., altered to a degree that makes their reference condition unrecognizable. The remaining non-reference communities, those with a moderate to high degree of alteration, classified into a native grassland group that differed from their parent reference group. To ensure continuity of the group classification within the context of the ecosite and vegetation dynamics within, non-reference communities with a nonnative ratio less than 0.50 were assigned to the same group as their respective reference communities. This ensures that the group classification is consistent with successional dynamics and that it is resilient through time and despite on-going ecosystem disturbance processes. Nonetheless, as shown by the provincial state and transition models, with sufficient levels of invasive species, these grasslands will form new ruderal (novel) grassland types. Thus, the impact of invasive species, such as Agropyron cristatum, pose a serious threat to the persistence and diversity of native prairies (Heidinga and Wilson 2002, Henderson and Naeth 2005).

The seven native dry and mesic grasslands groups presented here have distinct species diversity, environmental characteristics, geographic ranges, and productivity, and are all high priority for conservation. For instance, apart from the badlands complex (G566), these grasslands are all at-risk, with tallgrass prairie Critically Imperiled (G1), Northern rough fescue Imperiled (G2), and the others Vulnerable (G3). The group and alliance classification that we have presented here represent a robust, mappable classification that can be used to refine conservation priorities and conservation strategies to preserve imperiled native grasslands and shrublands in Canada’s Prairie Provinces.

Our studies show a diversity of sand prairie types, including both Northwestern Plains Sand Prairie and Northeastern Plains Sand Prairie, and further study is needed to characterize those types, especially in relation to tallgrass prairie in southeast Manitoba. Lastly, further study is needed of the Northwestern Aspen Woodland and Northeastern Aspen-Tallgrass Woodlands that fringe the northern border of the Northern Fescue grassland landscape.

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Figures

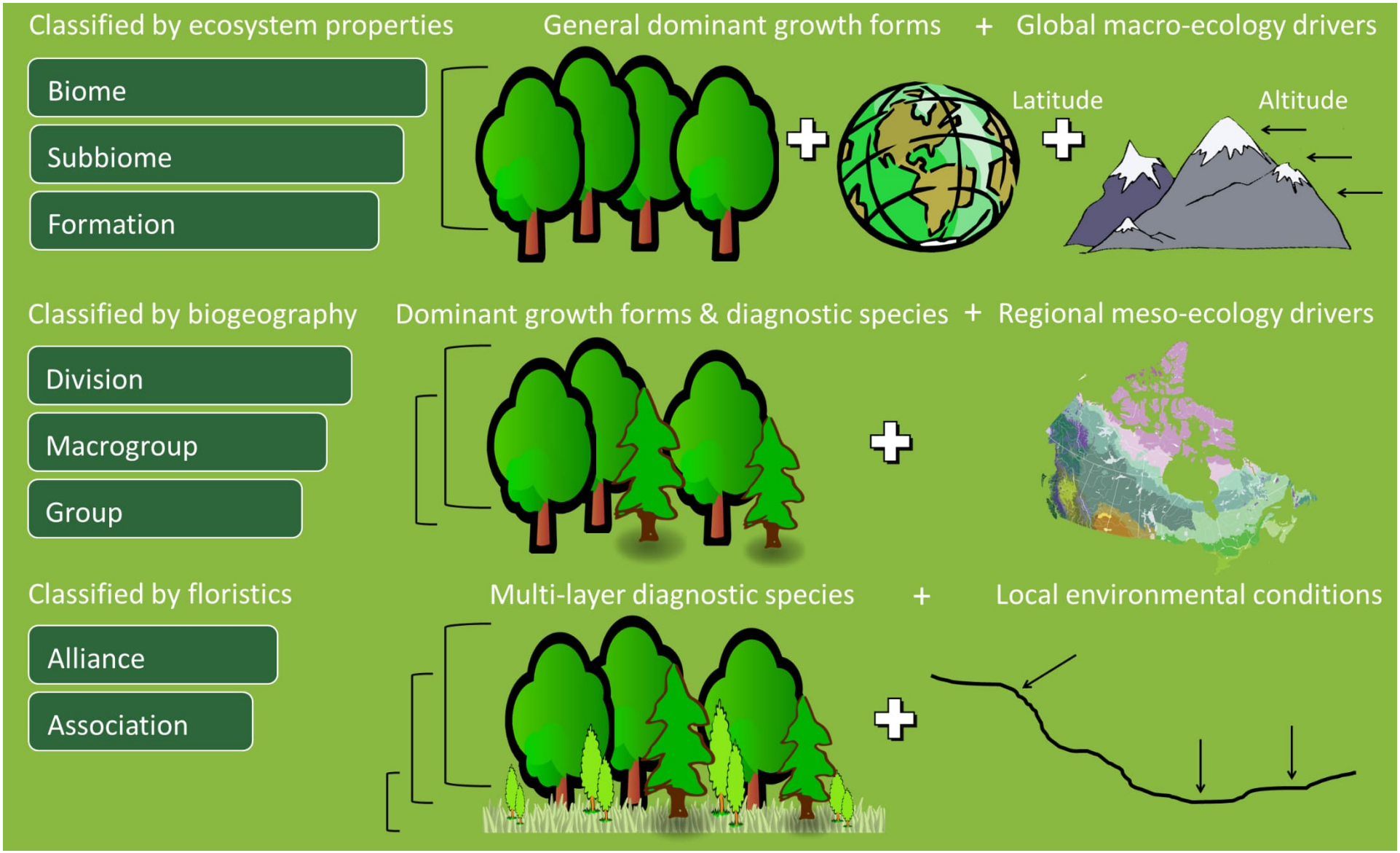
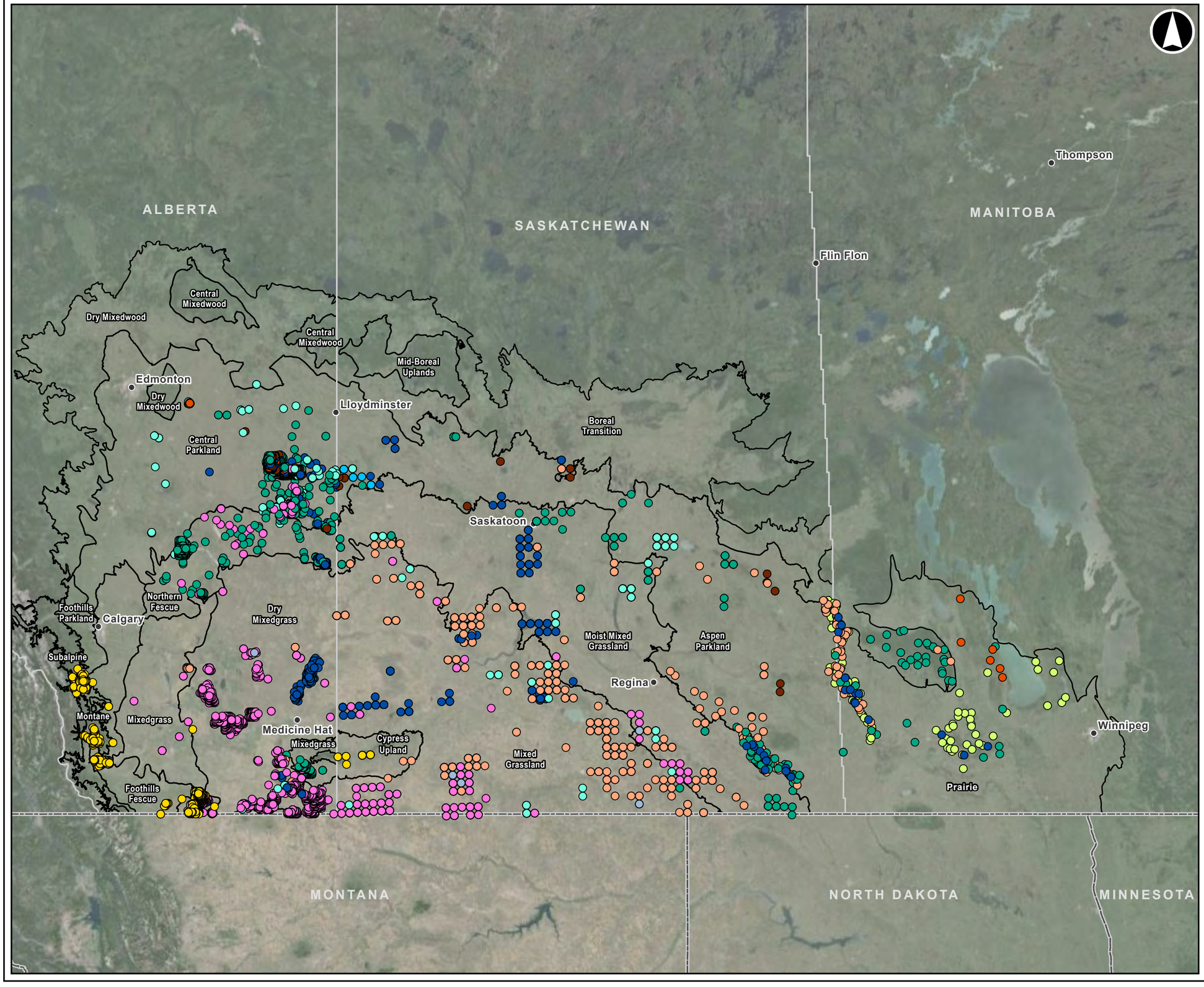


Figure 1. Canadian National Vegetation Classification and International Vegetation Classification hierarchy.



Legend

- Ecoregion
- G075: Northern Tallgrass Prairie
- G141: Northern Great Plains Mesic Mixedgrass Prairie
- G145: Northern Great Plains Mesic Forest & Woodland
- G273: Central Rocky Mountain Lower Montane, Foothill & Valley Grassland
- G325: Great Plains Freshwater Marsh
- G328: Northwestern Great Plains Aspen Woodland
- G331: Northern Great Plains Dry Mixedgrass Prairie
- G332: Northern Great Plains Rough Fescue Prairie
- G566: Great Plains Badlands Vegetation
- G889: Northern Great Plains Sand Prairie
- G975: Great Plains Wet Meadow, Shrub Swamp & Seepage Fen
- G984: Great Plains Saline Wet Meadow & Marsh

CANADIAN NATIONAL VEGETATION CLASSIFICATION NATURESERVE CANADA

VEGETATION PLOTS

0 100 200 300 400
Kilometres

Datum: WGS 1984 Web Mercator Auxiliary Sphere

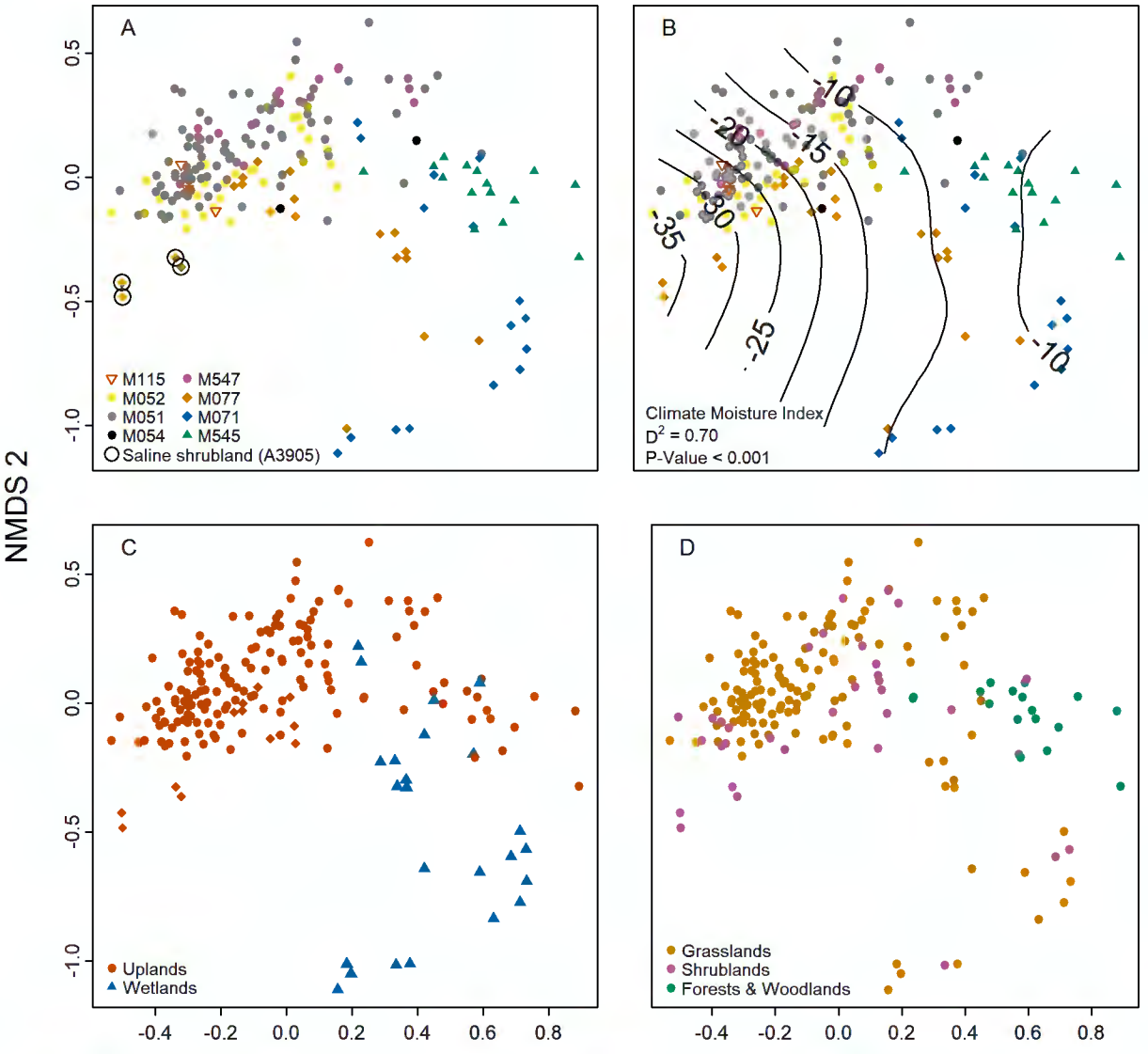
Apr, 2024	PN#: 60722041	1:7,000,000 * when printed 11"x17"	AECOM

Figure

MAP LOCATION: \\NA.AECOMNET.COM\FS\AMER\CALGARY\CACG\GIS\CSPROJECTS\ENV\60722041\800_CAD_GIS\820_GIS\DATA\RU_NATURESERVE_60722041.APRX FIGURE: MAP_PLOT_VEGETATIONPLOTS_60722041_V2
DATE SAVED: 4/18/2024 USER NAME: STEPHANIE.CLARK

Figure 3

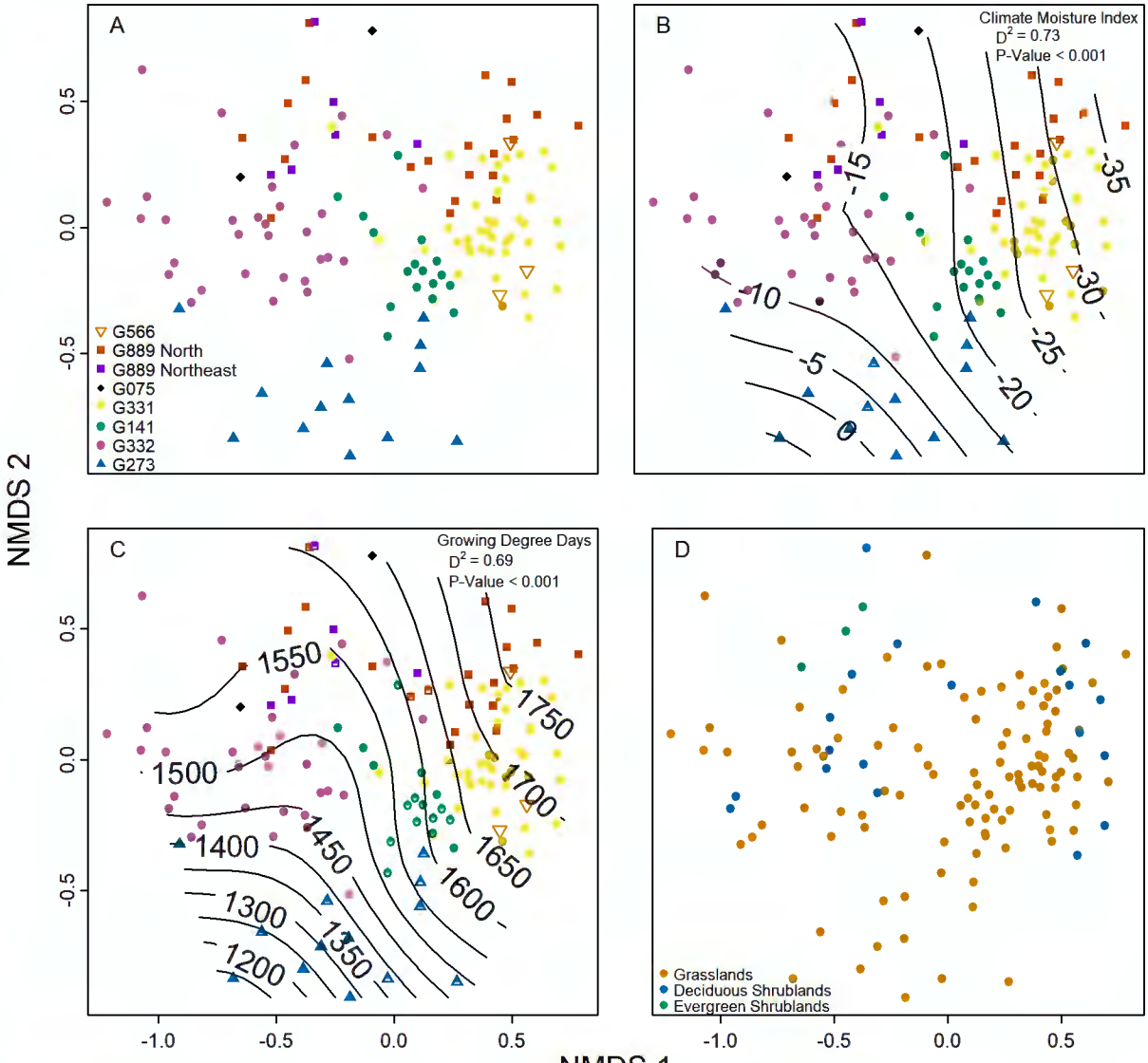
Non-metric Multidimensional Scaling (NMDS) ordination of all reference and minor alteration prairie communities with CNVC macrogroups, vegetation physiognomy, and physiography symbolized and fitted with Generalized Additive Model (GAM) surfaces overlaid to illustrate the relationships between plant species composition and a gradient in climate moisture index, Prairie Provinces, Canada.



M051: Great Plains Mixedgrass & Fescue Prairie
M052: Great Plains Sand Grassland & Shrubland
M054: Central Lowlands Tallgrass Prairie
M071: Great Plains Marsh, Wet Meadow, Shrubland & Playa
M077: Great Plains-Eastern Saline Wetland
M115: Great Plains Badlands Vegetation
M545: Northern Great Plains Forest & Woodland
M547: Rocky Mountain Grassland & Meadow

Figure 4

Non-metric Multidimensional Scaling (NMDS) ordination of reference and minor alteration dry and mesic non-forested communities with CNVC groups and vegetation physiognomy symbolized and fitted with Generalized Additive Model (GAM) surfaces overlaid to illustrate the relationships between plant species composition and gradients in climate moisture index and growing degree days, Prairie Provinces, Canada.



G075: Northern Tallgrass Prairie
G141: Northern Great Plains Mesic Mixedgrass Prairie
G273: Central Rocky Mountain Lower Montane, Foothill & Valley
G331: Northern Great Plains Dry Mixedgrass Prairie
G332: Northern Great Plains Rough Fescue Prairie
G566: Great Plains Badlands Vegetation
G889 North: Northern Great Plains Sand Prairie - Northern Plains
G889 Northeast: Northern Great Plains Sand Prairie - Northeastern Plains

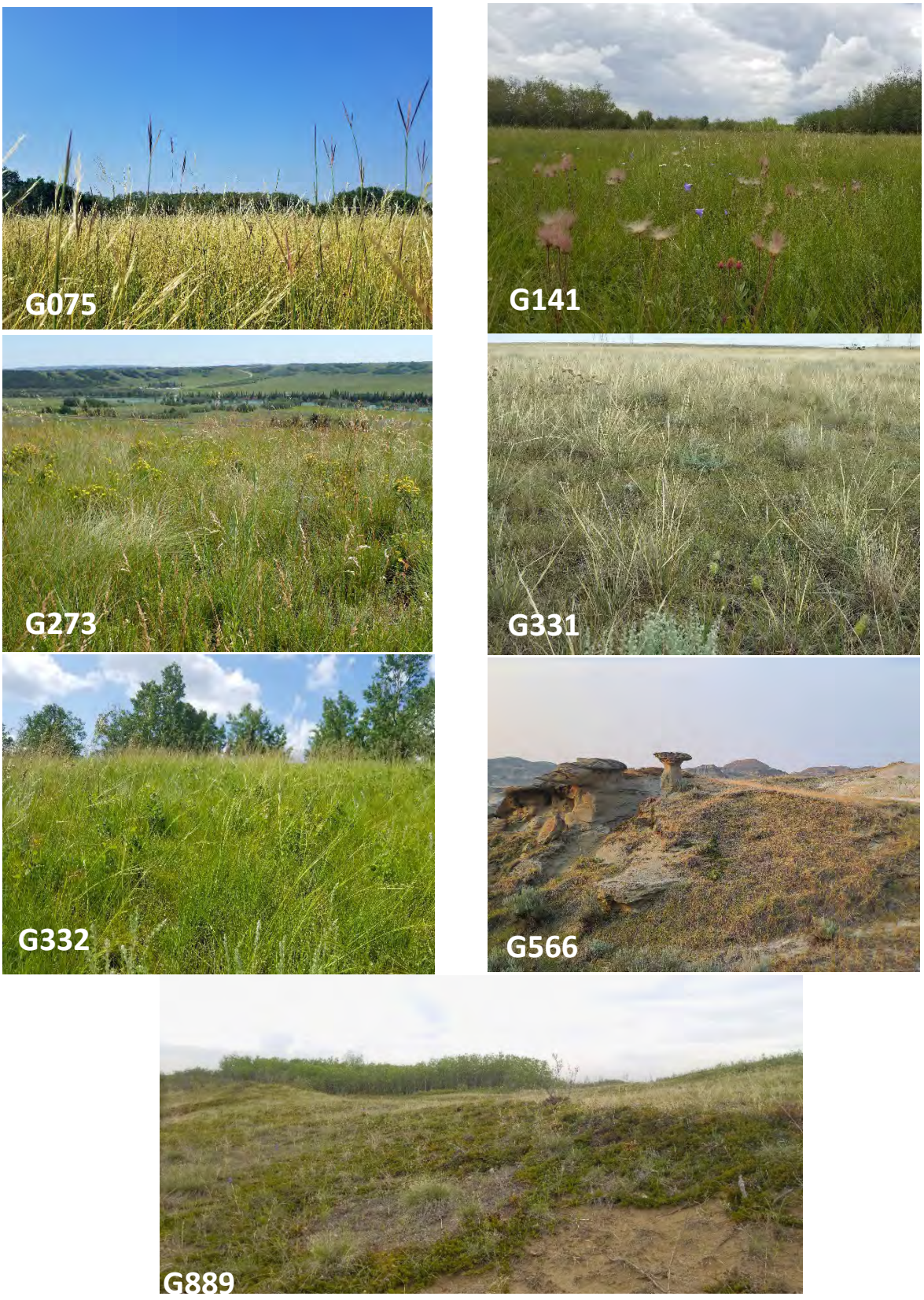
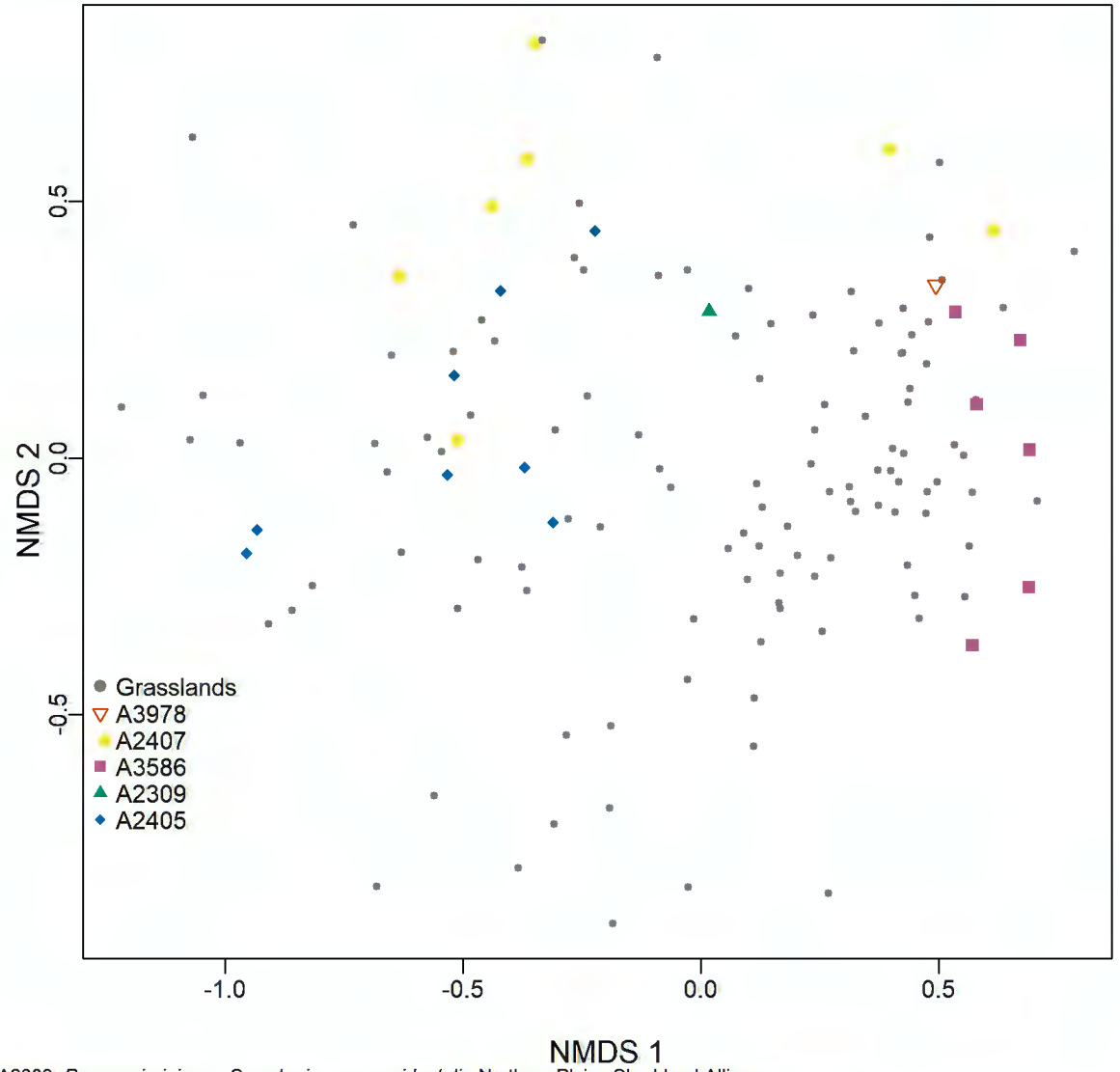


Figure 5 Representative photos of the seven dry and mesic grassland groups classified in the Prairie Provinces, CA. All photos by Lysandra Pyle. G075 = Northern Tallgrass Prairie, G141 = Northern Great Plains Mesic Mixedgrass Prairie, G273 = Central Rocky Mountain Lower Montane, Foothill & Valley Grassland, G331 = Northern Great Plains Dry Mixedgrass Prairie, G332 = Northern Great Plains Rough Fescue Prairie, G566 = Great Plains Badlands Vegetation, G889 = Northern Great Plains Sand Prairie.

Figure 6

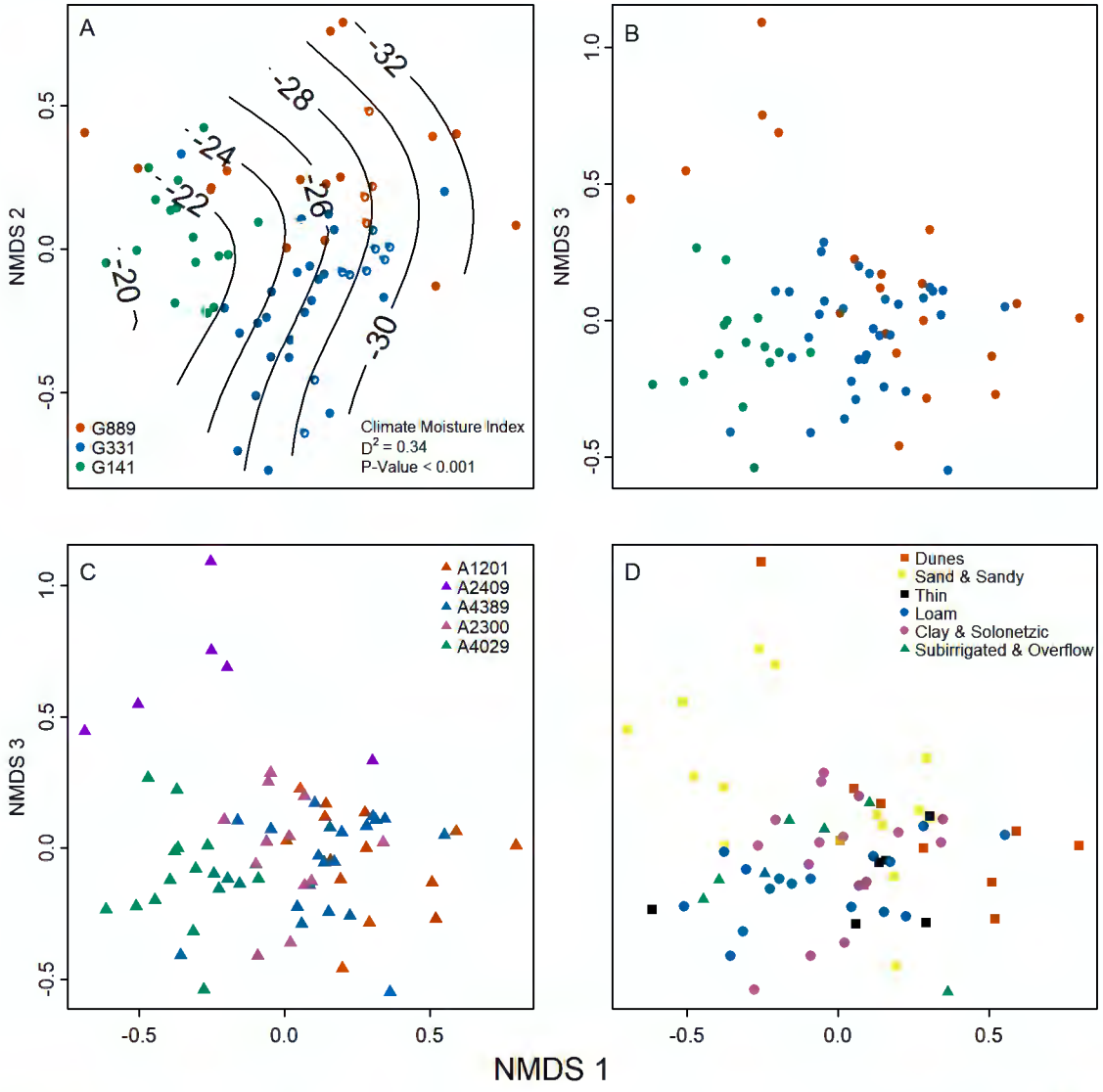
Non-metric Multidimensional Scaling (NMDS) ordination of reference and minor alteration dry and mesic non-forested communities with CNVC shrub alliances highlighted and symbolized, Prairie Provinces, Canada.



A2309: *Prunus virginiana - Symphoricarpos occidentalis* Northern Plains Shrubland Alliance
A2405: *Symphoricarpos occidentalis - Elaeagnus commutata / Festuca hallii* Shrub Grassland Alliance
A2407: *Juniperus horizontalis - Arctostaphylos uva-ursi / Calamovilfa longifolia* Sand Grassland Alliance
A3586: *Artemisia cana / Hesperostipa comata - Pascopyrum smithii* Shrubland Alliance
A3978: *Sarcobatus vermiculatus* Great Plains Badlands Alliance

Figure 7

Non-metric Multidimensional Scaling (NMDS) ordination of reference and minor alteration grassland communities in CNVC groups G889, G331, and G141 with groups, alliances, ecosites symbolized and fitted with Generalized Additive Model (GAM) surfaces overlaid to illustrate the relationships between plant species composition and a gradient in climate moisture index, Prairie Provinces, Canada.

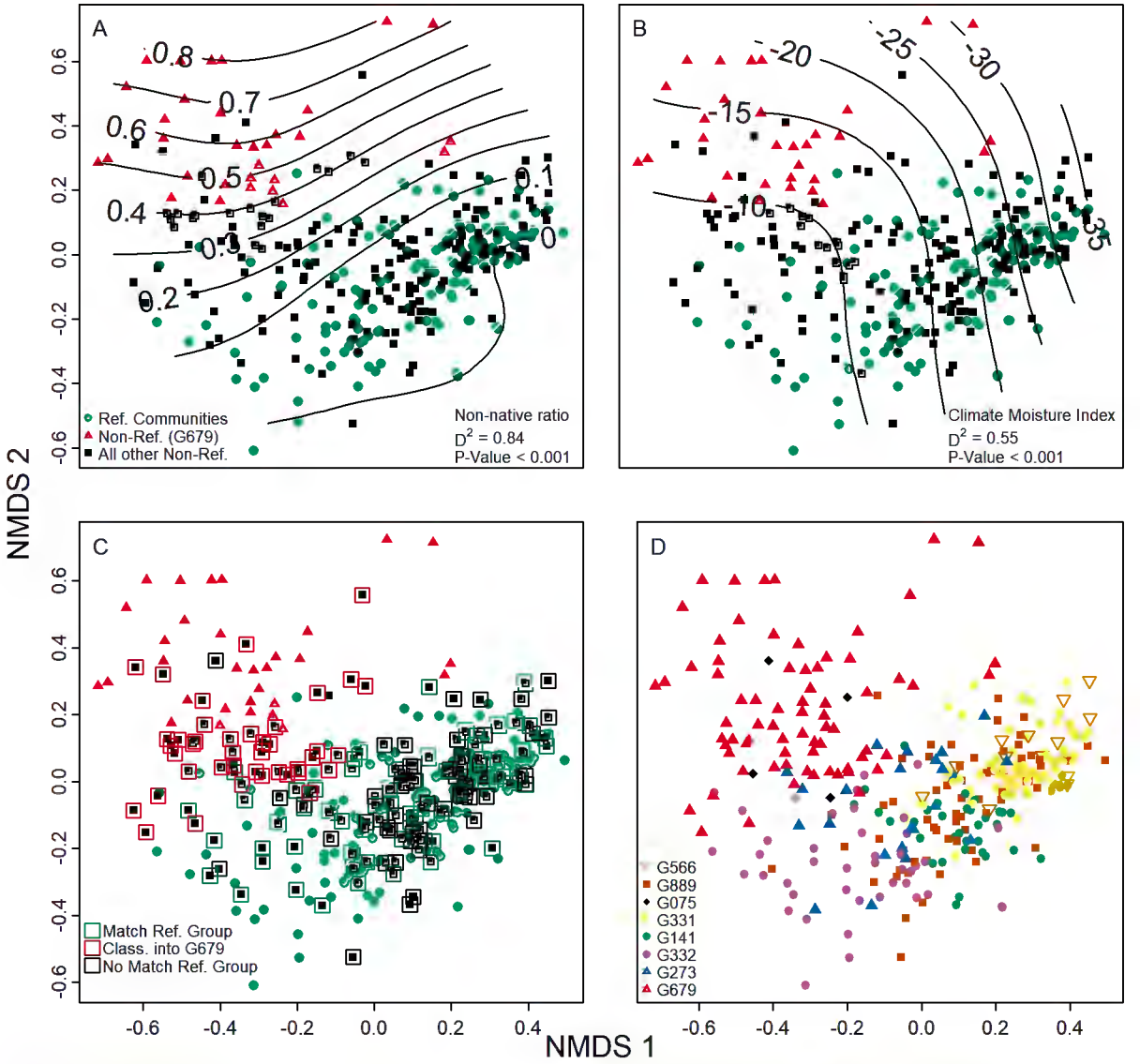


G141: Northern Great Plains Mesic Mixedgrass Prairie
G331: Northern Great Plains Dry Mixedgrass Prairie
G889: Northern Great Plains Sand Prairie

A1201: *Calamovilfa longifolia-Hesperostipa comata-Andropogon hallii* Sand Prairie Alliance
A2409: *Hesperostipa spartea-Bouteloua gracilis-Juniperus horizontalis* Sand Prairie Alliance
A2300: *Bouteloua gracilis-Pascopyrum smithii* Solonetzic Grassland Alliance
A4029: *Hesperostipa curtiseta-Elymus lanceolatus* Grassland Alliance
A4389: *Hesperostipa comata-Pascopyrum smithii-Bouteloua gracilis* Grassland Alliance

Figure 8

Non-metric Multidimensional Scaling (NMDS) ordination of reference, minor alteration, and non-reference dry and mesic non-forested communities with reference state, classification status* and fitted with Generalized Additive Model (GAM) surfaces overlaid to illustrate the relationships between plant species composition and gradients in the ratio of non-native plant cover to total cover and growing climate moisture index, Prairie Provinces, Canada. Panel D displays the group classification which for non-reference communities represents the group into which the community was classified using a supervised classification.



G075: Northern Tallgrass Prairie
G141: Northern Great Plains Mesic Mixedgrass Prairie
G273: Central Rocky Mountain Lower Montane, Foothill & Valley
G331: Northern Great Plains Dry Mixedgrass Prairie
G332: Northern Great Plains Rough Fescue Prairie
G566: Great Plains Badlands Vegetation
G679: Northern & Central Great Plains Ruderal Grassland & Shrubland
G889: Northern Great Plains Sand Prairie

Tables

Table 1

Climate summary by ecoregion, Prairie Provinces, Canada.

Climate Normal Period*	1981-2010	1991-2020	1991-2020	1981-2010	1981-2010	1981-2010	1981-2010
Location (Level 2 Veg. Zone)	Calgary (Foothills Fescue)	Edmonton (Great Plains Parkland)	Medicine Hat (Dry Mixedgrass)	Lloydminster (Great Plains Parkland)	Saskatoon (Mixedgrass)	Regina (Mixedgrass)	Winnipeg (Tallgrass)
Latitude	51°06'	53°19'	50°01'	53°17'	52°10'	50°26'	49°55'
Longitude	114°01'	113°35'	110°43'	109°40'	106°43'	104°40'	97°14'
Mean Annual Temperature (°C)	4.4	2.4	6	2	2.6	3.1	3
Mean Temperature for the Warmest Month of the Year (°C)	16.5	16.2	20.1	17.1	18.5	18.9	19.7
Mean Temperature for the Coldest Month of the Year (°C)	-7.1	-12.3	-8.5	-14.9	-15.5	-14.7	-16.4
Annual Number of Days with Maximum Temperature >0°C	305.9	274.5	304.1	251.1	257.3	262.2	252.2
Annual Number of Growing Degree Days >5°C	1447.2	1352.3	1976.2	1513.7	1645.7	1712	1820.7
Mean Annual Total Precipitation (mm)	418.8	434	330.9	411.9	353.7	389.7	521.1
* Canadian Climate Normals Station Data - Climate - Environment and Climate Change Canada (weather.gc.ca)							

Table 2

Cross-reference table between provincial ecosite titles and the aggregated ecosite titles used in this study, Prairie Provinces, Canada.

Province	Provincial Ecosite	Description	Aggregated Ecosite
Alberta	Badlands	Bedrock exposures >10%, and bedrock generally <1m deep	Badlands
Alberta	Blowout	Dominant or co-dominant soils in the Solonetzic order (CSSC 1998).	Solonetzic
Alberta	Choppy Sandhills	Coarse-textures sands shaped into dunes.	Dunes
Alberta	Clayey	Clay dominated soils with fine textures including clay, sandy clay, and silty clay.	Clay
Alberta	Fen (subhydric/rich)*	a minerogenous peatland with surface or subsurface water flow that range from moderately-acidic to basic	Fen Peat
Alberta	Foxtail barley(subhygric/medium to poor)**	An ecological site representing a subhygric moisture regime and nutrient regime that is medium to poor and can be mildly saline	Saline Wet Meadow
Alberta	Gravel	Gravels at the surface or <30 cm from the surface	Shallow to gravel
Alberta	Horsetail (hygric/rich)**	A wet, nutrient rich site found in areas where flooding or seepage contributes to nutrient supply	Meadow and Marsh
Alberta	Limy	Calcareous soils.	Limy
Alberta	Loamy	Medium textures soils including loam and silt loam.	Loam
Alberta	Marsh (hydric/rich)**	Shoreline sites along streams and around ponds where water is above the rooting zone for at least part of the growing season	Meadow and Marsh
Alberta	Needle and thread (subxeric/medium)**	Steeply sloping landscapes with bedrock at or near the surface; loams to sandy loams or sands and generally south facing slopes create dry conditions. (Central	Loam
Alberta	Overflow	Fan, apron, channeled or concave (non-saline) landscapes	Subirrigated and Overflow
Alberta	Plains rough fescue/Snowberry (mesic/rich)**	Black, loamy well drained soils with adequate nutrients and average moisture in the Central Parkland subregion.	Loam
Alberta	Red osier dogwood (subhygric/rich)**	Very moist, nutrient-rich sites usually on mid to lower slope positions or adjacent to streams where they receive seepage or floodwaters.	Loam
Alberta	saline blowout (mesic/poor)**	Hardpan (solonetzic) slightly saline soils with impeded drainage and nutrient uptake.	Solonetzic
Alberta	Saline Lowlands	Saline discharge; salt-enriched	Saline Wet Meadow
Alberta	Saline Lowlands (hygric/poor)**	Saline and alkaline clayey soils with imperfect to very poor drainage and enough salinity to impede plant growth, generally receiving surface or	Saline Wet Meadow
Alberta	Sand dropseed (xeric/poor)**	Loamy sands and sands on level to duned landscapes with sparse xerophytic vegetation; dry and nutrient poor (Central Parkland subregion)	Sand and Sandy
Alberta	Sandgrass/juniper (subxeric/poor)**	Loamy sands and sands on level to duned landscapes; very dry on southerly slopes, but somewhat moister on level and northerly aspects (Central Parkland	Sand and Sandy
Alberta	Sands	Coarse sandy soils in non-dune landscapes, including sand and loamy sand.	Sand and Sandy
Alberta	Sandy	Moderately coarse sandy soils (sandy loam) in non-dune landscapes.	Sand and Sandy
Alberta	Shallow to Gravel	Thin veneer (30–100 cm) of mineral soil over gravels.	Shallow to gravel
Alberta	Sub-irrigated	Gleyed; imperfectly drained.	Subirrigated and Overflow
Alberta	Tame Pasture	Dominated by agronomic species (e.g. *Poa pratensis, Bromus inermis, Agropyron cristatum*) on dry to moist, nutrient poor to nutrient rich sites	Tame Pasture
Alberta	Thin Breaks	Bedrock generally, 1 - 5 m; bedrock exposures <10% .	Thin
Alberta	Western porcupine grass (submesic/medium)**	Sandy loam sites that have medium nutrient status and variable moisture depending on texture, slope aspect and slope position (Central Parkland	Loam
Alberta	Western wheatgrass (mesic/medium)**	Clay loams often in shallow depressions that are flooded in spring and on uplands; some are weakly saline (Central Parkland subregion)	Loam
Manitoba	Clay	Well drained to imperfectly drained soils with clay to heavy clay texture.	Clay
Manitoba	Dunes	Sand deposits shaped into hills and ridges by wind.	Dunes
Manitoba	Eroded Slopes	Well drained, steep slopes of various soil textures. High rates of water erosion result in thin soil profiles.	Thin
Manitoba	Fen	Wetlands with thick (> 50 cm) organic deposits and alkaline, neutral, or slightly acidic pH.	Fen Peat
Manitoba	Loam	Well drained uplands with loam, silty loam, and clay loam textured soils.	Loam
Manitoba	Marsh	Permanently flooded areas with emergent vegetation.	Meadow and Marsh
Manitoba	Moist Loam	Imperfectly drained soils with loamy texture. Evidence of temporary saturation by water within 50 cm of the soil surface.	Loam
Manitoba	Moist Sand	Imperfectly drained coarse-textured soils including gravel and sandy loams. Evidence of temporary	Sand and Sandy
Manitoba	Sand	Rapidly drained to well drained uplands with coarser textured soils (loamy sand, sand, finer gravel) in a non-dune landscape.	Sand and Sandy
Manitoba	Wet Meadow	Lowland sites typically flooded for only a few weeks in the spring but remain saturated throughout the	Meadow and Marsh

Table 2

Cross-reference table between provincial ecosite titles and the aggregated ecosite titles used in this study, Prairie Provinces, Canada.

Province	Provincial Ecosite	Description	Aggregated Ecosite
Saskatchewan	Badlands	Sparsely vegetated landscapes with >10% exposure of bedrock.	Badlands
Saskatchewan	Clay	Stable well-drained upland ecosites with fine to very fine-textured soils (clay, heavy clay).	Clay
Saskatchewan	Dunes	Landscapes with sand dunes.	Dunes
Saskatchewan	Gravelly	Landscapes with gravelly soils at the surface, or with a thin surface layer of finer material over a gravel substrate.	Shallow to gravel
Saskatchewan	Loam	Stable well-drained upland ecosites with medium to moderately fine-textured soils (loam, silt loam, clay loam).	Loam
Saskatchewan	Marsh	Wetlands flooding late into the summer or throughout the year (marshes).	Meadow and Marsh
Saskatchewan	Meadow	Wet low-lying sites that are normally flooded for 3-4 weeks in spring.	Meadow and Marsh
Saskatchewan	Overflow	Well-drained sites (no mottles or gleying), but on alluvial landforms (floodplains, alluvial fans) that receive additional moisture from stream	Subirrigated and Overflow
Saskatchewan	Saline Shallow Marsh	Wetlands that are normally flooded until July or early August, with saline soils. Potential vegetation is dominated by salt-tolerant plants.	Saline Marsh
Saskatchewan	Saline Subirrigated	Moist low-lying sites that are rarely flooded, with saline soils. Potential vegetation is dominated by salt-tolerant plants.	Saline Subirrigated
Saskatchewan	Saline Upland	Drier transitional or upland sites with saline soils. Salt may appear on the surface in dry periods. Potential vegetation includes a mixture of salt-	Saline Upland
Saskatchewan	Saline Wet Meadow	Wet low-lying sites that are normally flooded for 3-4 weeks in spring, with saline soils. Potential vegetation is dominated by salt-tolerant	Saline Wet Meadow
Saskatchewan	Sand	Stable well-drained upland ecosites with coarse-textured soils (sand, loamy sand), but without dune topography.	Sand and Sandy
Saskatchewan	Sandy Loam	Stable well-drained upland ecosites with moderately coarse-textured soils (sandy loam).	Sand and Sandy
Saskatchewan	Solonetzic	Landscapes with soils in the Solonetzic Order, characterized by a hard, impermeable B-horizon which is high in sodium. Often with scattered	Solonetzic
Saskatchewan	Subirrigated	Moist low-lying sites that are rarely flooded. Imperfectly drained soils show signs of intermittent saturation, such as faint to distinct mottles	Subirrigated and Overflow
Saskatchewan	Thin	Landscapes with predominantly steep slopes (>20%) and high levels of erosion resulting in shallow soil profiles.	Thin

* Alberta Environment and Sustainable Resource Development (ESRD). 2015. Alberta Wetland Classification System. Water Policy Branch, Policy and Planning Division, Edmonton, AB

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Kupsch, T., K. France, H, Loonen, A. Burkinshaw, M. G. Willoughby, and R. L. McNeil Landwise, Inc. 2013 (under revision). Range plant communities and range health assessment guidelines for the Central Parkland Subregion of Alberta. Second appproximation. Publication No. T/125. Alberta Sustainable Resource Development, Public Lands & Forests Division, Rangeland Management Branch, Lethbridge, AB. [N13KUP01ICEC]

Table 3

Cross-reference table of successional state classes for rangeland plant communities across Alberta, Manitoba, and Saskatchewan, Prairie Provinces, Canada.

Province	Provincial Successional State	Aggregated Successional State
Alberta	Grazing Succession	Non-Reference
Alberta	Modified Plant Community	Non-Reference
Alberta	Reference Plant Community	Reference
Alberta	Successional Plant Community	Non-Reference
Manitoba	Alt	Minor Alteration
Manitoba	MC	Non-Reference
Manitoba	Mod	Non-Reference
Manitoba	RC	Non-Reference
Manitoba	Sev Alt	Non-Reference
Manitoba	Sig Alt	Non-Reference
Saskatchewan	Unknown	Non-Reference
Saskatchewan	Minor Alteration From RC	Minor Alteration
Saskatchewan	Moderate Alteration from RC	Non-Reference
Saskatchewan	Not Defined	Non-Reference
Saskatchewan	Reference Community	Reference
Saskatchewan	Severe Alteration from RC	Non-Reference
Saskatchewan	Significant Alteration from RC	Non-Reference
Saskatchewan	Significant Alteration from RC, Or Minor Alteration from MG-LM-C	Non-Reference

Table 4

Results of the correlation analysis between species scores and NMDS axes showing the species with the greatest correlation with the ordination axes for all reference and minor alteration prairie communities, Prairie Provinces Canada

Axis Correlation*	Scientific Name**	NMDS1	NMDS2	NMDS3
Axes 1 & 2	*Pascopyrum smithii*	-0.23	-0.4	-0.03
	Sphaeralcea coccinea	-0.27	-0.29	0.14
	Bouteloua gracilis	-0.37	-0.31	0.18
Axis 1	*Galium trifidum*	0.58	-0.1	0.03
	Epilobium palustre	0.58	-0.11	0.01
	Sium suave	0.57	-0.12	-0.04
	Carex utriculata	0.52	-0.03	0.08
	Schoenoplectus acutus	0.5	-0.09	-0.01
	Phlox hoodii	-0.27	-0.15	0.13
	Hesperostipa curtiseta	-0.29	0.09	-0.21
	Hesperostipa comata	-0.35	-0.27	0.4
	Elymus lanceolatus	-0.38	-0.23	0.07
	Artemisia frigida	-0.45	-0.22	0.06
	Koeleria macrantha	-0.45	-0.25	0.01
Axis 2	*Amelanchier alnifolia*	0.17	0.55	0.2
	Populus tremuloides	0.26	0.48	0.23
	Prunus virginiana	0.09	0.41	0.26
	Symphoricarpos occidentalis	0.02	0.4	0.13
	Oryzopsis asperifolia	0.17	0.39	0.16
	Atriplex gardneri	-0.08	-0.29	0.01
	Poa secunda	-0.18	-0.29	0.05
	Lepidium densiflorum	-0.08	-0.31	0.05
	Distichlis spicata	0.15	-0.31	-0.04
	Sarcobatus vermiculatus	-0.05	-0.31	0.05
Axis 3	*Carex duriuscula*	-0.19	-0.07	0.29
	Sporobolus rigidus	-0.14	0.09	0.29
	Ladeania lanceolata	-0.1	-0.03	0.27
	Lithospermum incisum	-0.08	-0.02	0.25
	Toxicodendron radicans	0.06	0.25	0.24
	Sisyrinchium montanum	0.01	0.14	-0.3
	Schizachyrium scoparium	<0.01	0.12	-0.31
	Achillea millefolium	-0.07	0.12	-0.33
	Festuca hallii	-0.1	0.33	-0.4
	Geum triflorum	-0.02	0.22	-0.45

* Indicates the axes for which the listed species have the highest correlation.

** Species with the highest (either positive or negative) correlation to one of the axes.

Table 5

Results of the correlation analysis between species scores and NMDS axes showing the species with the greatest correlation with the ordination axes for the dry and mesic grassland reference and minor alteration prairie communities, Prairie Provinces, Canada.

Axis Correlation*	Scientific Name**	MDS1	MDS2	MDS3
Axis 1 & 2	*Pascopyrum smithii*	0.37	-0.46	-0.19
Axis 1 & 3	*Elymus lanceolatus*	0.38	-0.29	0.32
Axis 1	*Hesperostipa comata*	0.65	0.2	-0.17
	Bouteloua gracilis	0.52	0.04	-0.23
	Sphaeralcea coccinea	0.47	-0.15	-0.05
	Solidago missouriensis	-0.45	0.24	-0.01
	Galium boreale	-0.49	-0.01	-0.21
	Geum triflorum	-0.55	-0.2	-0.15
	Elymus trachycaulus	-0.57	-0.01	-0.21
	Festuca hallii	-0.67	0.11	0.12
Axis 2	*Sporobolus rigidus*	0.14	0.5	-0.18
	Carex obtusata	-0.21	0.4	0.24
	Prunus virginiana	-0.04	0.33	-0.08
	Heterotheca villosa	0.13	0.3	-0.19
	Artemisia campestris	0.06	0.29	-0.18
	Festuca idahoensis	-0.06	-0.32	0.28
	Bromus pumpellianus	-0.21	-0.36	0.12
	Danthonia parryi	-0.19	-0.39	0.08
	Festuca campestris	-0.21	-0.53	0.23
Axis 3	*Carex pensylvanica*	-0.2	0.24	0.37
	Hesperostipa curtiseta	-0.2	0.04	0.36
	Rosa arkansana	-0.31	0.06	0.35
	Selaginella densa	0.19	0.16	0.31
	Andropogon gerardii	-0.11	-0.04	-0.3
	Sisyrinchium montanum	-0.38	-0.05	-0.31
	Danthonia spicata	-0.25	0	-0.32
	Schizachyrium scoparium	-0.32	0.01	-0.37
	Hesperostipa spartea	-0.3	-0.03	-0.43

* Indicates the axes for which the listed species have the highest correlation.

** Species with the highest (either positive or negative) correlation to one of the axes.

Table 6

Indicator species analysis results, dominant species, and diagnostic environmental characteristics for the dry and mesic grassland groups, Prairie Provinces, Canada.

Group	Group Title	Scientific Name	Specificity	Fidelity	Overall Ind. Value	P-Value	Signif.	Prominence Value (PV)	Other Spp. with High PV (>5)	Diagnostic Environmental Characteristics	Number of Plots
G075	Northern Tallgrass Prairie	*Andropogon gerardii*	0.9999	1	1	0.001	***	32.45	*Poa pratensis* (17.81)	Occurring in Manitoba in the tall grass prairie ecoregion.	10
		Sporobolus rigidus [1]	0.8844	0.8824	0.883	0.001	***	3.48			
		Heterotheca villosa [1]	0.7174	0.7941	0.755	0.003	**	0.89			
		Equisetum hyemale	0.9627	0.5	0.694	0.007	**	2.35			
G141	Northern Great Plains Mesic Mixedgrass Prairie	*Sphaeralcea coccinea* [2]	0.9052	0.6935	0.792	0.001	***	0.76	*Hesperostipa curtiseta* (25.87) *Elymus lanceolatus* (14.44) *Pascopyrum smithii (* 6.79) *Hesperostipa comata* (6.28) *Koeleria macrantha* (6.24) *Artemisia frigida* (6.05) *Prunus virginiana* (6.00)	Occuring in the northern extent of the Northen Great Plains Mixedgrass Prairie.	528
G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	*Festuca campestris*	1	0.7692	0.877	0.004	**	19.21	*Elymus lanceolatus* (11.34) *Hesperostipa comata* (6.79) *Festuca hallii* (5.95) *Dasiphora fruticosa* (5.20) *Danthonia parryi* (5.16)	Occurring in the foothills and lower montane environments in western Alberta and Cypress Hills.	340
		Festuca idahoensis	0.9606	0.7692	0.86	0.003	**	16.03			
G331	Northern Great Plains Dry Mixedgrass Prairie	*Poa secunda* [3]	0.8973	0.7556	0.823	0.004	**	3.66	*Hesperostipa comata* (28.15) *Elymus lanceolatus* (10.69) *Koeleria macrantha* (10.60) *Bouteloua gracilis* (9.83) *Pascopyrum smithii* (9.38) *Artemisia frigida* (5.47)	Occuring in the southern extent of the Northen Great Plains Mixedgrass Prairie.	1343
		Sphaeralcea coccinea [2]	0.9052	0.6935	0.792	0.001	***	1.57			
G332	Northern Great Plains Rough Fescue Prairie	*Festuca hallii*	0.8414	0.9375	0.888	0.001	***	30.23	*Hesperostipa curtiseta* (10.91) *Symphoricarpos occidentalis* (6.04)	Occurring in the northern fescue ecoregion.	454
G566	Great Plains Badlands Vegetation	*Sporobolus rigidus* [1]	0.8844	0.8824	0.883	0.001	***	0.64	*Pascopyrum smithii* (21.26) *Elymus lanceolatus* (19.93) *Artemisia frigida* (10.19) *Bouteloua gracilis* (7.55) *Koeleria macrantha* (6.57) *Hesperostipa comata* (5.43) *Puccinellia nuttalliana* (5.20)	Occurring on badland ecosites.	30
		Poa secunda [3]	0.8973	0.7556	0.823	0.004	**	7.69			
		Atriplex gardneri	1	0.6667	0.816	0.001	***	4.23			
		Distichlis spicata	0.9451	0.6667	0.794	0.003	**	7.25			
		Sphaeralcea coccinea [2]	0.9052	0.6935	0.792	0.001	***	2.53			
		Heterotheca villosa [1]	0.7174	0.7941	0.755	0.003	**	0.59			
		Gutierrezia sarothrae	0.709	0.6667	0.687	0.01	*	2.31			
		Krascheninnikovia lanata	0.6959	0.6667	0.681	0.01	**	1.91			
G889	Northern Great Plains Sand Prairie	*Heterotheca villosa* [1]	0.7174	0.7941	0.755	0.003	**	1.49	*Hesperostipa comata* (17.42) *Hesperostipa spartea* (7.08) *Koeleria macrantha* (6.56) *Bouteloua gracilis* (5.94) *Artemisia frigida* (5.02) *Juniperus horizontalis* (5.00)	Occurring on sand dunes and other deep, coarse sand deposits.	474
		Ladeania lanceolata	1	0.4138	0.643	0.016	*	2.74			
		Sporobolus rigidus [1]	0.8844	0.8824	0.883	0.001	***	7.31			

1 G075+G566+G889
2 G141+G331+G566
3 G331+G566

Table 7

Prominence, average abundance, constancy, and indicator species for the dry and mesic grassland clusters generated using noise cluster analysis for comparison with the dry and mesic grassland group classification, Prairie Provinces, Canada.

Cluster	Scientific Name	Prominence Value	Avg. Abundance	Constancy (%)	Signif. Indicator*
M1	*Hesperostipa comata*	34.91	34.91	100	
M1	*Koeleria macrantha*	10.57	10.79	96	
M1	*Bouteloua gracilis*	10.55	11.06	91	
M1	*Elymus lanceolatus*	5.48	7.53	53	
M1	*Pascopyrum smithii*	5.29	7.07	56	
M1	*Artemisia frigida*	5.21	5.59	87	
M1	*Ladeania lanceolata*	1.62	5.11	10	*
M2	*Festuca campestris*	35.17	35.17	100	*
M2	*Danthonia parryi*	9.03	13.32	46	*
M2	*Festuca idahoensis*	7.22	7.79	86	*
M2	*Elymus lanceolatus*	6.16	6.89	80	
M2	*Lupinus sericeus*	1.47	2.89	26	*
M2	*Bromus pumpellianus*	0.96	1.75	30	*
M2	*Toxicoscordion venenosum*	0.71	2.7	7	*
M2	*Anemone multifida*	0.53	1.1	23	*
M2	*Agoseris glauca*	0.38	0.84	21	*
M2	*Oxytropis sericea*	0.31	0.94	11	*
M2	*Anaphalis margaritacea*	0.14	0.43	11	*
M2	*Primula conjugens*	0.13	0.36	13	*
M3	*Hesperostipa curtiseta*	25.99	26.25	98	
M3	*Elymus lanceolatus*	13.98	16.14	75	
M3	*Artemisia frigida*	6.27	6.68	88	
M3	*Hesperostipa comata*	5.89	7.73	58	
M3	*Koeleria macrantha*	5.72	6.13	87	
M3	*Pascopyrum smithii*	5.56	7.56	54	
M4	*Festuca hallii*	39.35	39.75	98	
M4	*Hesperostipa curtiseta*	10.94	11.6	89	
M4	*Festuca campestris*	6.49	45.92	2	
M4	*Symphoricarpos occidentalis*	6	7.44	65	
M4	*Symphyotrichum laeve*	1.46	2.91	25	*
M4	*Fragaria virginiana*	1.01	2.93	12	*
M4	*Bromus ciliatus*	0.48	2.16	5	*
M4	*Salix bebbiana*	0.24	0.57	17	*
M5	*Elymus lanceolatus*	22.43	23.01	95	
M5	*Hesperostipa comata*	14.8	16.34	82	
M5	*Koeleria macrantha*	10.25	10.46	96	
M5	*Pascopyrum smithii*	8.15	9.41	75	
M5	*Bouteloua gracilis*	7.44	8.17	83	
M5	*Artemisia frigida*	7.19	7.46	93	
M6	*Festuca hallii*	7.41	9.12	66	
M6	*Hesperostipa comata*	7.01	8.76	64	
M6	*Hesperostipa curtiseta*	6.73	8.16	68	
M6	*Koeleria macrantha*	5.31	5.51	93	
M6	*Sporobolus rigidus*	5.2	6.01	75	
M6	*Elaeagnus commutata*	4.4	7.23	37	*
M6	*Rosa woodsii*	3.42	5.86	34	*
M6	*Prunus virginiana*	1.33	2.72	24	*
M7	*Pascopyrum smithii*	26.76	27.03	98	
M7	*Koeleria macrantha*	8.74	9.26	89	
M7	*Elymus lanceolatus*	7.34	9.9	55	
M7	*Hesperostipa comata*	6.73	8.84	58	
M7	*Poa secunda*	6.23	8.81	50	
M7	*Hesperostipa curtiseta*	6	10.6	32	
M7	*Bouteloua gracilis*	5.64	6.56	74	
M7	*Artemisia frigida*	5.04	5.43	86	
M7	*Gutierrezia sarothrae*	1.24	2.54	24	*
M7	*Atriplex gardneri*	1.07	2.86	14	*
M7	*Hordeum jubatum*	1.02	3.59	8	*
M7	*Grindelia squarrosa*	1	2.08	23	*

* $p < 0.01$ and not including indicators across multiple clusters

Table 8

Contingency table of dry and mesic grassland groups assigned based on a combination of quantative analysis and expert review and the group classification generated using cluster analysis, Prairie Provinces, Canada.

Group Code	Group Title	Cluster								Total	Group consistency across clusters	Proportion of group assigned to noise cluster
		M1	M2	M3	M4	M5	M6	M7	N			
G075	**Northern Tallgrass Prairie**								2	2	No Primary Cluster	100%
G141	**Northern Great Plains Mesic Mixedgrass Prairie**			13		1		1	2	17	87%	12%
G273	**Central Rocky Mountain Lower Montane, Foothill & Valley Grassland**		8			2			3	13	80%	23%
G331	**Northern Great Plains Dry Mixedgrass Prairie**	13				13	1	12	3	42	No Primary Cluster	7%
G332	**Northern Great Plains Rough Fescue Prairie**	2		2	18		6		4	32	64%	13%
G566	**Great Plains Badlands Vegetation**					1		1	1	3	No Primary Cluster	33%
G889	**Northern Great Plains Sand Prairie**	14		1			5		9	29	70%	31%
Total		29	8	16	18	17	12	14	24	138	n/a	n/a
Cluster consistency across groups		48%	100%	81%	100%	76%	50%	86%	n/a	n/a	n/a	n/a

*Excludes communities assigned to the noise cluster (N).

Table 9

Partition analysis results for the dry and mesic grassland groups showing the within to between group floristic similarity ratio, Prairie Provinces, Canada.

Macrogroup		M051	M051	M051	M052	M054	M115	M547
	Group	**G141**	**G331**	**G332**	**G889**	**G075**	**G566**	**G273**
M051	**G141**	**0.47**	0.24	0.18	0.18	0.06	0.21	0.12
M051	**G331**	0.24	**0.36**	0.09	0.22	0.04	0.31	0.09
M051	**G332**	0.18	0.09	**0.33**	0.12	0.06	0.07	0.07
M052	**G889**	0.18	0.22	0.12	**0.25**	0.06	0.15	0.06
M054	**G075**	0.06	0.04	0.06	0.06	**0.65**	0.05	0.04
M115	**G566**	0.21	0.31	0.07	0.15	0.05	**0.33**	0.09
M547	**G273**	0.12	0.09	0.07	0.06	0.04	0.09	**0.32**

Legend:

Related groups within a macrogroup

Next most similar group after itself

Code	Title
G075	Northern Tallgrass Prairie
G141	Northern Great Plains Mesic Mixedgrass Prairie
G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland
G331	Northern Great Plains Dry Mixedgrass Prairie
G332	Northern Great Plains Rough Fescue Prairie
G566	Great Plains Badlands Vegetation
G889	Northern Great Plains Sand Prairie

Table 10

Indicator species analysis results, dominant species, and diagnostic environmental characteristics for the shrubland alliances, Prairie Provinces, Canada.

Group	Alliance	Alliance Title	Scientific Name	Specificity	Fidelity	Overall Ind. Value	P-Value	Signif.	Prominence Value (PV)	Other Spp. with High PV (>5)	Diagnostic Environmental Characteristics	Number of Plots
G141	A2309	Prunus virginiana - Symphoricarpos occidentalis Northern Plains Shrubland Alliance	*Elymus trachycaulus1*	0.8816	0.9091	0.895	0.009	**	1.54	*Prunus virginiana* (36.72) *Amelanchier alnifolia* (14.29) *Symphoricarpos occidentalis* (10.26) *Symphoricarpos albus* (9.19)	Moist loamy soils.	16
G332	A2405	Symphoricarpos occidentalis - Elaeagnus commutata / Festuca hallii Shrub Grassland Alliance	*Festuca hallii*	0.8827	0.875	0.879	0.025	*	30.99	*Symphoricarpos occidentalis* (11.82) *Festuca campestris* (9.26) *Hesperostipa curtiseta* (8.69) *Hesperostipa spartea* (6.84) *Elaeagnus commutata* (5.42)	Deep to shallow moist loamy soils.	120
			Elymus trachycaulus [1]	0.8816	0.9091	0.895	0.009	**	2.74			
G889	A2407	Juniperus horizontalis - Arctostaphylos uva-ursi / Calamovilfa longifolia Sand Grassland Alliance	*Sporobolus rigidus* [2]	0.8749	1	0.935	0.001	***	5.11	*Juniperus horizontalis* (11.78) *Prunus virginiana* (9.16) *Carex siccata* (8.19) *Carex obtusata* (7.92) *Hesperostipa comata* (6.88) *Carex inops* (5.11) *Thermopsis rhombifolia* (5.10)	Dunes and other coarse sand deposits.	76
			Heterotheca villosa [2]	0.8274	0.875	0.851	0.016	*	0.59			
G331	A3586	Artemisia cana / Hesperostipa comata - Pascopyrum smithii Shrubland Alliance	*Sphaeralcea coccinea*	0.986	1	0.993	0.001	***	1.38	*Hesperostipa comata* (34.53) *Bouteloua gracilis* (14.26) *Koeleria macrantha* (9.22) *Elymus lanceolatus* (6.01) *Pascopyrum smithii* (5.31)	Sandy loam deposits.	169
			Artemisia cana [3]	0.8804	1	0.938	0.001	***	2.26			
			Poa secunda [4]	0.9715	0.9	0.935	0.002	**	3.27			
G984	A3905	Sarcobatus vermiculatus Great Plains Wet Shrubland Alliance	*Sarcobatus vermiculatus* [5]	1	1	1	0.001	***	6.28	*Elymus lanceolatus* (8.53) *Pascopyrum smithii* (4.48)	Fine textured, saline, poorly drained sites	20
			Distichlis spicata [5]	0.9957	1	0.998	0.001	***	5.62			
			Poa secunda [4]	0.9715	0.9	0.935	0.002	**	2.93			
G566	A3978	Sarcobatus vermiculatus Great Plains Badlands Alliance	*Artemisia cana* [3]	0.8804	1	0.938	0.001	***	2.85	*Bouteloua gracilis* (15.66) *Hesperostipa comata* (9.87) *Pascopyrum smithii* (8.80)	Badland topography with eroded clays and exposed strata.	4
			Distichlis spicata [5]	0.9957	1	0.998	0.001	***	16.77			
			Sarcobatus vermiculatus [5]	1	1	1	0.001	***	4.3			
			Sporobolus rigidus [2]	0.8749	1	0.935	0.001	***	1.7			
			Heterotheca villosa [2]	0.8274	0.875	0.851	0.016	*	0.74			
G273	A4095	Arctostaphylos uva-ursi / Festuca spp. - Pseudoroegneria spicata Steppe Alliance	*Juniperus horizontalis*	0.7335	1	0.856	0.038	*	29.22	*Elymus lanceolatus* (15.86) *Pseudoroegneria spicata* (9.05) *Pascopyrum smithii (* 6.80) *Amelanchier alnifolia* (6.51)	On slopes in lower lower montane and foothill zones.	9

1 A2309+A2405
2 A2407+A3978
3 A3586+A3978
4 A3586+A3905
5 A3905+A3978

Table 11

Indicator species analysis and constancy/cover results for the grassland alliances in groups G141, G331, and G889 Prairie Provinces, Canada.

Group	Alliance	Alliance Title	Scientific Name	Specificity	Fidelity	Overall Ind. Value	P-Value	Signif.	Prominence Value (PV)	Other Spp. with High PV (>5)	Diagnostic Environmental Characteristics	Number of Plots
G889	A1201	Calamovilfa longifolia - Hesperostipa comata - Andropogon hallii Sand Prairie Alliance	*Sporobolus rigidus* [1]	0.903	0.95	0.926	0.001	***	8.76	*Hesperostipa comata* (21.40) *Koeleria macrantha* (7.80) *Artemisia frigida* (5.92) *Bouteloua gracilis* (5.84) *Elymus lanceolatus* (5.46)	Dunes and other coarse sandy deposits in Alberta and Saskatchewan.	318
			Heterotheca villosa [1]	0.7321	0.9	0.812	0.001	***	1.82			
			Ladeania lanceolata	1	0.6429	0.802	0.001	***	3.22			
			Sporobolus cryptandrus	0.9908	0.5	0.704	0.001	***	1.64			
			Lithospermum incisum	1	0.2857	0.535	0.009	**	0.18			
	A2409	Hesperostipa spartea-Bouteloua gracilis-Juniperus horizontalis Sand Prairie Alliance	*Sporobolus rigidus* [1]	0.903	0.95	0.926	0.001	***	3.15	*Bouteloua gracilis* (9.51) *Hesperostipa comata* (7.37) *Koeleria macrantha* (5.30)	Dunes and other coarse sandy deposits in southwest Manitoba and southeast Saskatchewan.	80
			Elymus trachycaulus	0.8061	1	0.898	0.001	***	3.16			
			Hesperostipa curtiseta [3]	0.878	0.9091	0.893	0.001	***	7.71			
			Hesperostipa spartea	0.9505	0.8333	0.89	0.001	***	17.43			
			Campanula rotundifolia	0.8958	0.8333	0.864	0.001	***	1.16			
			Helictochloa hookeri	0.7309	1	0.855	0.001	***	5.43			
			Dalea purpurea	0.8708	0.8333	0.852	0.001	***	1.33			
			Panicum capillare	0.8527	0.8333	0.843	0.001	***	1.36			
			Gaillardia aristata	1	0.6667	0.816	0.001	***	0.75			
			Heterotheca villosa [1]	0.7321	0.9	0.812	0.001	***	0.91			
			Galium boreale	0.7719	0.8333	0.802	0.001	***	2.41			
			Festuca saximontana	0.7557	0.8333	0.794	0.001	***	2.93			
			Sisyrinchium montanum	0.9254	0.6667	0.785	0.001	***	1.02			
			Geum triflorum	0.8857	0.6667	0.768	0.001	***	3.2			
			Pulsatilla patens [3]	0.9263	0.5909	0.74	0.001	***	1.48			
			Cerastium arvense	0.7997	0.6667	0.73	0.001	***	2.08			
			Comandra umbellata	0.6286	0.8333	0.724	0.001	***	1.44			
			Schizachyrium scoparium	1	0.5	0.707	0.002	**	4.94			
			Juniperus horizontalis	0.9834	0.5	0.701	0.001	***	4.34			
			Agoseris glauca	1	0.3333	0.577	0.008	**	0.36			
			Monarda fistulosa	1	0.3333	0.577	0.008	**	0.41			
			Potentilla anserina	1	0.3333	0.577	0.008	**	0.17			
			Solidago missouriensis	0.9623	0.3333	0.566	0.002	**	0.83			
			Symphyotrichum ericoides	0.9311	0.3333	0.557	0.004	**	0.66			
G331	A2300	Bouteloua gracilis - Pascopyrum smithii Solonetzic Grassland Alliance	*Atriplex gardneri*	0.9921	0.5	0.704	0.004	**	0.5	*Pascopyrum smithii* (17.47) *Elymus lanceolatus* (15.87) *Hesperostipa comata* (11.68) *Koeleria macrantha* (10.96) *Bouteloua gracilis* (8.37) *Artemisia frigida* (6.66)	Solonetzic soils and blowouts.	323
			Krascheninnikovia lanata	0.7371	0.5	0.607	0.009	**	1.49			
			Poa secunda [2]	0.838	0.8182	0.828	0.001	***	7.92			
	A4389	Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis Grassland Alliance	*Poa secunda* [2]	0.838	0.8182	0.828	0.001	***	1.93	*Hesperostipa comata* (32.67) *Koeleria macrantha* (10.69) *Elymus lanceolatus* (9.54) *Bouteloua gracilis* (9.47) *Pascopyrum smithii* (6.55) *Artemisia frigida* (5.08)	Dry mixed grass prairie on loamy, thin, sandy loam, and gravelly ecosites.	851

Table 11

Indicator species analysis and constancy/cover results for the grassland alliances in groups G141, G331, and G889 Prairie Provinces, Canada.

Group	Alliance	Alliance Title	Scientific Name	Specificity	Fidelity	Overall Ind. Value	P-Value	Signif.	Prominence Value (PV)	Other Spp. with High PV (>5)	Diagnostic Environmental Characteristics	Number of Plots
G141	A4029	Hesperostipa curtiseta - Elymus lanceolatus Grassland Alliance	*Hesperostipa curtiseta* [3]	0.878	0.9091	0.893	0.001	***	26.4	*Elymus lanceolatus* (14.78) *Pascopyrum smithii* (6.76) *Koeleria macrantha* (6.39) *Hesperostipa comata* (6.35) *Artemisia frigida* (6.16)	Mesic mixed grass prairie on loamy soils.	511
			Pulsatilla patens [3]	0.9263	0.5909	0.74	0.001	***	1.64			

1 A1201+A2409
2 A2300+A4389
3 A4029+A2409

Table 12

Partition analysis results for the grassland alliances in groups G141, G331, and G889 showing the within to between group floristic similarity ratio, Prairie Provinces, Canada.

Group		G889	G889	G331	G331	G141
	Alliance	A1201	A2409	A2300	A4389	A4029
G889	A1201	**0.43**	0.16	0.22	0.38	0.2
G889	A2409	0.16	**0.29**	0.11	0.14	0.17
G331	A2300	0.22	0.11	**0.44**	0.35	0.25
G331	A4389	0.38	0.14	0.35	**0.43**	0.25
G141	A4029	0.2	0.17	0.25	0.25	**0.51**

Legend:

Related groups within a macrogroup

Next most similar group after itself

Code	Title
A1201	Calamovilfa longifolia - Hesperostipa comata - Andropogon hallii Sand Prairie Alliance
A2409	Bouteloua gracilis - Pascopyrum smithii Solonetzic Grassland Alliance
A2300	Hesperostipa spartea - Bouteloua gracilis - Juniperus horizontalis Sand Prairie Alliance
A4389	Hesperostipa curtiseta - Elymus lanceolatus Grassland Alliance
A4029	Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis Grassland Alliance

Table 13

Non-native abundance ratio for non-reference plant communities assigned to the Northern Central Great Plains Ruderal Grassland Shrubland Group (G679) based on a ratio of greater than or equal to 0.50, Prairie Provinces, Canada.

Plant Community Code	Plant Community Title	Non-native Abundance Ratio
MG-SD-E	Agropyron cristatum	0.61
CPB5	Agropyron pectiniforme	0.72
DMGB1	Agropyron pectiniforme	0.83
MGB1	Agropyron pectiniforme-Artemisia frigida	0.68
DMGB3	Agropyron pectiniforme - Medicago sativa	0.66
CPI4	Agropyron trachycaulum-Poa pratensis	0.62
CPB4	Bromus biebersteinii	0.94
DMGB4	Bromus inermis	1.00
CPI5	Bromus inermis-Poa pratensis/Taraxacum officinale	0.71
FFB3	Bromus inermis - Medicago sativa	0.63
MGB3	Bromus inermis - Medicago sativa - Poa pratensis	0.68
NFB01	Bromus inermis - Poa pratensis / Taraxacum officinale	0.69
ER7-APAD	Bromus inermis – Poa pratensis – Symphoricarpos occidentalis – Elaeagnus commutata – Elymus trachycaulus sbsp. trachycaulus	0.51
DMGB6	Elymus junceus	0.77
FFC5	Festuca idahoensis - Festuca campestris - Koeleria macrantha	0.69
CPI2	Festuca rubra-Poa pratensis	0.86
NFA24	Festuca rubra - Poa pratensis	0.61
CPB1	Medicago sativa/Bromus spp.- Poa pratensis	0.75
CPI6	Phleum pratense-Bromus inermis	0.56
DMGB5	Phleum pratense – Dactylis glomerata- Bromus inermis	0.75
PEZ-SUB-A	Poa pratensis	0.53
NFB02	Poa pratensis	0.75
CPI3	Poa pratensis-Agropyron dasystachyum/Taraxacum officinale	0.50
CPB2	Poa pratensis-Bromus inermis	0.84
FFB2	Poa pratensis - Artemisia frigida	0.76
FFB4	Poa pratensis - Bromus inermis - Agropyron dasystachyum and Agropyron smithii	0.72
FFB1	Poa pratensis - Phleum pratense	0.55
ER8M-APAD	Poa pratensis – Schizachyrium scoparium – Hesperostipa comata	0.53
NFA23	Poa pratensis / Taraxacum officinale	0.50
NFC15	Symphoricarpos occidentalis / Poa pratensis	0.50
CPB3	Symphoricarpos occidentalis/Poa pratensis-Bromus inermis	0.64

Appendix A

Summary of diagnostic vegetation, climate, physical site characteristics within Level 2 zones of the Level 1 Grassland, Parkland and Steppe Zone (adapted from Baldwin et al. 2020).

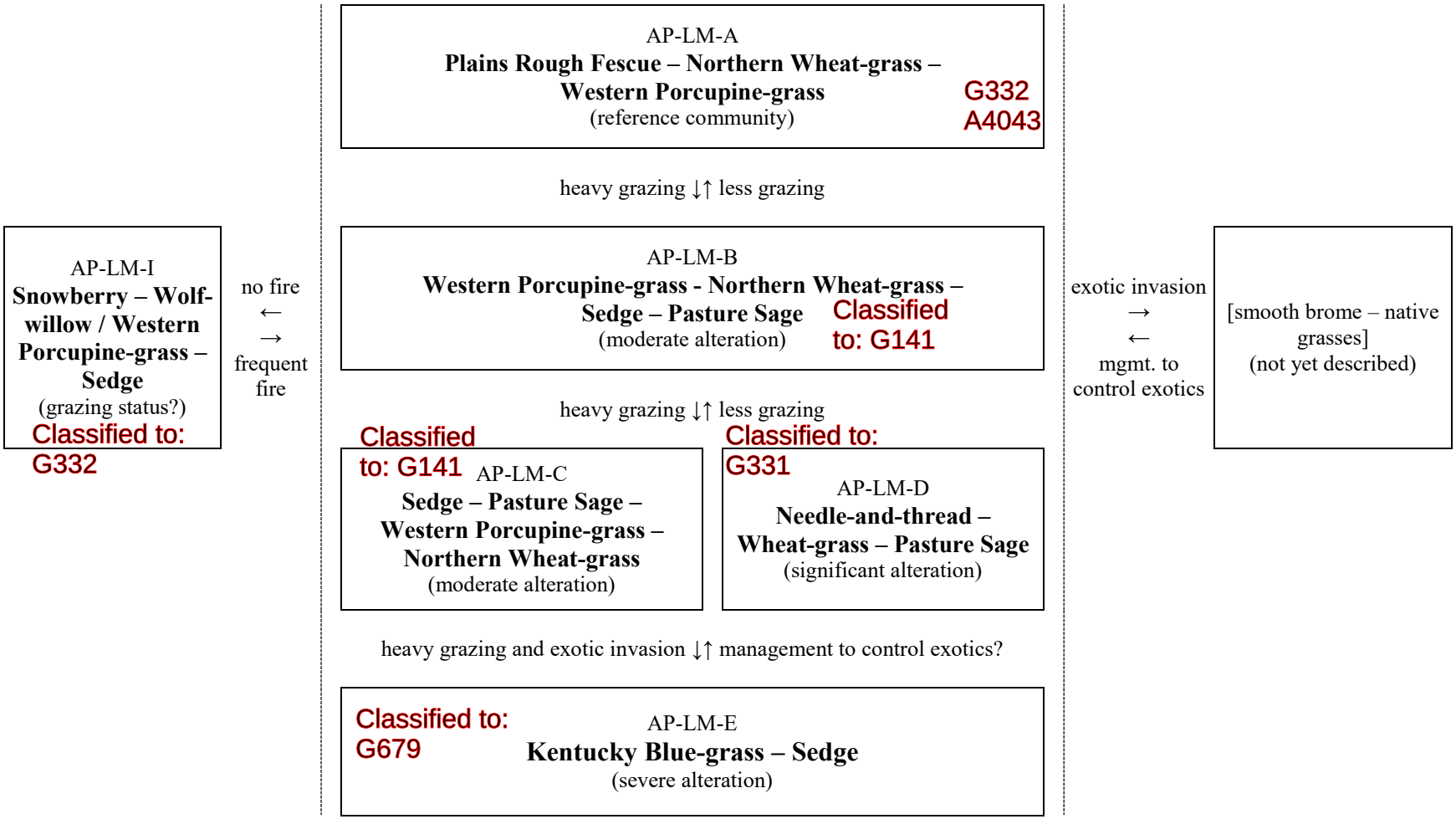
MAP = Mean Annual Precipitation (mm); MAT = mean annual temperature (°C); mASL= meters above sea level				
Level 2 Zone	**Diagnostic species**	**Climate**	**Landscape**	**Landuse**
Rocky Mountain Foothills Fescue (Alberta)	*Festuca campestris, Festuca idahoensis, Danthonia parryi*	MAP 400-590 (mainly May-Sept), MAT 4 °C warm summers, cool winters	Undulating plain (some hill systems and bedrock ridges); 800-1500 mASL; weakly calcareous tills, deep Chernozems	Cool season crops and livestock grazing
Great Plains Fescue Grassland (Alberta-Saskatchewan)	*Festuca halli, Hesperostipa curtiseta*	MAP 350-500 (mainly May-Sept), MAT 2.5 °C; warm summers, cold winters	Undulating plain (also low bedrock hills, valleys, hummocky till, sand dunes); <1000 mASL; weakly calcareous tills, deep Chernozems, some Solonetz	Crops, some livestock grazing.
Great Plains Mixedgrass Grassland (Alberta-Saskatchewan)	Relatively moist: mixed grasses (*H. curtiseta, Elymus lanceolatus, Pascopyrum smithii*) Drier: mixed grasses (*Hesperostipa comata, Bouteloua gracilis, Koeleria macrantha*, dryland sedges) Shrubs: Symphoricarpos occidentalis, Artemisia filifolia	MAP 300-430 (mainly May-Sept), MAT 3.6 °C; warm summers, cold winters. Driest conditions – lower elevations SW Saskatchewan, southeast Alberta	Undulating plain (also low bedrock hills, valleys, hummocky till, sand dunes); <1000 mASL; weakly calcareous tills, deep Chernozems, some Solonetz.	Dryland crops (irrigation), livestock grazing
Central Tallgrass Grassland	*Andropogon gerardii, Sporobolus heterolepis, Sorghastrum nutans, Schizachyrium scoparium, Panicum virgatum*	MAP 525 (mainly May-Sept), MAT 2.8 °C; warm summers, cold winters. Relatively wet and warm compared to other grassland zones but inadequate moisture for trees.	Mainly a level plain of deep glaciolacustrine silts and clays (some valley complexes and dune fields); <300 mASL; Vertisols, Chernozems, Gleysols.	Mostly cultivated crops

MAP = Mean Annual Precipitation (mm); MAT = mean annual temperature (°C); mASL= meters above sea level				
Level 2 Zone	**Diagnostic species**	**Climate**	**Landscape**	**Landuse**
Great Plains Aspen Parkland	Woodlands (dominant northward, isolated southward): *Populus tremuloides, Populus balsamifera, Acer negundo, Fraxinus pennsylvanica, Quercus macrocarpa*. *Grassland component* (dominant southward, isolated northward): *Festuca hallii, Heterostipa* sp., *Bouteloua gracilis, Elymus lanceolatus,* tallgrass species in Manitoba (see Central Tallgrass Grassland)	MAP 350-500 in Alberta-and western Saskatchewan, increasing to 400-540 and warmer in eastern Saskatchewan and Manitoba. MAT 2 °C; warm summers, cold winters.	Undulating plain (also low bedrock hills, valleys, hummocky till, sand dunes); <1000 mASL; weakly calcareous tills in Alberta, Saskatchewan; glaciolacustrine silts and clays (some sandy terrain) in Manitoba	Crops, some livestock grazing

Appendix B

State and transition models showing examples of the relationship between the group assigned to the reference community and the group into which the associated non-reference communities were classified, Prairie Provinces, Canada.

Aspen Parkland: Loam Ecosite
Drier Microsites



Thorpe, J. 2014c. Communities on Loam Ecosite, version 2. Prepared for the Saskatchewan Prairie Conservation Action Plan. Prepare by Saskatchewan Research Council. Publication 4. 44p.

Appendix C

List of plant species from the CNVC prairie provinces dataset sorted by native status, family, growth form, and species. Prairie Provinces, Canada. Synonyms are provided for taxa that are included in plant community code titles and that do not match with current taxonomy.

Appendix C

Plant species from CNVC prairie provinces dataset. Synonyms are provided for taxa that are included in plant community code titles and that do not match with current taxonomy.

Establishment Means	Family	Scientific Name	Growth Form	Unaccepted Synonym from Plant Community Titles
No Ranking	Linaceae	*Linum pratense*	Forbs	
Native	Amaranthaceae	*Atriplex argentea*	Forbs	
Native	Amaranthaceae	*Atriplex canescens*	Forbs	
Native	Amaranthaceae	*Atriplex dioica*	Forbs	
Native	Amaranthaceae	*Atriplex gardneri*	Forbs	
Native	Amaranthaceae	*Atriplex suckleyi*	Forbs	
Native	Amaranthaceae	*Blitum nuttallianum*	Forbs	
Native	Amaranthaceae	*Chenopodiastrum simplex*	Forbs	
Native	Amaranthaceae	*Chenopodium desiccatum*	Forbs	
Native	Amaranthaceae	*Chenopodium fremontii*	Forbs	
Native	Amaranthaceae	*Chenopodium leptophyllum*	Forbs	
Native	Amaranthaceae	*Chenopodium pratericola*	Forbs	
Native	Amaranthaceae	*Corispermum americanum*	Forbs	
Native	Amaranthaceae	*Krascheninnikovia lanata*	Forbs	
Native	Amaranthaceae	*Oxybasis rubra*	Forbs	
Native	Amaranthaceae	*Oxybasis salina*	Forbs	
Native	Amaranthaceae	*Salicornia depressa*	Forbs	
Native	Amaranthaceae	*Salicornia rubra*	Forbs	
Native	Amaranthaceae	*Sarcobatus vermiculatus*	Forbs	
Native	Amaranthaceae	*Suaeda calceoliformis*	Forbs	
Native	Amaryllidaceae	*Allium cernuum*	Forbs	
Native	Amaryllidaceae	*Allium stellatum*	Forbs	
Native	Amaryllidaceae	*Allium textile*	Forbs	
Native	Anacardiaceae	*Rhus aromatica*	Deciduous Shrubs	
Native	Anacardiaceae	*Toxicodendron radicans*	Deciduous Shrubs	
Native	Apiaceae	*Cicuta maculata*	Forbs	
Native	Apiaceae	*Cymopterus glomeratus*	Forbs	
Native	Apiaceae	*Heracleum maximum*	Forbs	
Native	Apiaceae	*Lomatium foeniculaceum*	Forbs	
Native	Apiaceae	*Lomatium macrocarpum*	Forbs	
Native	Apiaceae	*Lomatium triternatum*	Forbs	
Native	Apiaceae	*Musineon divaricatum*	Forbs	
Native	Apiaceae	*Osmorhiza berteroi*	Forbs	
Native	Apiaceae	*Osmorhiza depauperata*	Forbs	
Native	Apiaceae	*Perideridia gairdneri*	Forbs	
Native	Apiaceae	*Sanicula marilandica*	Forbs	
Native	Apiaceae	*Sium suave*	Forbs	
Native	Apiaceae	*Zizia aptera*	Forbs	
Native	Apocynaceae	*Apocynum androsaemifolium*	Forbs	
Native	Apocynaceae	*Apocynum cannabinum*	Forbs	
Native	Apocynaceae	*Asclepias ovalifolia*	Forbs	
Native	Apocynaceae	*Asclepias speciosa*	Forbs	
Native	Apocynaceae	*Asclepias verticillata*	Forbs	
Native	Apocynaceae	*Asclepias viridiflora*	Forbs	
Native	Araceae	*Calla palustris*	Forbs	
Native	Araceae	*Lemna minor*	Forbs	
Native	Araceae	*Lemna trisulca*	Forbs	
Native	Araliaceae	*Aralia nudicaulis*	Forbs	
Native	Asparagaceae	*Maianthemum canadense*	Forbs	
Native	Asparagaceae	*Maianthemum racemosum*	Forbs	
Native	Asparagaceae	*Maianthemum stellatum*	Forbs	
Native	Asteraceae	*Achillea sibirica*	Forbs	
Native	Asteraceae	*Agoseris glauca*	Forbs	
Native	Asteraceae	*Almutaster pauciflorus*	Forbs	
Native	Asteraceae	*Ambrosia acanthicarpa*	Forbs	
Native	Asteraceae	*Anaphalis margaritacea*	Forbs	
Native	Asteraceae	*Antennaria anaphaloides*	Forbs	
Native	Asteraceae	*Antennaria dimorpha*	Forbs	
Native	Asteraceae	*Antennaria howellii*	Forbs	
Native	Asteraceae	*Antennaria lanata*	Forbs	
Native	Asteraceae	*Antennaria microphylla*	Forbs	
Native	Asteraceae	*Antennaria neglecta*	Forbs	
Native	Asteraceae	*Antennaria parvifolia*	Forbs	
Native	Asteraceae	*Antennaria pulcherrima*	Forbs	
Native	Asteraceae	*Antennaria rosea*	Forbs	
Native	Asteraceae	*Arnica fulgens*	Forbs	
Native	Asteraceae	*Arnica sororia*	Forbs	
Native	Asteraceae	*Artemisia campestris*	Forbs	
Native	Asteraceae	*Artemisia cana*	Forbs	
Native	Asteraceae	*Artemisia dracunculus*	Forbs	
Native	Asteraceae	*Artemisia frigida*	Forbs	
Native	Asteraceae	*Artemisia longifolia*	Forbs	
Native	Asteraceae	*Artemisia ludoviciana*	Forbs	
Native	Asteraceae	*Artemisia michauxiana*	Forbs	
Native	Asteraceae	*Artemisia tridentata*	Deciduous Shrubs	
Native	Asteraceae	*Aster alpinus*	Forbs	
Native	Asteraceae	*Balsamorhiza sagittata*	Forbs	
Native	Asteraceae	*Bidens cernua*	Forbs	
Native	Asteraceae	*Canadanthus modestus*	Forbs	
Native	Asteraceae	*Carduus nutans*	Forbs	
Native	Asteraceae	*Centaurea stoebe*	Forbs	
Native	Asteraceae	*Cirsium drummondii*	Forbs	
Native	Asteraceae	*Cirsium flodmanii*	Forbs	
Native	Asteraceae	*Cirsium undulatum*	Forbs	
Native	Asteraceae	*Crepis occidentalis*	Forbs	
Native	Asteraceae	*Crepis runcinata*	Forbs	

Appendix C

Plant species from CNVC prairie provinces dataset. Synonyms are provided for taxa that are included in plant community code titles and that do not match with current taxonomy.

Establishment Means	Family	Scientific Name	Growth Form	Unaccepted Synonym from Plant Community Titles
Native	Asteraceae	*Dieteria canescens*	Forbs	
Native	Asteraceae	*Echinacea angustifolia*	Forbs	
Native	Asteraceae	*Ericameria nauseosa*	Deciduous Shrubs	
Native	Asteraceae	*Erigeron annuus*	Forbs	
Native	Asteraceae	*Erigeron caespitosus*	Forbs	
Native	Asteraceae	*Erigeron compositus*	Forbs	
Native	Asteraceae	*Erigeron flagellaris*	Forbs	
Native	Asteraceae	*Erigeron glabellus*	Forbs	
Native	Asteraceae	*Erigeron lanatus*	Forbs	
Native	Asteraceae	*Erigeron lonchophyllus*	Forbs	
Native	Asteraceae	*Erigeron philadelphicus*	Forbs	
Native	Asteraceae	*Erigeron pumilus*	Forbs	
Native	Asteraceae	*Erigeron radicatus*	Forbs	
Native	Asteraceae	*Erigeron speciosus*	Forbs	
Native	Asteraceae	*Eurybia conspicua*	Forbs	
Native	Asteraceae	*Euthamia graminifolia*	Forbs	
Native	Asteraceae	*Grindelia squarrosa*	Forbs	
Native	Asteraceae	*Gutierrezia sarothrae*	Forbs	
Native	Asteraceae	*Helianthus nuttallii*	Forbs	
Native	Asteraceae	*Helianthus pauciflorus*	Forbs	
Native	Asteraceae	*Helianthus petiolaris*	Forbs	
Native	Asteraceae	*Heterotheca villosa*	Forbs	
Native	Asteraceae	*Hieracium umbellatum*	Forbs	
Native	Asteraceae	*Hymenoxys richardsonii*	Forbs	
Native	Asteraceae	*Iva axillaris*	Forbs	
Native	Asteraceae	*Lactuca tatarica*	Forbs	
Native	Asteraceae	*Liatris ligulistylis*	Forbs	
Native	Asteraceae	*Liatris punctata*	Forbs	
Native	Asteraceae	*Lygodesmia juncea*	Forbs	
Native	Asteraceae	*Mulgedium pulchellum*	Forbs	
Native	Asteraceae	*Nabalus racemosus*	Forbs	
Native	Asteraceae	*Packera cana*	Forbs	
Native	Asteraceae	*Packera indecora*	Forbs	
Native	Asteraceae	*Packera pauciflora*	Forbs	
Native	Asteraceae	*Packera paupercula*	Forbs	
Native	Asteraceae	*Petasites frigidus*	Forbs	
Native	Asteraceae	*Pyrrocoma lanceolata*	Forbs	
Native	Asteraceae	*Ratibida columnifera*	Forbs	
Native	Asteraceae	*Rudbeckia hirta*	Forbs	
Native	Asteraceae	*Rudbeckia laciniata*	Forbs	
Native	Asteraceae	*Senecio eremophilus*	Forbs	
Native	Asteraceae	*Senecio integerrimus*	Forbs	
Native	Asteraceae	*Senecio triangularis*	Forbs	
Native	Asteraceae	*Shinnersoseris rostrata*	Forbs	
Native	Asteraceae	*Solidago bicolor*	Forbs	
Native	Asteraceae	*Solidago canadensis*	Forbs	
Native	Asteraceae	*Solidago gigantea*	Forbs	
Native	Asteraceae	*Solidago missouriensis*	Forbs	
Native	Asteraceae	*Solidago mollis*	Forbs	
Native	Asteraceae	*Solidago multiradiata*	Forbs	
Native	Asteraceae	*Solidago nemoralis*	Forbs	
Native	Asteraceae	*Solidago ptarmicoides*	Forbs	
Native	Asteraceae	*Solidago rigida*	Forbs	
Native	Asteraceae	*Solidago simplex*	Forbs	
Native	Asteraceae	*Sonchus arvensis*	Forbs	
Native	Asteraceae	*Symphyotrichum boreale*	Forbs	
Native	Asteraceae	*Symphyotrichum ciliatum*	Forbs	
Native	Asteraceae	*Symphyotrichum ciliolatum*	Forbs	
Native	Asteraceae	*Symphyotrichum ericoides*	Forbs	
Native	Asteraceae	*Symphyotrichum falcatum*	Forbs	
Native	Asteraceae	*Symphyotrichum laeve*	Forbs	
Native	Asteraceae	*Symphyotrichum lanceolatum*	Forbs	
Native	Asteraceae	*Symphyotrichum puniceum*	Forbs	
Native	Asteraceae	*Tephroseris palustris*	Forbs	*Senecio congestus*
Native	Asteraceae	*Tetraneuris acaulis*	Forbs	
Native	Asteraceae	*Townsendia hookeri*	Forbs	
Native	Asteraceae	*Xanthisma grindelioides*	Forbs	
Native	Asteraceae	*Xanthisma spinulosum*	Forbs	
Native	Balsaminaceae	*Impatiens capensis*	Forbs	
Native	Betulaceae	*Alnus alnobetula*	Deciduous Shrubs	
Native	Betulaceae	*Betula glandulosa*	Deciduous Shrubs	
Native	Betulaceae	*Betula occidentalis*	Deciduous Trees	
Native	Betulaceae	*Betula papyrifera*	Deciduous Trees	
Native	Betulaceae	*Betula pumila*	Deciduous Shrubs	
Native	Betulaceae	*Corylus americana*	Deciduous Shrubs	
Native	Betulaceae	*Corylus cornuta*	Deciduous Shrubs	
Native	Boraginaceae	*Cryptantha fendleri*	Forbs	
Native	Boraginaceae	*Cryptantha minima*	Forbs	
Native	Boraginaceae	*Hackelia deflexa*	Forbs	
Native	Boraginaceae	*Hackelia floribunda*	Forbs	
Native	Boraginaceae	*Lappula occidentalis*	Forbs	
Native	Boraginaceae	*Lithospermum canescens*	Forbs	
Native	Boraginaceae	*Lithospermum incisum*	Forbs	
Native	Boraginaceae	*Lithospermum occidentale*	Forbs	
Native	Boraginaceae	*Lithospermum ruderale*	Forbs	
Native	Boraginaceae	*Mertensia paniculata*	Forbs	

Appendix C

Plant species from CNVC prairie provinces dataset. Synonyms are provided for taxa that are included in plant community code titles and that do not match with current taxonomy.

Establishment Means	Family	Scientific Name	Growth Form	Unaccepted Synonym from Plant Community Titles
Native	Boraginaceae	*Oreocarya glomerata*	Forbs	
Native	Brassicaceae	*Arabis hirsuta*	Forbs	
Native	Brassicaceae	*Arabis pycnocarpa*	Forbs	
Native	Brassicaceae	*Boechera divaricarpa*	Forbs	
Native	Brassicaceae	*Boechera holboellii*	Forbs	
Native	Brassicaceae	*Descurainia incana*	Forbs	
Native	Brassicaceae	*Descurainia pinnata*	Forbs	
Native	Brassicaceae	*Draba aurea*	Forbs	
Native	Brassicaceae	*Draba nemorosa*	Forbs	
Native	Brassicaceae	*Erysimum asperum*	Forbs	
Native	Brassicaceae	*Erysimum inconspicuum*	Forbs	
Native	Brassicaceae	*Lepidium ramosissimum*	Forbs	
Native	Brassicaceae	*Physaria arenosa*	Forbs	
Native	Brassicaceae	*Rorippa palustris*	Forbs	
Native	Brassicaceae	*Turritis glabra*	Forbs	
Native	Cactaceae	*Escobaria vivipara*	Cacti	
Native	Cactaceae	*Opuntia fragilis*	Cacti	
Native	Cactaceae	*Opuntia polyacantha*	Cacti	
Native	Campanulaceae	*Campanula rotundifolia*	Forbs	
Native	Campanulaceae	*Lobelia kalmii*	Forbs	
Native	Campanulaceae	*Lobelia spicata*	Forbs	
Native	Campanulaceae	*Palustricodon aparinoides*	Forbs	
Native	Cannabaceae	*Humulus lupulus*	Vines	
Native	Caprifoliaceae	*Linnaea borealis*	Forbs	
Native	Caprifoliaceae	*Lonicera dioica*	Deciduous Shrubs	
Native	Caprifoliaceae	*Lonicera involucrata*	Deciduous Shrubs	
Native	Caprifoliaceae	*Symphoricarpos albus*	Deciduous Shrubs	
Native	Caprifoliaceae	*Symphoricarpos occidentalis*	Deciduous Shrubs	
Native	Caryophyllaceae	*Arenaria congesta*	Forbs	
Native	Caryophyllaceae	*Arenaria longipedunculata*	Forbs	
Native	Caryophyllaceae	*Cerastium arvense*	Forbs	
Native	Caryophyllaceae	*Cerastium fontanum*	Forbs	
Native	Caryophyllaceae	*Cerastium nutans*	Forbs	
Native	Caryophyllaceae	*Moehringia lateriflora*	Forbs	
Native	Caryophyllaceae	*Paronychia sessiliflora*	Forbs	
Native	Caryophyllaceae	*Silene acaulis*	Forbs	
Native	Caryophyllaceae	*Silene antirrhina*	Forbs	
Native	Caryophyllaceae	*Silene drummondii*	Forbs	
Native	Caryophyllaceae	*Silene menziesii*	Forbs	
Native	Caryophyllaceae	*Silene parryi*	Forbs	
Native	Caryophyllaceae	*Stellaria calycantha*	Forbs	
Native	Caryophyllaceae	*Stellaria longifolia*	Forbs	
Native	Caryophyllaceae	*Stellaria longipes*	Forbs	
Native	Celastraceae	*Parnassia palustris*	Forbs	
Native	Cistaceae	*Hudsonia tomentosa*	Forbs	
Native	Cleomaceae	*Peritoma serrulata*	Forbs	
Native	Convolvulaceae	*Calystegia macounii*	Forbs	
Native	Cornaceae	*Cornus canadensis*	Forbs	
Native	Cornaceae	*Cornus sericea*	Deciduous Shrubs	*Cornus stolonifera*
Native	Cupressaceae	*Juniperus communis*	Evergreen Shrubs	
Native	Cupressaceae	*Juniperus horizontalis*	Evergreen Shrubs	
Native	Cyperaceae	*Amphiscirpus nevadensis*	Sedges	*Scirpus nevadensis*
Native	Cyperaceae	*Bolboschoenus maritimus*	Sedges	
Native	Cyperaceae	*Carex*	Sedges	
Native	Cyperaceae	*Carex aquatilis*	Sedges	
Native	Cyperaceae	*Carex atherodes*	Sedges	
Native	Cyperaceae	*Carex aurea*	Sedges	
Native	Cyperaceae	*Carex backii*	Sedges	
Native	Cyperaceae	*Carex concinna*	Sedges	
Native	Cyperaceae	*Carex deweyana*	Sedges	
Native	Cyperaceae	*Carex diandra*	Sedges	
Native	Cyperaceae	*Carex douglasii*	Sedges	
Native	Cyperaceae	*Carex duriuscula*	Sedges	*Carex stenophylla*
Native	Cyperaceae	*Carex filifolia*	Sedges	
Native	Cyperaceae	*Carex foenea*	Sedges	
Native	Cyperaceae	*Carex hookeriana*	Sedges	
Native	Cyperaceae	*Carex inops*	Sedges	
Native	Cyperaceae	*Carex lacustris*	Sedges	
Native	Cyperaceae	*Carex lasiocarpa*	Sedges	
Native	Cyperaceae	*Carex microglochin*	Sedges	
Native	Cyperaceae	*Carex myosuroides*	Sedges	
Native	Cyperaceae	*Carex obtusata*	Sedges	
Native	Cyperaceae	*Carex pauciflora*	Sedges	
Native	Cyperaceae	*Carex peckii*	Sedges	
Native	Cyperaceae	*Carex pellita*	Sedges	
Native	Cyperaceae	*Carex pensylvanica*	Sedges	
Native	Cyperaceae	*Carex petasata*	Sedges	
Native	Cyperaceae	*Carex petricosa*	Sedges	
Native	Cyperaceae	*Carex phaeocephala*	Sedges	
Native	Cyperaceae	*Carex praegracilis*	Sedges	
Native	Cyperaceae	*Carex prairea*	Sedges	
Native	Cyperaceae	*Carex praticola*	Sedges	
Native	Cyperaceae	*Carex preslii*	Sedges	
Native	Cyperaceae	*Carex rossii*	Sedges	
Native	Cyperaceae	*Carex rostrata*	Sedges	
Native	Cyperaceae	*Carex sartwellii*	Sedges	

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Plant species from CNVC prairie provinces dataset. Synonyms are provided for taxa that are included in plant community code titles and that do not match with current taxonomy.

Establishment Means	Family	Scientific Name	Growth Form	Unaccepted Synonym from Plant Community Titles
Native	Cyperaceae	*Carex scirpoidea*	Sedges	
Native	Cyperaceae	*Carex siccata*	Sedges	
Native	Cyperaceae	*Carex sprengelii*	Sedges	
Native	Cyperaceae	*Carex umbellata*	Sedges	
Native	Cyperaceae	*Carex utriculata*	Sedges	
Native	Cyperaceae	*Carex viridula*	Sedges	
Native	Cyperaceae	*Carex xerantica*	Sedges	
Native	Cyperaceae	*Cyperus schweinitzii*	Sedges	
Native	Cyperaceae	*Eleocharis acicularis*	Sedges	
Native	Cyperaceae	*Eleocharis compressa*	Sedges	
Native	Cyperaceae	*Eleocharis engelmannii*	Sedges	
Native	Cyperaceae	*Eleocharis palustris*	Sedges	
Native	Cyperaceae	*Eriophorum angustifolium*	Sedges	
Native	Cyperaceae	*Eriophorum gracile*	Sedges	
Native	Cyperaceae	*Schoenoplectus acutus*	Sedges	*Scirpus acutus*
Native	Cyperaceae	*Schoenoplectus heterochaetus*	Sedges	
Native	Cyperaceae	*Schoenoplectus pungens*	Sedges	*Scirpus pungens*
Native	Cyperaceae	*Schoenoplectus tabernaemontani*	Sedges	
Native	Cyperaceae	*Scirpus pallidus*	Sedges	
Native	Cystopteridaceae	*Cystopteris fragilis*	Forbs	
Native	Elaeagnaceae	*Elaeagnus commutata*	Deciduous Trees	
Native	Elaeagnaceae	*Shepherdia canadensis*	Deciduous Shrubs	
Native	Equisetaceae	*Equisetum arvense*	Ferns and allies	
Native	Equisetaceae	*Equisetum fluviatile*	Ferns and allies	
Native	Equisetaceae	*Equisetum hyemale*	Ferns and allies	
Native	Equisetaceae	*Equisetum laevigatum*	Ferns and allies	
Native	Equisetaceae	*Equisetum pratense*	Ferns and allies	
Native	Equisetaceae	*Equisetum scirpoides*	Ferns and allies	
Native	Equisetaceae	*Equisetum variegatum*	Ferns and allies	
Native	Ericaceae	*Arctostaphylos uva-ursi*	Evergreen Shrubs	
Native	Ericaceae	*Moneses uniflora*	Forbs	
Native	Ericaceae	*Monotropa uniflora*	Forbs	
Native	Ericaceae	*Orthilia secunda*	Forbs	
Native	Ericaceae	*Pyrola asarifolia*	Forbs	
Native	Ericaceae	*Pyrola chlorantha*	Forbs	
Native	Ericaceae	*Pyrola elliptica*	Forbs	
Native	Ericaceae	*Vaccinium cespitosum*	Deciduous Shrubs	
Native	Euphorbiaceae	*Euphorbia geyeri*	Forbs	
Native	Euphorbiaceae	*Euphorbia serpillifolia*	Forbs	
Native	Fabaceae	*Astragalus agrestis*	Forbs	
Native	Fabaceae	*Astragalus americanus*	Forbs	
Native	Fabaceae	*Astragalus bisulcatus*	Forbs	
Native	Fabaceae	*Astragalus canadensis*	Forbs	
Native	Fabaceae	*Astragalus crassicarpus*	Forbs	
Native	Fabaceae	*Astragalus drummondii*	Forbs	
Native	Fabaceae	*Astragalus flexuosus*	Forbs	
Native	Fabaceae	*Astragalus gilviflorus*	Forbs	
Native	Fabaceae	*Astragalus kentrophyta*	Forbs	
Native	Fabaceae	*Astragalus laxmannii*	Forbs	
Native	Fabaceae	*Astragalus lotiflorus*	Forbs	
Native	Fabaceae	*Astragalus miser*	Forbs	
Native	Fabaceae	*Astragalus missouriensis*	Forbs	
Native	Fabaceae	*Astragalus pectinatus*	Forbs	
Native	Fabaceae	*Astragalus purshii*	Forbs	
Native	Fabaceae	*Astragalus spatulatus*	Forbs	
Native	Fabaceae	*Astragalus tenellus*	Forbs	
Native	Fabaceae	*Dalea candida*	Forbs	
Native	Fabaceae	*Dalea purpurea*	Forbs	
Native	Fabaceae	*Glycyrrhiza lepidota*	Forbs	
Native	Fabaceae	*Hedysarum alpinum*	Forbs	
Native	Fabaceae	*Hedysarum americanum*	Forbs	
Native	Fabaceae	*Hedysarum boreale*	Forbs	
Native	Fabaceae	*Hedysarum sulphurescens*	Forbs	
Native	Fabaceae	*Ladeania lanceolata*	Forbs	*Psoralidium lanceolatum*
Native	Fabaceae	*Ladeania lanceolata*	Forbs	*Psoralea lanceolata*
Native	Fabaceae	*Lathyrus ochroleucus*	Forbs	
Native	Fabaceae	*Lathyrus palustris*	Forbs	
Native	Fabaceae	*Lathyrus venosus*	Forbs	
Native	Fabaceae	*Lupinus argenteus*	Forbs	
Native	Fabaceae	*Lupinus sericeus*	Forbs	
Native	Fabaceae	*Medicago sativa*	Forbs	
Native	Fabaceae	*Oxytropis borealis*	Forbs	
Native	Fabaceae	*Oxytropis campestris*	Forbs	
Native	Fabaceae	*Oxytropis deflexa*	Forbs	
Native	Fabaceae	*Oxytropis lambertii*	Forbs	
Native	Fabaceae	*Oxytropis sericea*	Forbs	
Native	Fabaceae	*Oxytropis splendens*	Forbs	
Native	Fabaceae	*Pediomelum argophyllum*	Forbs	
Native	Fabaceae	*Pediomelum esculentum*	Forbs	
Native	Fabaceae	*Thermopsis rhombifolia*	Forbs	
Native	Fabaceae	*Vicia americana*	Forbs	
Native	Fagaceae	*Quercus macrocarpa*	Deciduous Trees	
Native	Gentianaceae	*Gentiana affinis*	Forbs	
Native	Gentianaceae	*Gentiana fremontii*	Forbs	
Native	Gentianaceae	*Gentianella amarella*	Forbs	
Native	Gentianaceae	*Gentianopsis crinita*	Forbs	

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Establishment Means	Family	Scientific Name	Growth Form	Unaccepted Synonym from Plant Community Titles
Native	Gentianaceae	*Gentianopsis detonsa*	Forbs	
Native	Gentianaceae	*Gentianopsis virgata*	Forbs	
Native	Gentianaceae	*Halenia deflexa*	Forbs	
Native	Geraniaceae	*Geranium richardsonii*	Forbs	
Native	Geraniaceae	*Geranium viscosissimum*	Forbs	
Native	Grossulariaceae	*Ribes americanum*	Deciduous Shrubs	
Native	Grossulariaceae	*Ribes aureum*	Deciduous Shrubs	
Native	Grossulariaceae	*Ribes glandulosum*	Deciduous Shrubs	
Native	Grossulariaceae	*Ribes hirtellum*	Deciduous Shrubs	
Native	Grossulariaceae	*Ribes hudsonianum*	Deciduous Shrubs	
Native	Grossulariaceae	*Ribes lacustre*	Deciduous Shrubs	
Native	Grossulariaceae	*Ribes oxyacanthoides*	Deciduous Shrubs	
Native	Grossulariaceae	*Ribes triste*	Deciduous Shrubs	
Native	Hydrophyllaceae	*Ellisia nyctelea*	Forbs	
Native	Hydrophyllaceae	*Phacelia franklinii*	Forbs	
Native	Iridaceae	*Sisyrinchium montanum*	Forbs	
Native	Iridaceae	*Sisyrinchium septentrionale*	Forbs	
Native	Juncaceae	*Juncus alpinoarticulatus*	Rushes	
Native	Juncaceae	*Juncus arcticus*	Rushes	
Native	Juncaceae	*Juncus balticus*	Rushes	
Native	Juncaceae	*Juncus longistylis*	Rushes	
Native	Juncaceae	*Juncus nodosus*	Rushes	
Native	Juncaginaceae	*Triglochin maritima*	Forbs	
Native	Juncaginaceae	*Triglochin palustris*	Forbs	
Native	Lamiaceae	*Agastache foeniculum*	Forbs	
Native	Lamiaceae	*Hedeoma hispida*	Forbs	
Native	Lamiaceae	*Lycopus americanus*	Forbs	
Native	Lamiaceae	*Lycopus asper*	Forbs	
Native	Lamiaceae	*Monarda fistulosa*	Forbs	
Native	Lamiaceae	*Prunella vulgaris*	Forbs	
Native	Lamiaceae	*Scutellaria galericulata*	Forbs	
Native	Lamiaceae	*Scutellaria lateriflora*	Forbs	
Native	Lamiaceae	*Stachys pilosa*	Forbs	
Native	Lentibulariaceae	*Pinguicula vulgaris*	Forbs	
Native	Lentibulariaceae	*Utricularia vulgaris*	Forbs	
Native	Liliaceae	*Lilium philadelphicum*	Forbs	
Native	Liliaceae	*Prosartes trachycarpa*	Forbs	
Native	Liliaceae	*Streptopus amplexifolius*	Forbs	
Native	Linaceae	*Linum lewisii*	Forbs	
Native	Linaceae	*Linum rigidum*	Forbs	
Native	Malvaceae	*Sphaeralcea coccinea*	Forbs	
Native	Melanthiaceae	*Anticlea elegans*	Forbs	
Native	Melanthiaceae	*Toxicoscordion venenosum*	Forbs	
Native	Menyanthaceae	*Menyanthes trifoliata*	Forbs	
Native	Montiaceae	*Montia parvifolia*	Forbs	
Native	Nyctaginaceae	*Mirabilis linearis*	Forbs	
Native	Nymphaeaceae	*Nuphar variegata*	Forbs	
Native	Oleaceae	*Fraxinus pennsylvanica*	Deciduous Trees	
Native	Onagraceae	*Chamaenerion angustifolium*	Forbs	
Native	Onagraceae	*Epilobium ciliatum*	Forbs	
Native	Onagraceae	*Epilobium glaberrimum*	Forbs	
Native	Onagraceae	*Epilobium leptophyllum*	Forbs	
Native	Onagraceae	*Epilobium palustre*	Forbs	
Native	Onagraceae	*Oenothera biennis*	Forbs	
Native	Onagraceae	*Oenothera caespitosa*	Forbs	
Native	Onagraceae	*Oenothera cespitosa*	Forbs	
Native	Onagraceae	*Oenothera nuttallii*	Forbs	
Native	Onagraceae	*Oenothera serrulata*	Forbs	
Native	Onagraceae	*Oenothera suffrutescens*	Forbs	
Native	Ophioglossaceae	*Botrychium campestre*	Ferns and allies	
Native	Ophioglossaceae	*Botrychium lunaria*	Ferns and allies	
Native	Ophioglossaceae	*Sceptridium multifidum*	Ferns and allies	
Native	Orchidaceae	*Corallorhiza maculata*	Forbs	
Native	Orchidaceae	*Corallorhiza trifida*	Forbs	
Native	Orchidaceae	*Cypripedium parviflorum*	Forbs	
Native	Orchidaceae	*Platanthera aquilonis*	Forbs	
Native	Orchidaceae	*Platanthera hyperborea*	Forbs	
Native	Orobanchaceae	*Aphyllon fasciculatum*	Forbs	
Native	Orobanchaceae	*Aphyllon ludovicianum*	Forbs	
Native	Orobanchaceae	*Castilleja lutescens*	Forbs	
Native	Orobanchaceae	*Castilleja miniata*	Forbs	
Native	Orobanchaceae	*Melampyrum lineare*	Forbs	
Native	Orobanchaceae	*Orthocarpus luteus*	Forbs	
Native	Orobanchaceae	*Pedicularis groenlandica*	Forbs	
Native	Orobanchaceae	*Pedicularis parviflora*	Forbs	
Native	Orobanchaceae	*Rhinanthus minor*	Forbs	
Native	Pinaceae	*Abies balsamea*	Evergreen Trees	
Native	Pinaceae	*Picea glauca*	Evergreen Trees	
Native	Pinaceae	*Pinus albicaulis*	Evergreen Trees	
Native	Pinaceae	*Pinus contorta*	Evergreen Trees	
Native	Pinaceae	*Pinus flexilis*	Evergreen Trees	
Native	Pinaceae	*Pseudotsuga menziesii*	Evergreen Trees	
Native	Plantaginaceae	*Hippuris vulgaris*	Forbs	
Native	Plantaginaceae	*Linaria dalmatica*	Forbs	
Native	Plantaginaceae	*Nuttallanthus canadensis*	Forbs	
Native	Plantaginaceae	*Penstemon albertinus*	Forbs	

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Establishment Means	Family	Scientific Name	Growth Form	Unaccepted Synonym from Plant Community Titles
Native	Plantaginaceae	*Penstemon albidus*	Forbs	
Native	Plantaginaceae	*Penstemon gracilis*	Forbs	
Native	Plantaginaceae	*Penstemon nitidus*	Forbs	
Native	Plantaginaceae	*Penstemon procerus*	Forbs	
Native	Plantaginaceae	*Plantago elongata*	Forbs	
Native	Plantaginaceae	*Plantago eriopoda*	Forbs	
Native	Plantaginaceae	*Plantago patagonica*	Forbs	
Native	Plantaginaceae	*Veronica americana*	Forbs	
Native	Plantaginaceae	*Veronica peregrina*	Forbs	
Native	Plantaginaceae	*Veronica scutellata*	Forbs	
Native	Plantaginaceae	*Veronica serpyllifolia*	Forbs	
Native	Poaceae	*×Elyhordeum macounii*	Grasses	
Native	Poaceae	*Agrostis hyemalis*	Grasses	
Native	Poaceae	*Agrostis scabra*	Grasses	
Native	Poaceae	*Alopecurus aequalis*	Grasses	
Native	Poaceae	*Alopecurus carolinianus*	Grasses	
Native	Poaceae	*Alopecurus magellanicus*	Grasses	
Native	Poaceae	*Andropogon gerardii*	Grasses	
Native	Poaceae	*Anthoxanthum nitens*	Grasses	
Native	Poaceae	*Aristida purpurea*	Grasses	
Native	Poaceae	*Beckmannia syzigachne*	Grasses	
Native	Poaceae	*Bouteloua curtipendula*	Grasses	
Native	Poaceae	*Bouteloua gracilis*	Grasses	
Native	Poaceae	*Bromus ciliatus*	Grasses	
Native	Poaceae	*Bromus latiglumis*	Grasses	
Native	Poaceae	*Bromus porteri*	Grasses	
Native	Poaceae	*Bromus pumpellianus*	Grasses	
Native	Poaceae	*Bromus sitchensis*	Grasses	
Native	Poaceae	*Bromus squarrosus*	Grasses	
Native	Poaceae	*Calamagrostis canadensis*	Grasses	
Native	Poaceae	*Calamagrostis montanensis*	Grasses	
Native	Poaceae	*Calamagrostis rubescens*	Grasses	
Native	Poaceae	*Calamagrostis stricta*	Grasses	
Native	Poaceae	*Cinna latifolia*	Grasses	
Native	Poaceae	*Danthonia californica*	Grasses	
Native	Poaceae	*Danthonia intermedia*	Grasses	
Native	Poaceae	*Danthonia parryi*	Grasses	
Native	Poaceae	*Danthonia spicata*	Grasses	
Native	Poaceae	*Danthonia unispicata*	Grasses	
Native	Poaceae	*Deschampsia cespitosa*	Grasses	
Native	Poaceae	*Dichanthelium depauperatum*	Grasses	
Native	Poaceae	*Dichanthelium leibergii*	Grasses	
Native	Poaceae	*Dichanthelium linearifolium*	Grasses	
Native	Poaceae	*Dichanthelium oligosanthes*	Grasses	
Native	Poaceae	*Distichlis spicata*	Grasses	*Distichlis stricta*
Native	Poaceae	*Elymus ×pseudorepens*	Grasses	
Native	Poaceae	*Elymus albicans*	Grasses	
Native	Poaceae	*Elymus canadensis*	Grasses	
Native	Poaceae	*Elymus elymoides*	Grasses	
Native	Poaceae	*Elymus glaucus*	Grasses	
Native	Poaceae	*Elymus lanceolatus*	Grasses	*Agropyron dasystachyum*
Native	Poaceae	*Elymus trachycaulus*	Grasses	*Agropyron trachycaulum*
Native	Poaceae	*Elymus virginicus*	Grasses	
Native	Poaceae	*Eriocoma hymenoides*	Grasses	
Native	Poaceae	*Eriocoma nelsonii*	Grasses	
Native	Poaceae	*Eriocoma richardsonii*	Grasses	*Stipa richardsonii*
Native	Poaceae	*Eriocoma richardsonii*	Grasses	*Achnatherum richardsonii*
Native	Poaceae	*Festuca campestris*	Grasses	
Native	Poaceae	*Festuca hallii*	Grasses	*Festuca altaica var. hallii*
Native	Poaceae	*Festuca idahoensis*	Grasses	
Native	Poaceae	*Festuca ovina*	Grasses	
Native	Poaceae	*Festuca saximontana*	Grasses	
Native	Poaceae	*Glyceria borealis*	Grasses	
Native	Poaceae	*Glyceria elata*	Grasses	
Native	Poaceae	*Glyceria grandis*	Grasses	
Native	Poaceae	*Glyceria striata*	Grasses	
Native	Poaceae	*Helictochloa hookeri*	Grasses	*Avenula hookeri*
Native	Poaceae	*Hesperostipa comata*	Grasses	*Stipa comata*
Native	Poaceae	*Hesperostipa curtiseta*	Grasses	*Stipa curtiseta*
Native	Poaceae	*Hesperostipa spartea*	Grasses	
Native	Poaceae	*Hierochloe hirta*	Grasses	
Native	Poaceae	*Hierochloe odorata*	Grasses	
Native	Poaceae	*Hordeum jubatum*	Grasses	
Native	Poaceae	*Koeleria macrantha*	Grasses	
Native	Poaceae	*Leymus cinereus*	Grasses	
Native	Poaceae	*Leymus innovatus*	Grasses	
Native	Poaceae	*Melica spectabilis*	Grasses	
Native	Poaceae	*Muhlenbergia asperifolia*	Grasses	
Native	Poaceae	*Muhlenbergia cuspidata*	Grasses	
Native	Poaceae	*Muhlenbergia glomerata*	Grasses	
Native	Poaceae	*Muhlenbergia paniculata*	Grasses	
Native	Poaceae	*Muhlenbergia racemosa*	Grasses	
Native	Poaceae	*Muhlenbergia richardsonis*	Grasses	
Native	Poaceae	*Munroa squarrosa*	Grasses	
Native	Poaceae	*Nassella viridula*	Grasses	*Stipa viridula*
Native	Poaceae	*Oryzopsis asperifolia*	Grasses	

Appendix C

Plant species from CNVC prairie provinces dataset. Synonyms are provided for taxa that are included in plant community code titles and that do not match with current taxonomy.

Establishment Means	Family	Scientific Name	Growth Form	Unaccepted Synonym from Plant Community Titles
Native	Poaceae	*Panicum capillare*	Grasses	
Native	Poaceae	*Panicum miliaceum*	Grasses	
Native	Poaceae	*Panicum virgatum*	Grasses	
Native	Poaceae	*Pascopyrum smithii*	Grasses	*Agropyron smithii*
Native	Poaceae	*Phalaris arundinacea*	Grasses	
Native	Poaceae	*Phleum pratense*	Grasses	
Native	Poaceae	*Piptatheropsis micrantha*	Grasses	
Native	Poaceae	*Piptatheropsis pungens*	Grasses	
Native	Poaceae	*Poa abbreviata*	Grasses	
Native	Poaceae	*Poa alpina*	Grasses	
Native	Poaceae	*Poa arida*	Grasses	
Native	Poaceae	*Poa cusickii*	Grasses	
Native	Poaceae	*Poa glauca*	Grasses	
Native	Poaceae	*Poa interior*	Grasses	
Native	Poaceae	*Poa palustris*	Grasses	
Native	Poaceae	*Poa secunda*	Grasses	*Poa sandbergii*
Native	Poaceae	*Poa stenantha*	Grasses	
Native	Poaceae	*Pseudoroegneria spicata*	Grasses	
Native	Poaceae	*Puccinellia nuttalliana*	Grasses	
Native	Poaceae	*Schizachne purpurascens*	Grasses	
Native	Poaceae	*Schizachyrium scoparium*	Grasses	
Native	Poaceae	*Scolochloa festucacea*	Grasses	
Native	Poaceae	*Sphenopholis intermedia*	Grasses	
Native	Poaceae	*Sporobolus cryptandrus*	Grasses	
Native	Poaceae	*Sporobolus heterolepis*	Grasses	
Native	Poaceae	*Sporobolus hookerianus*	Grasses	*Spartina gracilis*
Native	Poaceae	*Sporobolus michauxianus*	Grasses	
Native	Poaceae	*Sporobolus rigidus*	Grasses	*Calamovilfa longifolia*
Native	Poaceae	*Thinopyrum intermedium*	Grasses	
Native	Poaceae	*Thinopyrum ponticum*	Grasses	
Native	Poaceae	*Vulpia octoflora*	Grasses	
Native	Polemoniaceae	*Navarretia leucocephala*	Forbs	
Native	Polemoniaceae	*Phlox hoodii*	Forbs	
Native	Polemoniaceae	*Polemonium viscosum*	Forbs	
Native	Polygalaceae	*Polygala senega*	Forbs	
Native	Polygalaceae	*Polygaloides paucifolia*	Forbs	
Native	Polygonaceae	*Bistorta vivipara*	Forbs	
Native	Polygonaceae	*Eriogonum flavum*	Forbs	
Native	Polygonaceae	*Persicaria amphibia*	Forbs	
Native	Polygonaceae	*Polygonum amphibium*	Forbs	
Native	Polygonaceae	*Polygonum aviculare*	Forbs	
Native	Polygonaceae	*Polygonum douglasii*	Forbs	
Native	Polygonaceae	*Polygonum ramosissimum*	Forbs	
Native	Polygonaceae	*Rumex fueginus*	Forbs	
Native	Polygonaceae	*Rumex maritimus*	Forbs	
Native	Polygonaceae	*Rumex occidentalis*	Forbs	
Native	Polygonaceae	*Rumex triangulivalvis*	Forbs	
Native	Polygonaceae	*Rumex venosus*	Forbs	
Native	Potamogetonaceae	*Potamogeton alpinus*	Forbs	
Native	Primulaceae	*Androsace occidentalis*	Forbs	
Native	Primulaceae	*Androsace septentrionalis*	Forbs	
Native	Primulaceae	*Lysimachia borealis*	Forbs	
Native	Primulaceae	*Lysimachia ciliata*	Forbs	
Native	Primulaceae	*Lysimachia maritima*	Forbs	
Native	Primulaceae	*Lysimachia thyrsiflora*	Forbs	
Native	Primulaceae	*Primula conjugens*	Forbs	
Native	Primulaceae	*Primula incana*	Forbs	
Native	Primulaceae	*Primula pauciflora*	Forbs	
Native	Ranunculaceae	*Actaea rubra*	Forbs	
Native	Ranunculaceae	*Anemonastrum canadense*	Forbs	
Native	Ranunculaceae	*Anemone cylindrica*	Forbs	
Native	Ranunculaceae	*Anemone multifida*	Forbs	
Native	Ranunculaceae	*Anemone parviflora*	Forbs	
Native	Ranunculaceae	*Caltha palustris*	Forbs	
Native	Ranunculaceae	*Clematis ligusticifolia*	Vines	
Native	Ranunculaceae	*Coptidium lapponicum*	Forbs	
Native	Ranunculaceae	*Delphinium bicolor*	Forbs	
Native	Ranunculaceae	*Delphinium glaucum*	Forbs	
Native	Ranunculaceae	*Halerpestes cymbalaria*	Forbs	
Native	Ranunculaceae	*Pulsatilla patens*	Forbs	
Native	Ranunculaceae	*Ranunculus abortivus*	Forbs	
Native	Ranunculaceae	*Ranunculus cardiophyllus*	Forbs	
Native	Ranunculaceae	*Ranunculus gmelinii*	Forbs	
Native	Ranunculaceae	*Ranunculus macounii*	Forbs	
Native	Ranunculaceae	*Ranunculus rhomboideus*	Forbs	
Native	Ranunculaceae	*Ranunculus sceleratus*	Forbs	
Native	Ranunculaceae	*Thalictrum dasycarpum*	Forbs	
Native	Ranunculaceae	*Thalictrum occidentale*	Forbs	
Native	Ranunculaceae	*Thalictrum venulosum*	Forbs	
Native	Rhamnaceae	*Endotropis alnifolia*	Deciduous Shrubs	
Native	Rosaceae	*Agrimonia striata*	Forbs	
Native	Rosaceae	*Amelanchier alnifolia*	Deciduous Shrubs	
Native	Rosaceae	*Chamaerhodos erecta*	Forbs	
Native	Rosaceae	*Crataegus chrysocarpa*	Deciduous Shrubs	
Native	Rosaceae	*Crataegus dodgei*	Deciduous Shrubs	
Native	Rosaceae	*Dasiphora fruticosa*	Deciduous Shrubs	

Appendix C

Plant species from CNVC prairie provinces dataset. Synonyms are provided for taxa that are included in plant community code titles and that do not match with current taxonomy.

Establishment Means	Family	Scientific Name	Growth Form	Unaccepted Synonym from Plant Community Titles
Native	Rosaceae	*Drymocallis arguta*	Forbs	
Native	Rosaceae	*Fragaria vesca*	Forbs	
Native	Rosaceae	*Fragaria virginiana*	Forbs	
Native	Rosaceae	*Geum aleppicum*	Forbs	
Native	Rosaceae	*Geum macrophyllum*	Forbs	
Native	Rosaceae	*Geum rivale*	Forbs	
Native	Rosaceae	*Geum triflorum*	Forbs	
Native	Rosaceae	*Potentilla anserina*	Forbs	
Native	Rosaceae	*Potentilla concinna*	Forbs	
Native	Rosaceae	*Potentilla diversifolia*	Forbs	
Native	Rosaceae	*Potentilla gracilis*	Forbs	
Native	Rosaceae	*Potentilla hippiana*	Forbs	
Native	Rosaceae	*Potentilla hyparctica*	Forbs	
Native	Rosaceae	*Potentilla lasiodonta*	Forbs	
Native	Rosaceae	*Potentilla norvegica*	Forbs	
Native	Rosaceae	*Potentilla pensylvanica*	Forbs	
Native	Rosaceae	*Potentilla supina*	Forbs	
Native	Rosaceae	*Prunus pensylvanica*	Deciduous Trees	
Native	Rosaceae	*Prunus pumila*	Deciduous Shrubs	
Native	Rosaceae	*Prunus virginiana*	Deciduous Trees	
Native	Rosaceae	*Rosa acicularis*	Deciduous Shrubs	
Native	Rosaceae	*Rosa arkansana*	Deciduous Shrubs	
Native	Rosaceae	*Rosa woodsii*	Deciduous Shrubs	
Native	Rosaceae	*Rubus arcticus*	Forbs	
Native	Rosaceae	*Rubus idaeus*	Deciduous Shrubs	
Native	Rosaceae	*Rubus pubescens*	Forbs	
Native	Rosaceae	*Sorbus scopulina*	Deciduous Trees	
Native	Rosaceae	*Spiraea alba*	Deciduous Shrubs	
Native	Rosaceae	*Spiraea betulifolia*	Deciduous Shrubs	
Native	Rubiaceae	*Galium boreale*	Forbs	
Native	Rubiaceae	*Galium labradoricum*	Forbs	
Native	Rubiaceae	*Galium trifidum*	Forbs	
Native	Rubiaceae	*Galium triflorum*	Forbs	
Native	Rubiaceae	*Houstonia longifolia*	Forbs	
Native	Salicaceae	*Populus ×jackii*	Deciduous Trees	
Native	Salicaceae	*Populus balsamifera*	Deciduous Trees	
Native	Salicaceae	*Populus deltoides*	Deciduous Trees	
Native	Salicaceae	*Populus tremuloides*	Deciduous Trees	
Native	Salicaceae	*Salix amygdaloides*	Deciduous Trees	
Native	Salicaceae	*Salix athabascensis*	Deciduous Shrubs	
Native	Salicaceae	*Salix bebbiana*	Deciduous Shrubs	
Native	Salicaceae	*Salix brachycarpa*	Deciduous Shrubs	
Native	Salicaceae	*Salix candida*	Deciduous Shrubs	
Native	Salicaceae	*Salix discolor*	Deciduous Shrubs	
Native	Salicaceae	*Salix exigua*	Deciduous Shrubs	
Native	Salicaceae	*Salix famelica*	Deciduous Shrubs	
Native	Salicaceae	*Salix interior*	Deciduous Shrubs	
Native	Salicaceae	*Salix lucida*	Deciduous Shrubs	
Native	Salicaceae	*Salix lutea*	Deciduous Shrubs	
Native	Salicaceae	*Salix maccalliana*	Deciduous Shrubs	
Native	Salicaceae	*Salix monticola*	Deciduous Shrubs	
Native	Salicaceae	*Salix myrtillifolia*	Deciduous Shrubs	
Native	Salicaceae	*Salix pedicellaris*	Deciduous Shrubs	
Native	Salicaceae	*Salix petiolaris*	Deciduous Shrubs	
Native	Salicaceae	*Salix planifolia*	Deciduous Shrubs	
Native	Salicaceae	*Salix pseudomonticola*	Deciduous Shrubs	
Native	Salicaceae	*Salix serissima*	Deciduous Shrubs	
Native	Santalaceae	*Comandra umbellata*	Forbs	
Native	Sapindaceae	*Acer negundo*	Deciduous Trees	
Native	Saxifragaceae	*Heuchera cylindrica*	Forbs	
Native	Saxifragaceae	*Heuchera parvifolia*	Forbs	
Native	Saxifragaceae	*Heuchera richardsonii*	Forbs	
Native	Saxifragaceae	*Mitella nuda*	Forbs	
Native	Selaginellaceae	*Selaginella densa*	Lycophytes	
Native	Smilacaceae	*Smilax lasioneura*	Forbs	
Native	Solanaceae	*Physalis virginiana*	Forbs	
Native	Tofieldiaceae	*Triantha glutinosa*	Forbs	
Native	Typhaceae	*Sparganium emersum*	Forbs	
Native	Typhaceae	*Typha latifolia*	Forbs	
Native	Ulmaceae	*Ulmus americana*	Deciduous Trees	
Native	Urticaceae	*Parietaria pensylvanica*	Forbs	
Native	Urticaceae	*Urtica dioica*	Forbs	
Native	Viburnaceae	*Sambucus racemosa*	Deciduous Shrubs	
Native	Viburnaceae	*Viburnum edule*	Deciduous Shrubs	
Native	Viburnaceae	*Viburnum opulus*	Deciduous Shrubs	
Native	Violaceae	*Viola adunca*	Forbs	
Native	Violaceae	*Viola canadensis*	Forbs	
Native	Violaceae	*Viola nephrophylla*	Forbs	
Native	Violaceae	*Viola nuttallii*	Forbs	
Native	Violaceae	*Viola pedatifida*	Forbs	
Native	Violaceae	*Viola renifolia*	Forbs	
Native	Violaceae	*Viola vallicola*	Forbs	
Introduced	Acoraceae	*Acorus calamus*	Forbs	
Introduced	Alismataceae	*Alisma plantago-aquatica*	Forbs	
Introduced	Amaranthaceae	*Amaranthus retroflexus*	Forbs	
Introduced	Amaranthaceae	*Axyris amaranthoides*	Forbs	

Appendix C

Plant species from CNVC prairie provinces dataset. Synonyms are provided for taxa that are included in plant community code titles and that do not match with current taxonomy.

Establishment Means	Family	Scientific Name	Growth Form	Unaccepted Synonym from Plant Community Titles
Introduced	Amaranthaceae	*Bassia scoparia*	Forbs	
Introduced	Amaranthaceae	*Chenopodium album*	Forbs	
Introduced	Amaranthaceae	*Kali tragus*	Forbs	
Introduced	Amaranthaceae	*Kali turgidum*	Forbs	
Introduced	Asparagaceae	*Asparagus officinalis*	Forbs	
Introduced	Asteraceae	*Achillea millefolium*	Forbs	
Introduced	Asteraceae	*Ambrosia psilostachya*	Forbs	
Introduced	Asteraceae	*Arctium minus*	Forbs	
Introduced	Asteraceae	*Artemisia absinthium*	Forbs	
Introduced	Asteraceae	*Artemisia biennis*	Forbs	
Introduced	Asteraceae	*Cirsium arvense*	Forbs	
Introduced	Asteraceae	*Cirsium vulgare*	Forbs	
Introduced	Asteraceae	*Crepis tectorum*	Forbs	
Introduced	Asteraceae	*Erigeron canadensis*	Forbs	
Introduced	Asteraceae	*Gaillardia aristata*	Forbs	
Introduced	Asteraceae	*Helianthus ×laetiflorus*	Forbs	
Introduced	Asteraceae	*Helianthus annuus*	Forbs	
Introduced	Asteraceae	*Lactuca serriola*	Forbs	
Introduced	Asteraceae	*Rhaponticum repens*	Forbs	
Introduced	Asteraceae	*Senecio viscosus*	Forbs	
Introduced	Asteraceae	*Senecio vulgaris*	Forbs	
Introduced	Asteraceae	*Sonchus asper*	Forbs	
Introduced	Asteraceae	*Sonchus oleraceus*	Forbs	
Introduced	Asteraceae	*Taraxacum officinale*	Forbs	
Introduced	Asteraceae	*Tragopogon dubius*	Forbs	
Introduced	Asteraceae	*Tragopogon pratensis*	Forbs	
Introduced	Asteraceae	*Tripleurospermum inodorum*	Forbs	
Introduced	Boraginaceae	*Cynoglossum officinale*	Forbs	
Introduced	Boraginaceae	*Lappula squarrosa*	Forbs	
Introduced	Boraginaceae	*Myosotis stricta*	Forbs	
Introduced	Brassicaceae	*Camelina alyssum*	Forbs	
Introduced	Brassicaceae	*Capsella bursa-pastoris*	Forbs	
Introduced	Brassicaceae	*Descurainia sophia*	Forbs	
Introduced	Brassicaceae	*Erysimum cheiranthoides*	Forbs	
Introduced	Brassicaceae	*Lepidium chalepense*	Forbs	
Introduced	Brassicaceae	*Lepidium densiflorum*	Forbs	
Introduced	Brassicaceae	*Lepidium perfoliatum*	Forbs	
Introduced	Brassicaceae	*Neslia paniculata*	Forbs	
Introduced	Brassicaceae	*Sinapis arvensis*	Forbs	
Introduced	Brassicaceae	*Thlaspi arvense*	Forbs	
Introduced	Campanulaceae	*Campanula rapunculoides*	Forbs	
Introduced	Caryophyllaceae	*Silene latifolia*	Forbs	
Introduced	Caryophyllaceae	*Silene noctiflora*	Forbs	
Introduced	Caryophyllaceae	*Silene vulgaris*	Forbs	
Introduced	Caryophyllaceae	*Stellaria media*	Forbs	
Introduced	Convolvulaceae	*Convolvulus arvensis*	Forbs	
Introduced	Elaeagnaceae	*Shepherdia argentea*	Deciduous Trees	
Introduced	Euphorbiaceae	*Euphorbia esula*	Forbs	
Introduced	Fabaceae	*Astragalus cicer*	Forbs	
Introduced	Fabaceae	*Caragana arborescens*	Deciduous Shrubs	
Introduced	Fabaceae	*Medicago lupulina*	Forbs	
Introduced	Fabaceae	*Melilotus officinalis*	Forbs	
Introduced	Fabaceae	*Trifolium aureum*	Forbs	
Introduced	Fabaceae	*Trifolium hybridum*	Forbs	
Introduced	Fabaceae	*Trifolium pratense*	Forbs	
Introduced	Fabaceae	*Trifolium repens*	Forbs	
Introduced	Lamiaceae	*Galeopsis tetrahit*	Forbs	
Introduced	Lamiaceae	*Glechoma hederacea*	Forbs	
Introduced	Lamiaceae	*Mentha arvensis*	Forbs	
Introduced	Lamiaceae	*Stachys palustris*	Forbs	
Introduced	Linaceae	*Linum usitatissimum*	Forbs	
Introduced	Nyctaginaceae	*Mirabilis albida*	Forbs	
Introduced	Plantaginaceae	*Linaria vulgaris*	Forbs	
Introduced	Plantaginaceae	*Plantago major*	Forbs	
Introduced	Plantaginaceae	*Veronica anagallis-aquatica*	Forbs	
Introduced	Poaceae	*Agropyron cristatum*	Grasses	*Agropyron pectiniforme*
Introduced	Poaceae	*Agropyron fragile*	Grasses	
Introduced	Poaceae	*Agrostis stolonifera*	Grasses	
Introduced	Poaceae	*Alopecurus pratensis*	Grasses	
Introduced	Poaceae	*Bromus inermis*	Grasses	
Introduced	Poaceae	*Bromus japonicus*	Grasses	
Introduced	Poaceae	*Bromus riparius*	Grasses	*Bromus biebersteinii*
Introduced	Poaceae	*Bromus tectorum*	Grasses	
Introduced	Poaceae	*Dactylis glomerata*	Grasses	
Introduced	Poaceae	*Elymus repens*	Grasses	
Introduced	Poaceae	*Festuca rubra*	Grasses	
Introduced	Poaceae	*Lolium pratense*	Grasses	
Introduced	Poaceae	*Poa compressa*	Grasses	
Introduced	Poaceae	*Poa nemoralis*	Grasses	
Introduced	Poaceae	*Poa pratensis*	Grasses	
Introduced	Poaceae	*Psathyrostachys juncea*	Grasses	*Elymus junceus*
Introduced	Poaceae	*Setaria pumila*	Grasses	
Introduced	Polemoniaceae	*Collomia linearis*	Forbs	
Introduced	Polygonaceae	*Fagopyrum esculentum*	Forbs	
Introduced	Polygonaceae	*Fagopyrum tataricum*	Forbs	
Introduced	Polygonaceae	*Fallopia convolvulus*	Forbs	

Appendix C

Plant species from CNVC prairie provinces dataset. Synonyms are provided for taxa that are included in plant community code titles and that do not match with current taxonomy.

Establishment Means	Family	Scientific Name	Growth Form	Unaccepted Synonym from Plant Community Titles
Introduced	Polygonaceae	*Rumex crispus*	Forbs	
Introduced	Polygonaceae	*Rumex pseudonatronatus*	Forbs	
Introduced	Polygonaceae	*Rumex salicifolius*	Forbs	
Introduced	Ranunculaceae	*Ranunculus acris*	Forbs	
Introduced	Rhamnaceae	*Rhamnus cathartica*	Deciduous Trees	
Introduced	Rosaceae	*Potentilla argentea*	Forbs	
Introduced	Rubiaceae	*Galium aparine*	Forbs	
Introduced	Ulmaceae	*Ulmus pumila*	Deciduous Trees	

Appendix D

Classification cross-reference table showing the assignment of plant communities to macrogroups, groups, and alliances, Prairie Provinces, Canada.

Appendix D

Classification cross-reference table showing the assignment of plant communities to macrogroups, groups, and alliances, Prairie Provinces, Canada.

Macrogroup Code	Macrogroup Title	Group Code	Group Title	Alliance Code	Alliance Title	Plant Community Code	Plant Community Title	Successional Status	Aggregated Ecosite
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	A2309	Prunus virginiana - Symphoricarpos occidentalis Northern Plains Shrubland Alliance	CY3-APAD	*Symphoricarpos occidentalis – Hesperostipa comata – Poa pratensis*	Reference & Minor Alteration	Clay
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	A2309	Prunus virginiana - Symphoricarpos occidentalis Northern Plains Shrubland Alliance	PEZ-SUB-D	*Prunus virginiana - Amelanchier alnifolia*	Reference & Minor Alteration	Subirrigated and Overflow
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	A2309	Prunus virginiana - Symphoricarpos occidentalis Northern Plains Shrubland Alliance	PEZ-TH-A	*Prunus virginiana - Amelanchier alnifolia*	Reference & Minor Alteration	Thin
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	A2404	Pascopyrum smithii Clay Grassland Alliance	CPA1	*Agropyron smithii-Poa*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	A4029	Hesperostipa curtiseta - Elymus lanceolatus Grassland Alliance	AP-SD-A	*Hesperostipa curtiseta*	Reference & Minor Alteration	Sand and Sandy
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	A4029	Hesperostipa curtiseta - Elymus lanceolatus Grassland Alliance	AP-SD-B	*Hesperostipa curtiseta - Carex spp.*	Reference & Minor Alteration	Sand and Sandy
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	A4029	Hesperostipa curtiseta - Elymus lanceolatus Grassland Alliance	DMG-LM-B	*Elymus lanceolatus - Hesperostipa curtiseta*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	A4029	Hesperostipa curtiseta - Elymus lanceolatus Grassland Alliance	DMGA1	*Symphoricarpos occidentalis /Stipa curtiseta - Stipa comata*	Reference & Minor Alteration	Subirrigated and Overflow
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	A4029	Hesperostipa curtiseta - Elymus lanceolatus Grassland Alliance	DMGC11	*Artemisia cana / Stipa curtiseta – Bouteloua gracilis*	Reference & Minor Alteration	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	A4029	Hesperostipa curtiseta - Elymus lanceolatus Grassland Alliance	DMGC3	*Artemisia cana / Stipa curtiseta – Agropyron spp.*	Reference & Minor Alteration	Subirrigated and Overflow
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	A4029	Hesperostipa curtiseta - Elymus lanceolatus Grassland Alliance	LM2-APAD	*Hesperostipa curtiseta – Nassella viridula – Pascopyrum smithii*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	A4029	Hesperostipa curtiseta - Elymus lanceolatus Grassland Alliance	MG-GR-A	*Hesperostipa curtiseta - Elymus lanceolatus - Hesperostipa comata*	Reference & Minor Alteration	Shallow to gravel
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	A4029	Hesperostipa curtiseta - Elymus lanceolatus Grassland Alliance	MG-LM-A	*Hesperostipa curtiseta - Elymus lanceolatus*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	A4029	Hesperostipa curtiseta - Elymus lanceolatus Grassland Alliance	MG-LM-B	*Hesperostipa curtiseta - Elymus lanceolatus - Carex spp. - Artemisia frigida*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	A4029	Hesperostipa curtiseta - Elymus lanceolatus Grassland Alliance	MG-SO-A	*Elymus lanceolatus / Pascopyrum smithii - Hesperostipa curtiseta - Koeleria macrantha*	Reference & Minor Alteration	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	A4029	Hesperostipa curtiseta - Elymus lanceolatus Grassland Alliance	MG-SUB-A	*Pascopyrum smithii - Hesperostipa curtiseta - Elymus lanceolatus*	Reference & Minor Alteration	Subirrigated and Overflow
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	A4029	Hesperostipa curtiseta - Elymus lanceolatus Grassland Alliance	MG-TH-A	*Hesperostipa curtiseta - Elymus lanceolatus - Nassella viridula*	Reference & Minor Alteration	Thin
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	A4029	Hesperostipa curtiseta - Elymus lanceolatus Grassland Alliance	MGA36	*Stipa curtiseta – Agropyron dasystachyum*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	A4029	Hesperostipa curtiseta - Elymus lanceolatus Grassland Alliance	MGA4	*Stipa comata - Agropyron dasystachyum - Koeleria macrantha*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	A4029	Hesperostipa curtiseta - Elymus lanceolatus Grassland Alliance	SD2-APAD	*Hesperostipa curtiseta – Carex – Bouteloua gracilis*	Reference & Minor Alteration	Sand and Sandy
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	N/A	Non-reference, unassigned	AP-GR-B	*Artemisia frigida - Hesperostipa comata - Koeleria macrantha - Carex spp.*	Non-Reference	Shallow to gravel

Appendix D

Classification cross-reference table showing the assignment of plant communities to macrogroups, groups, and alliances, Prairie Provinces, Canada.

Macrogroup Code	Macrogroup Title	Group Code	Group Title	Alliance Code	Alliance Title	Plant Community Code	Plant Community Title	Successional Status	Aggregated Ecosite
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	N/A	Non-reference, unassigned	AP-SD-C	*Carex spp. - Hesperostipa curtiseta - Koeleria macrantha*	Non-Reference	Sand and Sandy
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	N/A	Non-reference, unassigned	AP-SD-D	*Hesperostipa comata - Koeleria macrantha - Carex spp. - Bouteloua gracilis*	Non-Reference	Sand and Sandy
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	N/A	Non-reference, unassigned	AP-SD-F	*Agropyron cristatum - Carex spp.*	Non-Reference	Sand and Sandy
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	N/A	Non-reference, unassigned	AP-TH-B	*Hesperostipa comata - Bouteloua gracilis*	Non-Reference	Thin
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	N/A	Non-reference, unassigned	CY2-APAD	*Hesperostipa curtiseta – Carex – Poa pratensis – Avenula hookeri – Pascopyrum smithii*	Non-Reference	Clay
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	N/A	Non-reference, unassigned	LM3-APAD	*Pascopyrum smithii – Hesperostipa curtiseta – Carex*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	N/A	Non-reference, unassigned	LM6-APAD	*Poa pratensis – Symphoricarpos occidentalis – Bromus inermis – Carex*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	N/A	Non-reference, unassigned	MG-GR-B	*Hesperostipa comata - Koeleria macrantha - Artemisia frigida*	Non-Reference	Shallow to gravel
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	N/A	Non-reference, unassigned	MG-GR-C	*Artemisia frigida - Koeleria macrantha - Hesperostipa comata - Bouteloua gracilis*	Non-Reference	Shallow to gravel
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	N/A	Non-reference, unassigned	MG-LM-C	*Hesperostipa comata - Elymus lanceolatus*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	N/A	Non-reference, unassigned	MG-LM-D	*Hesperostipa comata - Carex spp. - Artemisia frigida*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	N/A	Non-reference, unassigned	MG-LM-E	*Artemisia frigida - Hesperostipa comata - Elymus lanceolatus*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	N/A	Non-reference, unassigned	MG-LM-F	*Bouteloua gracilis - Artemisia frigida - Koeleria macrantha*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	N/A	Non-reference, unassigned	MG-LM-G	*Agropyron cristatum - Native grasses*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	N/A	Non-reference, unassigned	MG-LM-H	*Symphoricarpos occidentalis - Hesperostipa curtiseta*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	N/A	Non-reference, unassigned	MG-SO-C	*Koeleria macrantha - Artemisia frigida - Carex spp.*	Non-Reference	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	N/A	Non-reference, unassigned	MG-TH-B	*Elymus lanceolatus - Hesperostipa comata - Bouteloua gracilis - Pascopyrum smithii*	Non-Reference	Thin
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	N/A	Non-reference, unassigned	MG-TH-C	*Hesperostipa comata - Bouteloua gracilis - Koeleria macrantha*	Non-Reference	Thin
M051	Great Plains Mixedgrass & Fescue Prairie	G141	Northern Great Plains Mesic Mixedgrass Prairie	N/A	Non-reference, unassigned	SD5-APAD	*Hesperostipa curtiseta – Poa pratensis – Carex*	Non-Reference	Sand and Sandy
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A2300	Bouteloua gracilis - Pascopyrum smithii Solonetzic Grassland Alliance	DMG-SO-A	*Elymus lanceolatus - Hesperostipa comata - Koeleria macrantha*	Reference & Minor Alteration	Solonetzic

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Classification cross-reference table showing the assignment of plant communities to macrogroups, groups, and alliances, Prairie Provinces, Canada.

Macrogroup Code	Macrogroup Title	Group Code	Group Title	Alliance Code	Alliance Title	Plant Community Code	Plant Community Title	Successional Status	Aggregated Ecosite
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A2300	Bouteloua gracilis - Pascopyrum smithii Solonetzic Grassland Alliance	DMG-SO-B	*Elymus lanceolatus - Koeleria macrantha - Artemisia frigida - Bouteloua gracilis*	Reference & Minor Alteration	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A2300	Bouteloua gracilis - Pascopyrum smithii Solonetzic Grassland Alliance	DMGA16	*Agropyron smithii- Carex - Stipa comata*	Reference & Minor Alteration	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A2300	Bouteloua gracilis - Pascopyrum smithii Solonetzic Grassland Alliance	DMGA17	*Stipa comata - Poa sandbergii*	Reference & Minor Alteration	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A2300	Bouteloua gracilis - Pascopyrum smithii Solonetzic Grassland Alliance	DMGA34	*Artemisia cana / Agropyron dasystachyum - Koeleria macrantha*	Reference & Minor Alteration	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A2300	Bouteloua gracilis - Pascopyrum smithii Solonetzic Grassland Alliance	DMGA39	*Agropyron - Poa sandbergii*	Reference & Minor Alteration	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A2300	Bouteloua gracilis - Pascopyrum smithii Solonetzic Grassland Alliance	DMGA8	*Agropyron smithii - Artemisia frigida - Opuntia polyacantha*	Reference & Minor Alteration	Clay
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A2300	Bouteloua gracilis - Pascopyrum smithii Solonetzic Grassland Alliance	MG-CY-A	*Elymus lanceolatus*	Reference & Minor Alteration	Clay
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A2300	Bouteloua gracilis - Pascopyrum smithii Solonetzic Grassland Alliance	MG-CY-B	*Elymus lanceolatus - Pascopyrum smithii - Koeleria macrantha - Carex spp.*	Reference & Minor Alteration	Clay
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A2300	Bouteloua gracilis - Pascopyrum smithii Solonetzic Grassland Alliance	MG-SO-B	*Pascopyrum smithii - Carex spp. - Koeleria macrantha*	Reference & Minor Alteration	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A2300	Bouteloua gracilis - Pascopyrum smithii Solonetzic Grassland Alliance	MGA17	*Agropyron smithii - Koeleria macrantha - Carex*	Reference & Minor Alteration	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A2300	Bouteloua gracilis - Pascopyrum smithii Solonetzic Grassland Alliance	NFA12	*Agropyron smithii - Koeleria macrantha*	Reference & Minor Alteration	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A2300	Bouteloua gracilis - Pascopyrum smithii Solonetzic Grassland Alliance	NFA18	*Agropyron smithii - Festuca hallii - Carex spp.*	Reference & Minor Alteration	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A3586	Artemisia cana / Hesperostipa comata - Pascopyrum smithii Shrubland Alliance	DMG-OV-A	*Artemisia cana - Elymus lanceolatus / Pascopyrum smithii*	Reference & Minor Alteration	Subirrigated and Overflow
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A3586	Artemisia cana / Hesperostipa comata - Pascopyrum smithii Shrubland Alliance	DMGA12	*Artemisia cana/Stipa comata - Bouteloua gracilis*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A3586	Artemisia cana / Hesperostipa comata - Pascopyrum smithii Shrubland Alliance	DMGA23	*Artemisia cana / Stipa comata - Bouteloua gracilis - Koeleria macrantha*	Reference & Minor Alteration	Shallow to gravel
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A3586	Artemisia cana / Hesperostipa comata - Pascopyrum smithii Shrubland Alliance	DMGA24	*Artemisia cana / Stipa comata - Agropyron smithii - Bouteloua gracilis*	Reference & Minor Alteration	Limy
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A3586	Artemisia cana / Hesperostipa comata - Pascopyrum smithii Shrubland Alliance	DMGA37	*Artemisia cana / Stipa comata - Bouteloua gracilis - Koeleria macrantha*	Reference & Minor Alteration	Shallow to gravel
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A3586	Artemisia cana / Hesperostipa comata - Pascopyrum smithii Shrubland Alliance	DMGC10	*Artemisia cana / Agropyron dasystachyum –Poa sandbergii*	Reference & Minor Alteration	Subirrigated and Overflow
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A4389	Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis Grassland Alliance	CPA11	*Stipa comata/Artemisia frigida-Selaginella densa*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A4389	Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis Grassland Alliance	CPC1	*Elaeagnus commutata-Rosa acicularis/Koeleria macrantha-Calamovilfa longifolia*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A4389	Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis Grassland Alliance	DMG-LM-A	*Elymus lanceolatus - Hesperostipa comata*	Reference & Minor Alteration	Loam

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Macrogroup Code	Macrogroup Title	Group Code	Group Title	Alliance Code	Alliance Title	Plant Community Code	Plant Community Title	Successional Status	Aggregated Ecosite
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A4389	Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis Grassland Alliance	DMG-LM-C	*Hesperostipa comata - Elymus lanceolatus - Koeleria macrantha - Bouteloua gracilis*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A4389	Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis Grassland Alliance	DMG-TH-A	*Hesperostipa comata - Elymus lanceolatus - Koeleria macrantha*	Reference & Minor Alteration	Thin
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A4389	Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis Grassland Alliance	DMG-TH-B	*Koeleria macrantha - Hesperostipa comata - Elymus lanceolatus - Bouteloua gracilis*	Reference & Minor Alteration	Thin
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A4389	Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis Grassland Alliance	DMGA14	*Agropyron smithii - Stipa comata*	Reference & Minor Alteration	Sand and Sandy
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A4389	Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis Grassland Alliance	DMGA15	*Agropyron Spp. - Stipa comata - Koeleria macrantha*	Reference & Minor Alteration	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A4389	Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis Grassland Alliance	DMGA18	*Artemisia cana / Stipa comata - Bouteloua gracilis - Koeleria macrantha*	Reference & Minor Alteration	Sand and Sandy
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A4389	Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis Grassland Alliance	DMGA2	*Stipa comata - Agropyron spp*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A4389	Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis Grassland Alliance	DMGA20	*Artemisia cana / Agropyron spp.*	Reference & Minor Alteration	Saline Wet Meadow
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A4389	Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis Grassland Alliance	DMGA22	*Stipa comata - Bouteloua gracilis - Koeleria macrantha*	Reference & Minor Alteration	Thin
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A4389	Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis Grassland Alliance	DMGA3	*Stipa comata - Koeleria macrantha - Bouteloua gracilis*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A4389	Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis Grassland Alliance	DMGA35	*Stipa comata - Koeleria macrantha - Bouteloua gracilis*	Reference & Minor Alteration	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A4389	Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis Grassland Alliance	DMGA5	*Stipa comata - Agropyron dasystachyum - Calamagrostis montanensis*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A4389	Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis Grassland Alliance	DMGA52	*Agropyron smithii - Bouteloua gracilis*	Reference & Minor Alteration	Subirrigated and Overflow
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A4389	Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis Grassland Alliance	DMGA56	*Stipa comata – Distichlis stricta*	Reference & Minor Alteration	Subirrigated and Overflow
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A4389	Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis Grassland Alliance	DMGA61	*Stipa curtiseta – Poa sandbergii – Koeleria macrantha*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A4389	Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis Grassland Alliance	DMGA9	*Stipa comata - Carex filifolia*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A4389	Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis Grassland Alliance	MG-SUB-B	*Artemisia frigida - Pascopyrum smithii*	Reference & Minor Alteration	Subirrigated and Overflow
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A4389	Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis Grassland Alliance	MGA14	*Stipa comata - Agropyron dasystachyum - Koeleria macrantha*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A4389	Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis Grassland Alliance	MGA20	*Agropyron dasystachyum - Stipa comata - Koeleria macrantha*	Reference & Minor Alteration	Thin
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	A4389	Hesperostipa comata - Pascopyrum smithii - Bouteloua gracilis Grassland Alliance	MGA21	*Agropyron - Stipa comata*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	CPC22	*Rosa-Elaeagnus commutata/Poa pratensis*	Non-Reference	Loam

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Macrogroup Code	Macrogroup Title	Group Code	Group Title	Alliance Code	Alliance Title	Plant Community Code	Plant Community Title	Successional Status	Aggregated Ecosite
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	DMG-LM-D	*Koeleria macrantha - Hesperostipa comata - Artemisia frigida - Bouteloua gracilis*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	DMG-LM-E	*Bouteloua gracilis -Hesperostipa comata - Koeleria macrantha - Pascopyrum smithii*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	DMG-LM-F	*Artemisia frigida - Hesperostipa comata - Koeleria macrantha - Elymus lanceolatus*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	DMG-SO-C	*Koeleria macrantha - Elymus lanceolatus - Artemisia frigida - Bouteloua gracilis*	Non-Reference	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	DMG-SO-D	*Koeleria macrantha - Artemisia frigida - Bouteloua gracilis - Elymus lanceolatus*	Non-Reference	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	DMGA10	*Bouteloua gracilis - Stipa comata*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	DMGA30	*Poa sandbergii - Agropyron dasystachyum*	Non-Reference	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	DMGA31	*Artemisia cana / Poa sandbergii - Koeleria macrantha*	Non-Reference	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	DMGA33	*Stipa comata - Artemisia frigida*	Non-Reference	Shallow to gravel
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	DMGA44	*Distichlis stricta - Agropyron smithii*	Non-Reference	Saline Wet Meadow
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	DMGA45	*Agropyron smithii - Distichlis stricta - Grindelia squarrosa*	Non-Reference	Subirrigated and Overflow
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	DMGA46	*Stipa comata - Bouteloua gracilis - Agropyron Spp.*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	DMGA47	*Stipa comata - Bouteloua gracilis - Agropyron dasystachyum*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	DMGA48	*Bouteloua gracilis - Stipa comata*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	DMGA53	*Bouteloua gracilis – Poa sandbergii*	Non-Reference	Subirrigated and Overflow
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	DMGA59	*Agropyron smithii – Carex Spp*	Non-Reference	Subirrigated and Overflow
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	DMGA60	*Carex spp. - Western Wheatgrass –Artemisia ludoviciana*	Non-Reference	Subirrigated and Overflow
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	DMGA62	*Bouteloua gracilis – Poa sandbergii – Stipa comata*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	DMGB7	*Hordeum jubatum – Poa pratensis - Agropyron smithii*	Non-Reference	Subirrigated and Overflow
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	DMGC12	*Artemisia cana / Bouteloua gracilis – Poa sandbergii*	Non-Reference	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	DMGC16	*Artemisia cana / Bouteloua gracilis – Agropyron smithii - Stipa comata*	Non-Reference	Thin

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Classification cross-reference table showing the assignment of plant communities to macrogroups, groups, and alliances, Prairie Provinces, Canada.

Macrogroup Code	Macrogroup Title	Group Code	Group Title	Alliance Code	Alliance Title	Plant Community Code	Plant Community Title	Successional Status	Aggregated Ecosite
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	MG-CY-C	*Artemisia frigida - Elymus lanceolatus - Carex spp. - Pascopyrum smithii*	Non-Reference	Clay
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	MG-TH-D	*Juniperus horizontalis*	Non-Reference	Thin
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	MGA22	*Stipa comata - Koeleria macrantha*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	MGA32	*Agropyron dasystachyum – Koeleria macrantha*	Non-Reference	Thin
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	MGC1	*Artemisia cana / Agropyron smithii - Koeleria macrantha*	Non-Reference	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	MGC3	*Symphoricarpos occidentalis / Carex filifolia - Koeleria macrantha*	Non-Reference	Thin
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	NFA19	*Carex spp. - Poa pratensis*	Non-Reference	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	NFA20	*Carex spp. - Koeleria macrantha - Agropyron smithii*	Non-Reference	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	NFA21	*Agropyron smithii*	Non-Reference	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	NFA22	*Opuntia polyacantha / Koeleria macrantha*	Non-Reference	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G331	Northern Great Plains Dry Mixedgrass Prairie	N/A	Non-reference, unassigned	PEZ-SUB-O	*Juniperus horizontalis - Arctostaphylos uva-ursi / Glycyrrhiza lepidota*	Non-Reference	Subirrigated and Overflow
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A2304	Festuca hallii - Hesperostipa spartea Grassland Alliance	CY5-APAD	*Festuca hallii – Poa pratensis – Achnatherum richardsonii – Carex*	Reference & Minor Alteration	Clay
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A2304	Festuca hallii - Hesperostipa spartea Grassland Alliance	LM1-APAD	*Festuca hallii – Hesperostipa spartea / Hesperostipa curtiseta*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A2304	Festuca hallii - Hesperostipa spartea Grassland Alliance	LM12-APAD	*Festuca hallii – Poa pratensis – Galium boreale – Carex*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A2304	Festuca hallii - Hesperostipa spartea Grassland Alliance	LM7-APAD	*Schizachyrium scoparium – Poa pratensis – Symphyotrichum laeve*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A2304	Festuca hallii - Hesperostipa spartea Grassland Alliance	LM8-APAD	*Festuca hallii – Hesperostipa spartea / Achnatherum richardsonii*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A2304	Festuca hallii - Hesperostipa spartea Grassland Alliance	SD11-APAD	*Schizachyrium scoparium – Hesperostipa spartea – Festuca hallii*	Reference & Minor Alteration	Sand and Sandy
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A2405	Symphoricarpos occidentalis - Elaeagnus commutata / Festuca hallii Shrub Grassland Alliance	CPC21	*Symphoricarpos occidentalis-Elaeagnus commutata/Stipa comata-Poa pratensis*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A2405	Symphoricarpos occidentalis - Elaeagnus commutata / Festuca hallii Shrub Grassland Alliance	CPC29	*Symphoricarpos occidentalis/Festuca hallii*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A2405	Symphoricarpos occidentalis - Elaeagnus commutata / Festuca hallii Shrub Grassland Alliance	CPC5	*Symphoricarpos occidentalis-Elaeagnus commutata/Festuca hallii-Stipa curtiseta*	Reference & Minor Alteration	Loam

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Macrogroup Code	Macrogroup Title	Group Code	Group Title	Alliance Code	Alliance Title	Plant Community Code	Plant Community Title	Successional Status	Aggregated Ecosite
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A2405	Symphoricarpos occidentalis - Elaeagnus commutata / Festuca hallii Shrub Grassland Alliance	ER4-APAD	*Symphoricarpos occidentalis – Hesperostipa spartea – Poa pratensis*	Reference & Minor Alteration	Thin
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A2405	Symphoricarpos occidentalis - Elaeagnus commutata / Festuca hallii Shrub Grassland Alliance	NFC01	*Symphoricarpos occidentalis / Festuca hallii*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A2405	Symphoricarpos occidentalis - Elaeagnus commutata / Festuca hallii Shrub Grassland Alliance	NFC06	*Symphoricarpos occidentalis / Festuca hallii - Stipa curtiseta*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A2405	Symphoricarpos occidentalis - Elaeagnus commutata / Festuca hallii Shrub Grassland Alliance	NFC07	*Symphoricarpos occidentalis / Carex spp. - Festuca hallii*	Reference & Minor Alteration	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A2405	Symphoricarpos occidentalis - Elaeagnus commutata / Festuca hallii Shrub Grassland Alliance	NFC11	*Elaeagnus commutata / Stipa curtiseta - Festuca hallii*	Reference & Minor Alteration	Sand and Sandy
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A4043	Festuca hallii Northwestern Plains Grassland Alliance	AP-LM-A	*Festuca altaica var. hallii - Elymus lanceolatus - Hesperostipa curtiseta*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A4043	Festuca hallii Northwestern Plains Grassland Alliance	CPA2	*Festuca hallii-Agropyron smithii*	Reference & Minor Alteration	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A4043	Festuca hallii Northwestern Plains Grassland Alliance	CPA25	*Festuca hallii*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A4043	Festuca hallii Northwestern Plains Grassland Alliance	CPA3	*Festuca hallii-Stipa curtiseta*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A4043	Festuca hallii Northwestern Plains Grassland Alliance	CPA34	*Bouteloua gracilis-Stipa curtiseta/Artemisia frigida*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A4043	Festuca hallii Northwestern Plains Grassland Alliance	CPA49	*Stipa curtiseta-Festuca hallii*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A4043	Festuca hallii Northwestern Plains Grassland Alliance	CPA6	*Carex -Stipa curtiseta*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A4043	Festuca hallii Northwestern Plains Grassland Alliance	ER3-APAD	*Hesperostipa comata – Avenula hookeri – Carex*	Reference & Minor Alteration	Thin
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A4043	Festuca hallii Northwestern Plains Grassland Alliance	MGA1	*Festuca hallii-Stipa curtiseta-Carex*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A4043	Festuca hallii Northwestern Plains Grassland Alliance	MGA5	*Stipa comata - Festuca hallii - Agropyron smithii*	Reference & Minor Alteration	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A4043	Festuca hallii Northwestern Plains Grassland Alliance	MGA7	*Festuca hallii - Koeleria macrantha -Agropyron dasystachyum*	Reference & Minor Alteration	Shallow to gravel
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A4043	Festuca hallii Northwestern Plains Grassland Alliance	MGA8	*Festuca hallii - Muhlenbergia cuspidata*	Reference & Minor Alteration	Thin
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A4043	Festuca hallii Northwestern Plains Grassland Alliance	NFA01	*Festuca hallii - Stipa curtiseta*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A4043	Festuca hallii Northwestern Plains Grassland Alliance	NFA07	*Stipa curtiseta - Festuca hallii*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A4043	Festuca hallii Northwestern Plains Grassland Alliance	NFA10	*Festuca hallii - Carex spp.*	Reference & Minor Alteration	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A4043	Festuca hallii Northwestern Plains Grassland Alliance	NFA25	*Stipa curtiseta - Carex spp. - Agropyron spp.*	Reference & Minor Alteration	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A4043	Festuca hallii Northwestern Plains Grassland Alliance	NFA28	*Festuca hallii - Stipa curtiseta*	Reference & Minor Alteration	Sand and Sandy
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	A4043	Festuca hallii Northwestern Plains Grassland Alliance	SD1a-APAD	*Festuca hallii – Avenula hookeri – Hesperostipa curtiseta – Hesperostipa spartea*	Reference & Minor Alteration	Sand and Sandy

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Macrogroup Code	Macrogroup Title	Group Code	Group Title	Alliance Code	Alliance Title	Plant Community Code	Plant Community Title	Successional Status	Aggregated Ecosite
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	AP-LM-B	*Hesperostipa curtiseta - Elymus lanceolatus - Carex spp. - Artemisia frigida*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	AP-LM-C	*Carex spp. - Artemisia frigida - Hesperostipa curtiseta - Elymus lanceolatus*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	AP-LM-D	*Hesperostipa comata - Elymus lanceolatus / Pascopyrum smithii - Artemisia frigida*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	AP-LM-E	*Poa pratensis - Carex spp.*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	AP-LM-I	*Symphoricarpos occidentalis - Elaeagnus commutata / Hesperostipa curtiseta - Carex spp.*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	AP-SD-E	*Artemisia frigida - Carex spp. - Hesperostipa comata - Koeleria macrantha*	Non-Reference	Sand and Sandy
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	CPA26	*Festuca hallii - Poa pratensis*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	CPA27	*Poa pratensis-Agropyron trachycaulum*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	CPA4	*Carex spp.-Agropyron smithii-Festuca hallii*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	CPA46	*Poa pratensis-Bromus inermis*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	CPA5	*Carex-Poa pratensis*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	CPA50	*Stipa curtiseta-Festuca hallii-Poa pratensis*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	CPA51	*Poa pratensis-Stipa curtiseta*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	CPA52	*Agropyron trachycaulum-Poa pratensis*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	CPA8	*Carex -Koeleria macrantha*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	CPC23	*Symphoricarpos occidentalis/Bromus inermis*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	CPC30	*Symphoricarpos occidentalis/Festuca hallii-Poa pratensis*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	CPC32	*Symphoricarpos occidentalis/Poa pratensis*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	CPC6	*Symphoricarpos occidentalis-Elaeagnus commutata/Poa pratensis*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	CU-LM-B	*Carex spp. - Poa pratensis - Taraxacum officinale*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	LM4-APAD	*Poa pratensis – Hesperostipa curtiseta – Artemisia*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	LM5-APAD	*Bromus inermis – Poa pratensis – Hesperostipa curtiseta*	Non-Reference	Loam

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M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	LM9-APAD	*Festuca hallii – Carex – Koeleria macrantha*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	MGA2	*Stipa curtiseta - Festuca hallii*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	MGA3	*Stipa comata - Koeleria macrantha*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	NFA02	*Festuca hallii - Poa pratensis*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	NFA03	*Poa pratensis - Festuca hallii*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	NFA08	*Carex spp. - Festuca hallii - Stipa curtiseta*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	NFA09	*Bouteloua gracilis - Carex spp.*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	NFA11	*Carex spp. - Festuca hallii*	Non-Reference	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	NFA17	*Carex spp - Agropyron smithii*	Non-Reference	Solonetzic
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	NFA26	*Carex spp. - Agropyron spp. - Stipa curtiseta*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	NFA27	*Stipa curtiseta - Carex spp.*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	NFA29	*Carex spp. - Stipa curtiseta - Festuca hallii*	Non-Reference	Sand and Sandy
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	NFA30	*Carex spp. - Stipa curtiseta*	Non-Reference	Sand and Sandy
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	NFC02	*Symphoricarpos occidentalis / Festuca hallii - Poa pratensis*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	NFC03	*Symphoricarpos occidentalis / Poa pratensis - Festuca hallii*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	NFC08	*Symphoricarpos occidentalis / Populus tremuloides*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	NFC09	*Symphoricarpos occidentalis / Festuca hallii - Bouteloua gracilis*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	NFC10	*Symphoricarpos occidentalis / Poa pratensis - Stipa curtiseta*	Non-Reference	Loam
M051	Great Plains Mixedgrass & Fescue Prairie	G332	Northern Great Plains Rough Fescue Prairie	N/A	Non-reference, unassigned	NFC12	*Elaeagnus commutata / Bromus inermis - Poa pratensis*	Non-Reference	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A1201	Calamovilfa longifolia - Hesperostipa comata - Andropogon hallii Sand Prairie Alliance	CPA47	*Festuca hallii - Calamovilfa longifolia*	Reference & Minor Alteration	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A1201	Calamovilfa longifolia - Hesperostipa comata - Andropogon hallii Sand Prairie Alliance	CPA9	*Sporobolus cryptandrus-Calamovilfa longifolia*	Reference & Minor Alteration	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A1201	Calamovilfa longifolia - Hesperostipa comata - Andropogon hallii Sand Prairie Alliance	DMG-DN-A	*Hesperostipa comata*	Reference & Minor Alteration	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A1201	Calamovilfa longifolia - Hesperostipa comata - Andropogon hallii Sand Prairie Alliance	DMG-DN-B	*Artemisia cana - Hesperostipa comata*	Reference & Minor Alteration	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A1201	Calamovilfa longifolia - Hesperostipa comata - Andropogon hallii Sand Prairie Alliance	DMGA42	*Stipa comata-Bouteloua gracilis-Carex stenophylla*	Reference & Minor Alteration	Thin
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A1201	Calamovilfa longifolia - Hesperostipa comata - Andropogon hallii Sand Prairie Alliance	DMGA43	*Stipa comata-Carex stenophylla-Calamovilfa longifolia*	Reference & Minor Alteration	Sand and Sandy

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Macrogroup Code	Macrogroup Title	Group Code	Group Title	Alliance Code	Alliance Title	Plant Community Code	Plant Community Title	Successional Status	Aggregated Ecosite
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A1201	Calamovilfa longifolia - Hesperostipa comata - Andropogon hallii Sand Prairie Alliance	DMGA63	*Stipa comata –Calamovilfa longifolia - Psoralea lanceolata*	Reference & Minor Alteration	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A1201	Calamovilfa longifolia - Hesperostipa comata - Andropogon hallii Sand Prairie Alliance	DMGA65	*Stipa comata –Calamovilfa longifolia - Carex Spp.*	Reference & Minor Alteration	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A1201	Calamovilfa longifolia - Hesperostipa comata - Andropogon hallii Sand Prairie Alliance	DMGA67	*Stipa comata –Bouteloua gracilis - Carex Spp.)*	Reference & Minor Alteration	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A1201	Calamovilfa longifolia - Hesperostipa comata - Andropogon hallii Sand Prairie Alliance	DMGA69	*Calamovilfa longifolia - Stipa comata - Bouteloua gracilis*	Reference & Minor Alteration	Thin
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A1201	Calamovilfa longifolia - Hesperostipa comata - Andropogon hallii Sand Prairie Alliance	MG-DN-A	*Hesperostipa comata - Carex spp.*	Reference & Minor Alteration	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A1201	Calamovilfa longifolia - Hesperostipa comata - Andropogon hallii Sand Prairie Alliance	MG-DN-B	*Carex spp. - Hesperostipa comata - Koeleria macrantha*	Reference & Minor Alteration	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A1201	Calamovilfa longifolia - Hesperostipa comata - Andropogon hallii Sand Prairie Alliance	MG-SD-A	*Hesperostipa comata - Calamovilfa longifolia*	Reference & Minor Alteration	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A1201	Calamovilfa longifolia - Hesperostipa comata - Andropogon hallii Sand Prairie Alliance	MG-SD-B	*Hesperostipa comata - Elymus lanceolatus / Pascopyrum smithii - Carex spp.*	Reference & Minor Alteration	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A1201	Calamovilfa longifolia - Hesperostipa comata - Andropogon hallii Sand Prairie Alliance	MG-SD-C	*Hesperostipa comata - Koeleria macrantha - Carex spp. - Bouteloua gracilis*	Reference & Minor Alteration	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A1201	Calamovilfa longifolia - Hesperostipa comata - Andropogon hallii Sand Prairie Alliance	MGA16	*Stipa comata - Agropyron dasystachyum - Calamovilfa longifolia*	Reference & Minor Alteration	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A1201	Calamovilfa longifolia - Hesperostipa comata - Andropogon hallii Sand Prairie Alliance	NFA31	*Calamovilfa longifolia - Carex spp.*	Reference & Minor Alteration	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A2407	Juniperus horizontalis - Arctostaphylos uva-ursi / Calamovilfa longifolia Sand Grassland Alliance	CPC16	*Juniperus horizontalis/Festuca hallii*	Reference & Minor Alteration	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A2407	Juniperus horizontalis - Arctostaphylos uva-ursi / Calamovilfa longifolia Sand Grassland Alliance	CPC17	*Juniperus horizontalis/Calamovilfa longifolia-Carex spp.*	Reference & Minor Alteration	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A2407	Juniperus horizontalis - Arctostaphylos uva-ursi / Calamovilfa longifolia Sand Grassland Alliance	CPC18	*Juniperus horizontalis/Arctostaphylos uva-ursi/Calamovilfa longifolia*	Reference & Minor Alteration	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A2407	Juniperus horizontalis - Arctostaphylos uva-ursi / Calamovilfa longifolia Sand Grassland Alliance	DMGC14	*Rosa woodsii / Stipa comata*	Reference & Minor Alteration	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A2407	Juniperus horizontalis - Arctostaphylos uva-ursi / Calamovilfa longifolia Sand Grassland Alliance	DMGC15	*Artemisia cana / Stipa comata – Carex Spp*	Reference & Minor Alteration	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A2407	Juniperus horizontalis - Arctostaphylos uva-ursi / Calamovilfa longifolia Sand Grassland Alliance	NFC13	*Symphoricarpos occidentalis / Carex spp. - Calamovilfa longifolia*	Reference & Minor Alteration	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A2407	Juniperus horizontalis - Arctostaphylos uva-ursi / Calamovilfa longifolia Sand Grassland Alliance	PEZ-DN-A	*Prunus virginiana / Carex spp.*	Reference & Minor Alteration	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A2409	Hesperostipa spartea - Bouteloua gracilis - Juniperus horizontalis Sand Prairie Alliance	DN2-APAD	*Juniperus horizontalis – Hesperostipa spartea – Schizachyrium scoparium / Bouteloua gracilis – Prunus pumila*	Reference & Minor Alteration	Dunes

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Classification cross-reference table showing the assignment of plant communities to macrogroups, groups, and alliances, Prairie Provinces, Canada.

Macrogroup Code	Macrogroup Title	Group Code	Group Title	Alliance Code	Alliance Title	Plant Community Code	Plant Community Title	Successional Status	Aggregated Ecosite
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A2409	Hesperostipa spartea - Bouteloua gracilis - Juniperus horizontalis Sand Prairie Alliance	SD17-APAD	*Hesperostipa comata – Symphoricarpos occidentalis – Poa pratensis / Koeleria macrantha*	Reference & Minor Alteration	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A2409	Hesperostipa spartea - Bouteloua gracilis - Juniperus horizontalis Sand Prairie Alliance	SD1b-APAD	*Hesperostipa curtiseta – Avenula hookeri – Hesperostipa spartea*	Reference & Minor Alteration	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A2409	Hesperostipa spartea - Bouteloua gracilis - Juniperus horizontalis Sand Prairie Alliance	SD3-APAD	*Carex – Hesperostipa spartea / Bouteloua gracilis – Avenula hookeri*	Reference & Minor Alteration	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A2409	Hesperostipa spartea - Bouteloua gracilis - Juniperus horizontalis Sand Prairie Alliance	SD8-APAD	*Hesperostipa spartea – Bouteloua gracilis – Carex*	Reference & Minor Alteration	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	A2409	Hesperostipa spartea - Bouteloua gracilis - Juniperus horizontalis Sand Prairie Alliance	SD9-APAD	*Hesperostipa spartea – Carex – Bouteloua gracilis – Juniperus horizontalis*	Reference & Minor Alteration	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	AP-DN-A	*Carex spp. - Calamovilfa longifolia - Hesperostipa comata*	Non-Reference	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	AP-DN-B	*Carex spp. - Artemisia frigida - Koeleria macrantha*	Non-Reference	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	AP-DN-C	*Juniperus horizontalis*	Non-Reference	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	CPA48	*Bouteloua gracilis-Calamovilfa longifolia-Stipa comata*	Non-Reference	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	CPA7	*Calamovilfa longifolia-Stipa curtiseta-Koeleria macrantha*	Non-Reference	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	DMG-DN-C	*Hesperostipa comata - Artemisia frigida*	Non-Reference	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	DMG-DN-D	*Hesperostipa comata - Psoralidium lanceolatum - Artemisia frigida - Calamovilfa longifolia*	Non-Reference	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	DMG-DN-E	*Artemisia cana - Hesperostipa comata - Calamovilfa longifolia*	Non-Reference	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	DMG-DN-F	*Juniperus horizontalis / Elymus lanceolatus - Calamovilfa longifolia - Artemisia frigida*	Non-Reference	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	DMGA19	*Artemisia cana/ Stipa comata-Calamovilfa longifolia*	Non-Reference	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	DMGA32	*Stipa comata - Glycyrrhiza lepidota*	Non-Reference	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	DMGA64	*Stipa comata – Psoralea lanceolata - Calamovilfa longifolia*	Non-Reference	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	DMGA66	*Agropyron dasystachyum - Stipa comata – Psoralea lanceolata*	Non-Reference	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	DMGA68	*Stipa comata – Carex Spp. – Artemisia frigida*	Non-Reference	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	DN3a-APAD	*Calamovilfa longifolia – Carex – Hesperostipa curtiseta*	Non-Reference	Dunes

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Macrogroup Code	Macrogroup Title	Group Code	Group Title	Alliance Code	Alliance Title	Plant Community Code	Plant Community Title	Successional Status	Aggregated Ecosite
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	DN4-APAD	*Carex – Bouteloua gracilis / Calamovilfa longifolia – Hesperostipa spartea*	Non-Reference	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	DN5-APAD	*Carex – Poa pratensis – Hesperostipa spartea*	Non-Reference	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	DN8-APAD	*Andropogon gerardii – Poa pratensis – Artemisia ludoviciana*	Non-Reference	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	MG-DN-C	*Carex spp. - Koeleria macrantha - Hesperostipa comata*	Non-Reference	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	MG-DN-D	*Psoralidium lanceolatum - Calamovilfa longifolia - Artemisia frigida - Hesperostipa comata*	Non-Reference	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	MG-DN-E	*Juniperus horizontalis - Carex obtusata - Calamovilfa longifolia*	Non-Reference	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	MG-SD-D	*Artemisia frigida - Koeleria macrantha - Carex spp. - Hesperostipa comata - Bouteloua gracilis*	Non-Reference	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	MG-SD-F	*Juniperus horizontalis / Carex spp. - Calamovilfa longifolia*	Non-Reference	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	MG-SD-G	*Symphoricarpos occidentalis - Rosa spp. / Calamovilfa longifolia - Hesperostipa comata - Artemisia frigida*	Non-Reference	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	MGB4	*Bromus inermis - Calamovilfa longifolia*	Non-Reference	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	NFA32	*Carex spp. - Calamovilfa longifolia*	Non-Reference	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	NFA33	*Artemisia frigida - Carex spp.*	Non-Reference	Sand and Sandy
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	PEZ-DN-B	*Symphoricarpos occidentalis / Hesperostipa comata - Carex spp.*	Non-Reference	Dunes
M052	Great Plains Sand Grassland & Shrubland	G889	Northern Great Plains Sand Prairie	N/A	Non-reference, unassigned	SD12-APAD	*Carex – Schizachyrium scoparium*	Non-Reference	Sand and Sandy
M054	Central Lowlands Tallgrass Prairie	G075	Northern Tallgrass Prairie	A4018	Andropogon gerardii - Sporobolus heterolepis - Muhlenbergia richardsonis Northern Grassland Alliance	ML2-APAD	*Andropogon gerardii – Poa pratensis – Carex*	Reference & Minor Alteration	Loam
M054	Central Lowlands Tallgrass Prairie	G075	Northern Tallgrass Prairie	A4018	Andropogon gerardii - Sporobolus heterolepis - Muhlenbergia richardsonis Northern Grassland Alliance	MS3-APAD	*Andropogon gerardii / Poa pratensis*	Reference & Minor Alteration	Sand and Sandy
M071	Great Plains Marsh, Wet Meadow, Shrubland & Playa	G325	Great Plains Freshwater Marsh	A2355	Schoenoplectus acutus - Typha latifolia - Bolboschoenus maritimus Marsh Alliance	CPA16	*Scirpus acutus*	Reference & Minor Alteration	Meadow and Marsh
M071	Great Plains Marsh, Wet Meadow, Shrubland & Playa	G325	Great Plains Freshwater Marsh	A2355	Schoenoplectus acutus - Typha latifolia - Bolboschoenus maritimus Marsh Alliance	CPA17	*Typha latifolia*	Reference & Minor Alteration	Meadow and Marsh
M071	Great Plains Marsh, Wet Meadow, Shrubland & Playa	G325	Great Plains Freshwater Marsh	A3484	Carex atherodes - Carex aquatilis - Scolochloa festucacea Marsh Alliance	CPA14	*Carex atherodes*	Reference & Minor Alteration	Fen Peat
M071	Great Plains Marsh, Wet Meadow, Shrubland & Playa	G325	Great Plains Freshwater Marsh	A3484	Carex atherodes - Carex aquatilis - Scolochloa festucacea Marsh Alliance	NFA15	*Carex atherodes - Poa palustris*	Reference & Minor Alteration	Subirrigated and Overflow
M071	Great Plains Marsh, Wet Meadow, Shrubland & Playa	G325	Great Plains Freshwater Marsh	A3484	Carex atherodes - Carex aquatilis - Scolochloa festucacea Marsh Alliance	NFA16	*Carex spp. - Eleocharis palustris*	Reference & Minor Alteration	Subirrigated and Overflow

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Classification cross-reference table showing the assignment of plant communities to macrogroups, groups, and alliances, Prairie Provinces, Canada.

Macrogroup Code	Macrogroup Title	Group Code	Group Title	Alliance Code	Alliance Title	Plant Community Code	Plant Community Title	Successional Status	Aggregated Ecosite
M071	Great Plains Marsh, Wet Meadow, Shrubland & Playa	G325	Great Plains Freshwater Marsh	A3484	Carex atherodes - Carex aquatilis - Scolochloa festucacea Marsh Alliance	PEZ-SMH-A	*Carex aquatilis - Carex utriculata*	Reference & Minor Alteration	Meadow and Marsh
M071	Great Plains Marsh, Wet Meadow, Shrubland & Playa	G975	Great Plains Wet Meadow, Shrub Swamp & Seepage Fen	A2305	Carex pellita - Carex spp. - Calamagrostis canadensis Great Plains Wet Meadow Alliance	CPA10	*Calamagrostis canadensis C.inexpansa, C.stricta-Carex*	Reference & Minor Alteration	Fen Peat
M071	Great Plains Marsh, Wet Meadow, Shrubland & Playa	G975	Great Plains Wet Meadow, Shrub Swamp & Seepage Fen	A2305	Carex pellita - Carex spp. - Calamagrostis canadensis Great Plains Wet Meadow Alliance	CPA12	*Juncus balticus*	Reference & Minor Alteration	Fen Peat
M071	Great Plains Marsh, Wet Meadow, Shrubland & Playa	G975	Great Plains Wet Meadow, Shrub Swamp & Seepage Fen	A2305	Carex pellita - Carex spp. - Calamagrostis canadensis Great Plains Wet Meadow Alliance	WM1-APAD	*Carex (Wetland) – Poa palustris*	Reference & Minor Alteration	Meadow and Marsh
M071	Great Plains Marsh, Wet Meadow, Shrubland & Playa	G975	Great Plains Wet Meadow, Shrub Swamp & Seepage Fen	A2305	Carex pellita - Carex spp. - Calamagrostis canadensis Great Plains Wet Meadow Alliance	WM2-APAD	*Carex – Eleocharis – Scirpus / Schoenoplectus*	Reference & Minor Alteration	Meadow and Marsh
M071	Great Plains Marsh, Wet Meadow, Shrubland & Playa	G975	Great Plains Wet Meadow, Shrub Swamp & Seepage Fen	A2307	Salix interior - Mixed Shrubland Alliance	CPA15	*Carex utriculata*	Reference & Minor Alteration	Fen Peat
M071	Great Plains Marsh, Wet Meadow, Shrubland & Playa	G975	Great Plains Wet Meadow, Shrub Swamp & Seepage Fen	A2307	Salix interior - Mixed Shrubland Alliance	NFD04	*Populus tremuloides / Salix petiolaris / Carex spp.*	Reference & Minor Alteration	Subirrigated and Overflow
M071	Great Plains Marsh, Wet Meadow, Shrubland & Playa	G975	Great Plains Wet Meadow, Shrub Swamp & Seepage Fen	A2308	Salix bebbiana - Salix petiolaris Plains Shrub Swamp Alliance	CPC13	*Salix petiolaris/Calamagrostis spp.*	Reference & Minor Alteration	Fen Peat
M071	Great Plains Marsh, Wet Meadow, Shrubland & Playa	G975	Great Plains Wet Meadow, Shrub Swamp & Seepage Fen	A2308	Salix bebbiana - Salix petiolaris Plains Shrub Swamp Alliance	CPC15	*Salix petiolaris/Rosa acicularis-Symphoricarpos occidentalis/Sedge*	Reference & Minor Alteration	Fen Peat
M071	Great Plains Marsh, Wet Meadow, Shrubland & Playa	G975	Great Plains Wet Meadow, Shrub Swamp & Seepage Fen	A2308	Salix bebbiana - Salix petiolaris Plains Shrub Swamp Alliance	NFC14	*Salix petiolaris / Carex spp.*	Reference & Minor Alteration	Subirrigated and Overflow
M071	Great Plains Marsh, Wet Meadow, Shrubland & Playa	G975	Great Plains Wet Meadow, Shrub Swamp & Seepage Fen	A3495	Carex spp. - Triglochin maritima - Eleocharis quinqueflora Alkaline Fen Alliance	CPC20	*Salix spp-Betula glandulosa/Carex spp.*	Reference & Minor Alteration	Fen Peat
M071	Great Plains Marsh, Wet Meadow, Shrubland & Playa	G975	Great Plains Wet Meadow, Shrub Swamp & Seepage Fen	N/A	Non-reference, unassigned	CPC14	*Salix petiolaris/Poa pratensis*	Non-Reference	Fen Peat
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	A1341	Distichlis spicata - Hordeum jubatum Wet Meadow Alliance	CPA13	*Scirpus pungens*	Reference & Minor Alteration	Saline Wet Meadow
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	A1341	Distichlis spicata - Hordeum jubatum Wet Meadow Alliance	CPA24	*Senecio congestus*	Reference & Minor Alteration	Saline Wet Meadow
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	A1341	Distichlis spicata - Hordeum jubatum Wet Meadow Alliance	CPA40	*Juncus balticus-Distichlis stricta*	Reference & Minor Alteration	Saline Wet Meadow
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	A1341	Distichlis spicata - Hordeum jubatum Wet Meadow Alliance	PEZ-WMDSA-A	*Calamagrostis stricta ssp. inexpansa - Distichlis spicata var. stricta*	Reference & Minor Alteration	Saline Wet Meadow
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	A1341	Distichlis spicata - Hordeum jubatum Wet Meadow Alliance	PEZ-WMDSA-B	*Distichlis spicata var. stricta - Calamagrostis stricta ssp. inexpansa*	Reference & Minor Alteration	Saline Wet Meadow
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	A1341	Distichlis spicata - Hordeum jubatum Wet Meadow Alliance	PEZ-WMDSA-C	*Distichlis spicata var. stricta - Calamagrostis stricta ssp. inexpansa*	Reference & Minor Alteration	Saline Wet Meadow
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	A1341	Distichlis spicata - Hordeum jubatum Wet Meadow Alliance	PEZ-WMDSA-D	*Distichlis spicata var. stricta*	Reference & Minor Alteration	Saline Wet Meadow
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	A1341	Distichlis spicata - Hordeum jubatum Wet Meadow Alliance	PEZ-WMDSA-E	*Puccinellia nuttalliana - Distichlis spicata var. stricta - Hordeum jubatum*	Reference & Minor Alteration	Saline Wet Meadow
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	A1354	Pascopyrum smithii - Distichlis spicata - Hordeum jubatum Wet Grassland Alliance	AP-SUBSA-A	*Elymus trachycaulus ssp. trachycaulus - Distichlis spicata var. stricta*	Reference & Minor Alteration	Saline Subirrigated
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	A1354	Pascopyrum smithii - Distichlis spicata - Hordeum jubatum Wet Grassland Alliance	AP-SUBSA-C	*Distichlis spicata var. stricta - Elymus trachycaulus ssp. trachycaulus*	Reference & Minor Alteration	Saline Subirrigated
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	A1354	Pascopyrum smithii - Distichlis spicata - Hordeum jubatum Wet Grassland Alliance	AP-SUBSA-D	*Distichlis spicata var. stricta*	Reference & Minor Alteration	Saline Subirrigated

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Macrogroup Code	Macrogroup Title	Group Code	Group Title	Alliance Code	Alliance Title	Plant Community Code	Plant Community Title	Successional Status	Aggregated Ecosite
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	A1354	Pascopyrum smithii - Distichlis spicata - Hordeum jubatum Wet Grassland Alliance	AP-UPSA-A	*Hesperostipa curtiseta - Elymus trachycaulus ssp. trachycaulus - Carex spp. - Distichlis spicata var. stricta - Artemisia frigida*	Reference & Minor Alteration	Saline Upland
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	A1354	Pascopyrum smithii - Distichlis spicata - Hordeum jubatum Wet Grassland Alliance	MG-SUBSA-A	*Carex spp. - Pascopyrum smithii - Hesperostipa comata*	Reference & Minor Alteration	Saline Subirrigated
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	A1354	Pascopyrum smithii - Distichlis spicata - Hordeum jubatum Wet Grassland Alliance	MG-SUBSA-B	*Pascopyrum smithii - Bouteloua gracilis*	Reference & Minor Alteration	Saline Subirrigated
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	A1354	Pascopyrum smithii - Distichlis spicata - Hordeum jubatum Wet Grassland Alliance	MG-UPSA-A	*Elymus lanceolatus - Koeleria macrantha - Artemisia frigida*	Reference & Minor Alteration	Saline Upland
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	A1354	Pascopyrum smithii - Distichlis spicata - Hordeum jubatum Wet Grassland Alliance	MGA19	*Distichlis stricta - Agropyron smithii - Carex*	Reference & Minor Alteration	Saline Wet Meadow
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	A1354	Pascopyrum smithii - Distichlis spicata - Hordeum jubatum Wet Grassland Alliance	MGA6	*Distichlis stricta - Carex - Agropyron smithii*	Reference & Minor Alteration	Saline Wet Meadow
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	A1354	Pascopyrum smithii - Distichlis spicata - Hordeum jubatum Wet Grassland Alliance	NFA35	*Agropyron smithii - Poa spp.*	Reference & Minor Alteration	Saline Wet Meadow
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	A3905	Sarcobatus vermiculatus Great Plains Wet Shrubland Alliance	DMG-SUBSA-A	*Sarcobatus vermiculatus - Elymus lanceolatus*	Reference & Minor Alteration	Saline Subirrigated
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	A3905	Sarcobatus vermiculatus Great Plains Wet Shrubland Alliance	DMGC13	*Sarcobatus vermiculatus - Atriplex nuttallii - Agropyron smithii*	Reference & Minor Alteration	Saline Wet Meadow
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	A3905	Sarcobatus vermiculatus Great Plains Wet Shrubland Alliance	DMGC7	*Sarcobatus vermiculatus/Distichlis stricta - Agropyron smithii*	Reference & Minor Alteration	Subirrigated and Overflow
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	A3905	Sarcobatus vermiculatus Great Plains Wet Shrubland Alliance	DMGC9	*Sarcobatus vermiculatus / Iva axillaris - Agropyron spp*	Reference & Minor Alteration	Saline Wet Meadow
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	N/A	Non-reference, unassigned	AP-SUBSA-B	*Poa spp. - Distichlis spicata var. stricta - Forbs*	Non-Reference	Saline Subirrigated
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	N/A	Non-reference, unassigned	AP-SUBSA-E	*Distichlis spicata var. stricta - Forbs*	Non-Reference	Saline Subirrigated
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	N/A	Non-reference, unassigned	CPA20	*Poa pratensis-Distichlis stricta*	Non-Reference	Saline Wet Meadow
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	N/A	Non-reference, unassigned	CPA33	*Festuca saximontana-Stipa comata-Koeleria macrantha*	Non-Reference	Sand and Sandy
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	N/A	Non-reference, unassigned	CPA41	*Hordeum jubatum-Puccinellia nuttalliana*	Non-Reference	Saline Wet Meadow
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	N/A	Non-reference, unassigned	CPA42	*Distichlis stricta-Hordeum jubatum-Puccinellia nuttalliana*	Non-Reference	Saline Wet Meadow
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	N/A	Non-reference, unassigned	CPA43	*Distichlis stricta-Hordeum jubatum*	Non-Reference	Saline Wet Meadow
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	N/A	Non-reference, unassigned	CPA44	*Agropyron trachycaulum-Distichlis stricta*	Non-Reference	Saline Wet Meadow
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	N/A	Non-reference, unassigned	CPA45	*Spartina gracilis-Juncus balticus*	Non-Reference	Saline Wet Meadow
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	N/A	Non-reference, unassigned	MG-SUBSA-C	*Distichlis spicata var. stricta - Carex spp.*	Non-Reference	Saline Subirrigated
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	N/A	Non-reference, unassigned	MG-UPSA-B	*Bouteloua gracilis - Elymus lanceolatus - Pascopyrum smithii*	Non-Reference	Saline Upland
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	N/A	Non-reference, unassigned	NFA36	*Puccinellia nuttalliana*	Non-Reference	Saline Wet Meadow

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Classification cross-reference table showing the assignment of plant communities to macrogroups, groups, and alliances, Prairie Provinces, Canada.

Macrogroup Code	Macrogroup Title	Group Code	Group Title	Alliance Code	Alliance Title	Plant Community Code	Plant Community Title	Successional Status	Aggregated Ecosite
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	N/A	Non-reference, unassigned	NFA37	*Distichlis stricta*	Non-Reference	Saline Wet Meadow
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	N/A	Non-reference, unassigned	NFA38	*Hordeum jubatum*	Non-Reference	Saline Wet Meadow
M077	Great Plains-Eastern Saline Wetland	G984	Great Plains Saline Wet Meadow & Marsh	N/A	Non-reference, unassigned	PEZ-SMHSA-B	*Scirpus nevadensis*	Non-Reference	Saline Marsh
M115	Great Plains Badlands Vegetation	G566	Great Plains Badlands Vegetation	A2408	Pascopyrum smithii - Hesperostipa comata Badlands Grassland Alliance	DMGC4	*Juniperus horizontalis - Carex*	Reference & Minor Alteration	Badlands
M115	Great Plains Badlands Vegetation	G566	Great Plains Badlands Vegetation	A2408	Pascopyrum smithii - Hesperostipa comata Badlands Grassland Alliance	MG-BD-A	*Elymus lanceolatus - Pascopyrum smithii - Artemisia frigida*	Reference & Minor Alteration	Badlands
M115	Great Plains Badlands Vegetation	G566	Great Plains Badlands Vegetation	A2408	Pascopyrum smithii - Hesperostipa comata Badlands Grassland Alliance	MG-BD-B	*Pascopyrum smithii*	Reference & Minor Alteration	Badlands
M115	Great Plains Badlands Vegetation	G566	Great Plains Badlands Vegetation	A3978	Sarcobatus vermiculatus Great Plains Badlands Alliance	DMGA36	*Bouteloua gracilis - Distichlis stricta- Stipa comata*	Reference & Minor Alteration	Badlands
M115	Great Plains Badlands Vegetation	G566	Great Plains Badlands Vegetation	A3978	Sarcobatus vermiculatus Great Plains Badlands Alliance	MG-BD-C	*Bare Shale Community*	Reference & Minor Alteration	Badlands
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	CPB1	*Medicago sativa/Bromus spp.- Poa pratensis*	Non-reference	Loam
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	CPB2	*Poa pratensis-Bromus inermis*	Non-reference	Loam
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	CPB3	*Symphoricarpos occidentalis/Poa pratensis-Bromus inermis*	Non-reference	Loam
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	CPB4	*Bromus biebersteinii*	Non-reference	Loam
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	CPB5	*Agropyron pectiniforme*	Non-reference	Loam
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	CPI2	*Festuca rubra-Poa pratensis*	Non-reference	Loam
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	CPI3	*Poa pratensis-Agropyron dasystachyum/Taraxacum officinale*	Non-reference	Loam
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	CPI4	*Agropyron trachycaulum-Poa pratensis*	Non-reference	Loam
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	CPI5	*Bromus inermis-Poa pratensis/Taraxacum officinale*	Non-reference	Loam
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	CPI6	*Phleum pratense-Bromus inermis*	Non-reference	Loam
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	DMGB1	*Agropyron pectiniforme*	Non-reference	Tame Pasture
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	DMGB2	*Agropyron pectiniforme- Stipa comata / Artemisia cana*	Non-reference	Tame Pasture

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Classification cross-reference table showing the assignment of plant communities to macrogroups, groups, and alliances, Prairie Provinces, Canada.

Macrogroup Code	Macrogroup Title	Group Code	Group Title	Alliance Code	Alliance Title	Plant Community Code	Plant Community Title	Successional Status	Aggregated Ecosite
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	DMGB3	*Agropyron pectiniforme - Medicago sativa*	Non-reference	Tame Pasture
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	DMGB4	*Bromus inermis*	Non-reference	Tame Pasture
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	DMGB5	*Phleum pratense – Dactylis glomerata- Bromus inermis*	Non-reference	Tame Pasture
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	DMGB6	*Elymus junceus*	Non-reference	Tame Pasture
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	ER7-APAD	*Bromus inermis – Poa pratensis – Symphoricarpos occidentalis – Elaeagnus commutata – Elymus trachycaulus sbsp. trachycaulus*	Non-reference	Thin
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	ER8M-APAD	*Poa pratensis – Schizachyrium scoparium – Hesperostipa comata*	Non-reference	Thin
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	FFB1	*Poa pratensis - Phleum pratense*	Non-reference	Loam
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	FFB2	*Poa pratensis - Artemisia frigida*	Non-reference	Loam
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	FFB3	*Bromus inermis - Medicago sativa*	Non-reference	Loam
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	FFB4	*Poa pratensis - Bromus inermis - Agropyron dasystachyum and Agropyron smithii*	Non-reference	Loam
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	FFC5	*Festuca idahoensis - Festuca campestris - Koeleria macrantha*	Non-reference	Limy
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	MG-SD-E	*Agropyron cristatum*	Non-reference	Sand and Sandy
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	MGB1	*Agropyron pectiniforme- Artemisia frigida*	Non-reference	Loam
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	MGB3	*Bromus inermis - Medicago sativa - Poa pratensis*	Non-reference	Loam
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	NFA23	*Poa pratensis / Taraxacum officinale*	Non-reference	Loam
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	NFA24	*Festuca rubra - Poa pratensis*	Non-reference	Loam
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	NFB01	*Bromus inermis - Poa pratensis / Taraxacum officinale*	Non-reference	Loam

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Macrogroup Code	Macrogroup Title	Group Code	Group Title	Alliance Code	Alliance Title	Plant Community Code	Plant Community Title	Successional Status	Aggregated Ecosite
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	NFB02	*Poa pratensis*	Non-reference	Loam
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	NFC15	*Symphoricarpos occidentalis / Poa pratensis*	Non-reference	Subirrigated and Overflow
M498	Great Plains Ruderal Grassland & Shrubland	G679	Northern & Central Great Plains Ruderal Grassland & Shrubland	N/A	Non-reference, unassigned	PEZ-SUB-A	*Poa pratensis*	Non-reference	Subirrigated and Overflow
M537	North American Boreal Shrubland & Grassland	G358	Western Boreal Mesic Grassland & Meadow	A4248	Calamagrostis canadensis - Mixed Forb-Graminoid Meadow Alliance	FFC2	*Salix bebbiana / Carex - Deschampsia cespitosa*	Reference & Minor Alteration	Subirrigated and Overflow
M537	North American Boreal Shrubland & Grassland	G358	Western Boreal Mesic Grassland & Meadow	N/A	Non-reference, unassigned	FFA15	*Carex - Poa pratensis - Deschampsia cespitosa*	Non-Reference	Subirrigated and Overflow
M537	North American Boreal Shrubland & Grassland	G358	Western Boreal Mesic Grassland & Meadow	N/A	Non-reference, unassigned	FFC3	*Salix bebbiana / Poa pratensis - Phleum pratense - Deschampsia cespitosa*	Non-Reference	Subirrigated and Overflow
M545	Northern Great Plains Forest & Woodland	G145	Northern Great Plains Mesic Forest & Woodland	A3211	Fraxinus pennsylvanica - Ulmus americana Great Plains Forest Alliance	PEZ-SUB-T	*Fraxinus pennsylvanica - Acer negundo / Prunus virginiana*	Reference & Minor Alteration	Subirrigated and Overflow
M545	Northern Great Plains Forest & Woodland	G145	Northern Great Plains Mesic Forest & Woodland	N/A	Non-reference, unassigned	PEZ-SUB-U	*Fraxinus pennsylvanica - Acer negundo / Bromus inermis*	Non-Reference	Subirrigated and Overflow
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	A2211	Populus tremuloides - Picea glauca - Populus balsamifera Woodland Alliance	AP-SUB-A	*Populus balsamifera - Populus tremuloides / Cornus sericea / Aralia nudicaulis*	Reference & Minor Alteration	Subirrigated and Overflow
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	A2211	Populus tremuloides - Picea glauca - Populus balsamifera Woodland Alliance	CPD10	*Populus balsamifera-P. tremuloides/Cornus stolonifera/Equisetum arvense*	Reference & Minor Alteration	Meadow and Marsh
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	A2211	Populus tremuloides - Picea glauca - Populus balsamifera Woodland Alliance	CPD11	*Populus balsamifera-Populus balsamifera/Salix spp.*	Reference & Minor Alteration	Loam
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	A2211	Populus tremuloides - Picea glauca - Populus balsamifera Woodland Alliance	CPD6	*Populus tremuloides-P. balsamifera/Amelanchier alnifolia-Cornus stolonifera-Symphoricarpos*	Reference & Minor Alteration	Loam
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	A2232	Populus tremuloides / Festuca hallii Grassy Woodland Alliance	AP-LM-F	*Populus tremuloides / Amelanchier alnifolia / Rosa spp.*	Reference & Minor Alteration	Loam
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	A2232	Populus tremuloides / Festuca hallii Grassy Woodland Alliance	CPC24	*Spiraea alba-Populus tremuloides*	Reference & Minor Alteration	Loam
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	A2232	Populus tremuloides / Festuca hallii Grassy Woodland Alliance	CPD13	*Populus tremuloides/Symphoricarpos occidentalis-Rosa acicularis*	Reference & Minor Alteration	Loam
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	A2232	Populus tremuloides / Festuca hallii Grassy Woodland Alliance	CPD14	*Populus tremuloides/Corylus cornuta*	Reference & Minor Alteration	Loam
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	A2232	Populus tremuloides / Festuca hallii Grassy Woodland Alliance	CPD3	*Populus tremuloides/Symphoricarpos occidentalis-Prunus virginiana-Amelanchier*	Reference & Minor Alteration	Loam
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	A2232	Populus tremuloides / Festuca hallii Grassy Woodland Alliance	NFD01	*Populus tremuloides / Symphoricarpos occidentalis / Carex spp.*	Reference & Minor Alteration	Loam
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	A2406	Populus tremuloides / Prunus virginiana / Symphoricarpos spp. Woodland Alliance	AP-SD-G	*Populus tremuloides / Prunus virginiana - Amelanchier alnifolia / Rosa spp. - Symphoricarpos spp. / Carex spp.*	Reference & Minor Alteration	Dunes

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Macrogroup Code	Macrogroup Title	Group Code	Group Title	Alliance Code	Alliance Title	Plant Community Code	Plant Community Title	Successional Status	Aggregated Ecosite
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	A2406	Populus tremuloides / Prunus virginiana / Symphoricarpos spp. Woodland Alliance	CPC3	*Salix bebbiana-Rosa acicularis/Agropyron trachycaulum*	Reference & Minor Alteration	Sand and Sandy
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	A2406	Populus tremuloides / Prunus virginiana / Symphoricarpos spp. Woodland Alliance	CPD1	*Populus tremuloides/Juniperus horizontalis/Carex siccata*	Reference & Minor Alteration	Loam
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	A2406	Populus tremuloides / Prunus virginiana / Symphoricarpos spp. Woodland Alliance	CPD20	*Populus tremuloides/Arctostaphylos uva-ursi/Schizachne purpurascens-Carex*	Reference & Minor Alteration	Loam
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	A2406	Populus tremuloides / Prunus virginiana / Symphoricarpos spp. Woodland Alliance	MG-DN-F	*Populus tremuloides / Prunus virginiana / Symphoricarpos spp. / Carex spp.*	Reference & Minor Alteration	Dunes
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	N/A	Non-reference, unassigned	AP-LM-G	*Populus tremuloides / Symphoricarpos occidentalis - Rosa spp.*	Non-Reference	Loam
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	N/A	Non-reference, unassigned	AP-LM-H	*Populus tremuloides / Symphoricarpos occidentalis - Rosa spp. / Poa pratensis*	Non-Reference	Loam
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	N/A	Non-reference, unassigned	AP-SD-H	*Populus tremuloides / Prunus virginiana / Symphoricarpos occidentalis - Rosa spp.*	Non-Reference	Sand and Sandy
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	N/A	Non-reference, unassigned	AP-SD-I	*Populus tremuloides / Carex spp. - Schizachne purpurascens*	Non-Reference	Sand and Sandy
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	N/A	Non-reference, unassigned	AP-SD-J	*Populus tremuloides / Symphoricarpos occidentalis - Rosa spp. / Poa pratensis - Schizachne purpurascens*	Non-Reference	Sand and Sandy
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	N/A	Non-reference, unassigned	AP-SUB-B	*Populus balsamifera - Populus tremuloides / Symphoricarpos spp. - Rosa spp.*	Non-Reference	Subirrigated and Overflow
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	N/A	Non-reference, unassigned	AP-SUB-D	*Populus tremuloides - Populus balsamifera / Bromus inermis - Poa pratensis*	Non-Reference	Subirrigated and Overflow
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	N/A	Non-reference, unassigned	CPD15	*Artemisia campestris-Calamovilfa longifolia/Populus tremuloides*	Non-Reference	Loam
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	N/A	Non-reference, unassigned	CPD17	*Prunus virginiana-Symphoricarpos occidentalis-Amelanchier alnifolia/Populus tremuloides*	Non-Reference	Loam
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	N/A	Non-reference, unassigned	CPD18	*Symphoricarpos occidentalis/Populus tremuloides*	Non-Reference	Loam
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	N/A	Non-reference, unassigned	CPD21	*Populus balsamifera-Populus tremuloides/Symphoricarpos-Rosa*	Non-Reference	Loam
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	N/A	Non-reference, unassigned	CPD7	*Populus balsamifera-P. tremuloides/Bromus inermis*	Non-Reference	Loam

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Macrogroup Code	Macrogroup Title	Group Code	Group Title	Alliance Code	Alliance Title	Plant Community Code	Plant Community Title	Successional Status	Aggregated Ecosite
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	N/A	Non-reference, unassigned	DMG-DN-G	*Populus tremuloides / Juniperus horizontalis / Calamagrostis stricta - Elymus trachycaulus / Elymus lanceolatus*	Non-Reference	Dunes
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	N/A	Non-reference, unassigned	DMG-SD-H	*Populus tremuloides / Juniperus horizontalis / Elymus trachycaulus ssp. subsecundus - Glycyrrhiza lepidota*	Non-Reference	Subirrigated and Overflow
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	N/A	Non-reference, unassigned	NFD02	*Populus tremuloides / Symphoricarpos occidentalis / Poa pratensis*	Non-Reference	Loam
M545	Northern Great Plains Forest & Woodland	G328	Northwestern Great Plains Aspen Woodland	N/A	Non-reference, unassigned	NFD03	*Populus tremuloides / Symphoricarpos occidentalis / Festuca hallii*	Non-Reference	Loam
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	A3986	Festuca campestris - Festuca idahoensis Mesic Grassland Alliance	CU-LM-A	*Festuca altaica var. hallii*	Reference & Minor Alteration	Loam
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	A3986	Festuca campestris - Festuca idahoensis Mesic Grassland Alliance	FFA1	*Festuca campestris - Festuca idahoensis - Agropyron smithii*	Reference & Minor Alteration	Loam
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	A3986	Festuca campestris - Festuca idahoensis Mesic Grassland Alliance	FFA17	*Festuca campestris - Danthonia parryi - Koeleria macrantha*	Reference & Minor Alteration	Thin
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	A3986	Festuca campestris - Festuca idahoensis Mesic Grassland Alliance	FFA2	*Festuca campestris - Festuca idahoensis - Carex spp.*	Reference & Minor Alteration	Loam
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	A3986	Festuca campestris - Festuca idahoensis Mesic Grassland Alliance	FFA23	*Festuca campestris - Stipa richardsonii*	Reference & Minor Alteration	Loam
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	A3986	Festuca campestris - Festuca idahoensis Mesic Grassland Alliance	FFA24	*Festuca campestris - Agropyron dasystachyum and Agropyron smithii*	Reference & Minor Alteration	Loam
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	A3986	Festuca campestris - Festuca idahoensis Mesic Grassland Alliance	FFA27	*Agropyron dasystachyum-Agropyron smithii - Stipa viridula*	Reference & Minor Alteration	Loam
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	A3986	Festuca campestris - Festuca idahoensis Mesic Grassland Alliance	FFA29	*Agropyron dasystachyum - Agropyron smithii - Festuca campestris*	Reference & Minor Alteration	Limy
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	A3986	Festuca campestris - Festuca idahoensis Mesic Grassland Alliance	FFA5	*Festuca campestris - Danthonia parryi*	Reference & Minor Alteration	Loam
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	A3986	Festuca campestris - Festuca idahoensis Mesic Grassland Alliance	FFA9	*Festuca campestris - Danthonia parryi - Poa pratensis*	Reference & Minor Alteration	Shallow to gravel
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	A3988	Festuca idahoensis - Pseudoroegneria spicata - Pascopyrum smithii Mesic Grassland Alliance	MGA10	*Festuca idahoensis - Agropyron dasystachyum - Stipa comata*	Reference & Minor Alteration	Loam
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	A3988	Festuca idahoensis - Pseudoroegneria spicata - Pascopyrum smithii Mesic Grassland Alliance	MGA33	*Festuca idahoensis - Agropyron dasystachyum*	Reference & Minor Alteration	Clay
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	A3988	Festuca idahoensis - Pseudoroegneria spicata - Pascopyrum smithii Mesic Grassland Alliance	MGA38	*Festuca hallii – Festuca idahoensis – Agropyron dasystachyum*	Reference & Minor Alteration	Loam

Appendix D

Classification cross-reference table showing the assignment of plant communities to macrogroups, groups, and alliances, Prairie Provinces, Canada.

Macrogroup Code	Macrogroup Title	Group Code	Group Title	Alliance Code	Alliance Title	Plant Community Code	Plant Community Title	Successional Status	Aggregated Ecosite
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	A4095	Arctostaphylos uva-ursi / Festuca spp. - Pseudoroegneria spicata Steppe Alliance	FFC6	*Juniperus horizontalis / Agropyron dasystachyum and Agropyron smithii*	Reference & Minor Alteration	Thin
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	N/A	Non-reference, unassigned	FFA10	*Danthonia parryi - Festuca campestris - Festuca idahoensis*	Non-Reference	Shallow to gravel
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	N/A	Non-reference, unassigned	FFA13	*Festuca idahoensis - Festuca campestris - Koeleria macrantha*	Non-Reference	Shallow to gravel
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	N/A	Non-reference, unassigned	FFA14	*Agropyron dasystachyum - Stipa curtiseta - Koeleria macrantha*	Non-Reference	Loam
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	N/A	Non-reference, unassigned	FFA18	*Danthonia parryi - Festuca campestris - Stipa curtiseta*	Non-Reference	Thin
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	N/A	Non-reference, unassigned	FFA19	*Poa pratensis - Festuca campestris*	Non-Reference	Loam
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	N/A	Non-reference, unassigned	FFA25	*Agropyron dasystachyum and Agropyron smithii - Festuca campestris*	Non-Reference	Loam
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	N/A	Non-reference, unassigned	FFA26	*Bromus inermis - Agropyron dasystachyum and Agropyron smithii*	Non-Reference	Loam
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	N/A	Non-reference, unassigned	FFA28	*Stipa viridula - Artemisia frigida*	Non-Reference	Loam
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	N/A	Non-reference, unassigned	FFA3	*Festuca campestris - Artemisia frigida - Festuca idahoensis*	Non-Reference	Loam
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	N/A	Non-reference, unassigned	FFA4	*Carex spp. - Artemisia frigida - Poa pratensis*	Non-Reference	Loam
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	N/A	Non-reference, unassigned	FFA6	*Danthonia parryi - Festuca campestris - Poa pratensis*	Non-Reference	Loam
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	N/A	Non-reference, unassigned	FFC1	*Rubus idaeus-Rosa woodsii / Poa pratensis - Taraxacum officinale*	Non-Reference	Subirrigated and Overflow
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	N/A	Non-reference, unassigned	FFC4	*Juniperus horizontalis - Danthonia parryi - Stipa curtiseta*	Non-Reference	Thin
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	N/A	Non-reference, unassigned	MGA11	*Festuca idahoensis - Lupinus*	Non-Reference	Loam
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	N/A	Non-reference, unassigned	MGA12	*Symphoricarpos occidentalis / Poa pratensis - Festuca idahoensis*	Non-Reference	Loam
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	N/A	Non-reference, unassigned	MGA13	*Poa compressa - Lupinus sericeus*	Non-Reference	Loam
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	N/A	Non-reference, unassigned	MGA35	*Agropyron smithii –Poa sandbergii - Koeleria macrantha*	Non-Reference	Clay

Appendix D

Classification cross-reference table showing the assignment of plant communities to macrogroups, groups, and alliances, Prairie Provinces, Canada.

Macrogroup Code	Macrogroup Title	Group Code	Group Title	Alliance Code	Alliance Title	Plant Community Code	Plant Community Title	Successional Status	Aggregated Ecosite
M547	Rocky Mountain Grassland & Meadow	G273	Central Rocky Mountain Lower Montane, Foothill & Valley Grassland	N/A	Non-reference, unassigned	MGA37	*Agropyron dasystachyum – Stipa comata*	Non-Reference	Loam

Appendix E

Noise clustering results for the dry/mesic grassland groups showing the plant communities and groups assigned using a combination of quantitative analysis and expert review, clusters, and fuzzy cluster membership value, Prairie Provinces, Canada.

Appendix F Noise Clustering Results

Plant Community (PC) Code	PC Scientific Name	Aggregated Ecosite	Group Code	Alliance Code	M1	M2	M3	M4	M5	M6	M7	Noise	Cluster	Next best cluster fit*
DMGA17	*Stipa comata - Poa sandbergii*	Solonetzic	G331	A2300	0.5	0.017	0.036	0.018	0.203	0.064	0.062	0.101	M1	M5
DMGA12	*Artemisia cana/Stipa comata - Bouteloua gracilis*	Loam	G331	A3586	0.944	0.002	0.004	0.002	0.028	0.006	0.004	0.01	M1	
DMGA23	*Artemisia cana / Stipa comata - Bouteloua gracilis - Koeleria macrantha*	Shallow to gravel	G331	A3586	0.751	0.009	0.02	0.01	0.096	0.037	0.018	0.057	M1	M5
DMGA24	*Artemisia cana / Stipa comata - Agropyron smithii - Bouteloua gracilis*	Limy	G331	A3586	0.699	0.011	0.023	0.012	0.102	0.038	0.044	0.072	M1	M5
DMGA15	*Agropyron Spp. - Stipa comata - Koeleria macrantha*	Solonetzic	G331	A4389	0.824	0.007	0.014	0.007	0.068	0.028	0.013	0.039	M1	
DMGA18	*Artemisia cana / Stipa comata - Bouteloua gracilis - Koeleria macrantha*	Sand and Sandy	G331	A4389	0.979	0.001	0.002	0.001	0.009	0.003	0.002	0.004	M1	
DMGA2	*Stipa comata - Agropyron spp*	Loam	G331	A4389	0.751	0.007	0.023	0.008	0.123	0.035	0.015	0.038	M1	M5
DMGA22	*Stipa comata - Bouteloua gracilis - Koeleria macrantha*	Thin	G331	A4389	0.967	0.001	0.003	0.001	0.013	0.005	0.002	0.008	M1	
DMGA3	*Stipa comata - Koeleria macrantha - Bouteloua gracilis*	Loam	G331	A4389	0.964	0.001	0.003	0.001	0.015	0.005	0.003	0.008	M1	
DMGA35	*Stipa comata - Koeleria macrantha - Bouteloua gracilis*	Solonetzic	G331	A4389	0.909	0.002	0.006	0.002	0.049	0.01	0.008	0.013	M1	
DMGA56	*Stipa comata – Distichlis stricta*	Subirrigated and Overflow	G331	A4389	0.413	0.019	0.041	0.018	0.315	0.053	0.031	0.111	M1	M5
DMGA9	*Stipa comata - Carex filifolia*	Loam	G331	A4389	0.679	0.014	0.027	0.015	0.103	0.046	0.024	0.092	M1	M5
MGA14	*Stipa comata - Agropyron dasystachyum - Koeleria macrantha*	Loam	G331	A4389	0.452	0.009	0.033	0.009	0.404	0.033	0.014	0.046	M1	M5
ER3-APAD	*Hesperostipa comata – Avenula hookeri – Carex*	Thin	G332	A4043	0.413	0.027	0.06	0.05	0.114	0.134	0.049	0.153	M1	N
MGA5	*Stipa comata - Festuca hallii - Agropyron smithii*	Solonetzic	G332	A4043	0.207	0.025	0.059	0.095	0.149	0.19	0.132	0.142	M1	M5
DMGA42	*Stipa comata-Bouteloua gracilis-Carex stenophylla*	Thin	G889	A1201	0.54	0.023	0.042	0.023	0.119	0.086	0.032	0.136	M1	N
DMGA63	*Stipa comata –Calamovilfa longifolia - Psoralea lanceolata*	Dunes	G889	A1201	0.812	0.009	0.016	0.01	0.049	0.03	0.013	0.06	M1	
DMGA65	*Stipa comata –Calamovilfa longifolia - Carex Spp.*	Dunes	G889	A1201	0.512	0.024	0.044	0.025	0.122	0.086	0.034	0.153	M1	N
DMGA67	*Stipa comata –Bouteloua gracilis - Carex Spp.)*	Dunes	G889	A1201	0.444	0.028	0.049	0.029	0.13	0.089	0.044	0.186	M1	N
DMG-DN-A	*Hesperostipa comata*	Dunes	G889	A1201	0.93	0.002	0.005	0.002	0.034	0.009	0.005	0.013	M1	
DMG-DN-B	*Artemisia cana - Hesperostipa comata*	Dunes	G889	A1201	0.239	0.037	0.067	0.037	0.226	0.106	0.075	0.214	M1	M5
MGA16	*Stipa comata - Agropyron dasystachyum - Calamovilfa longifolia*	Sand and Sandy	G889	A1201	0.703	0.009	0.028	0.009	0.156	0.036	0.013	0.047	M1	M5
MG-DN-A	*Hesperostipa comata - Carex spp.*	Dunes	G889	A1201	0.73	0.009	0.028	0.013	0.08	0.068	0.021	0.052	M1	M6
MG-SD-A	*Hesperostipa comata - Calamovilfa longifolia*	Sand and Sandy	G889	A1201	0.809	0.008	0.016	0.008	0.058	0.038	0.016	0.046	M1	
MG-SD-B	*Hesperostipa comata - Elymus lanceolatus / Pascopyrum smithii - Carex spp.*	Sand and Sandy	G889	A1201	0.458	0.008	0.077	0.01	0.303	0.061	0.04	0.043	M1	M5
MG-SD-C	*Hesperostipa comata - Koeleria macrantha - Carex spp. - Bouteloua gracilis*	Sand and Sandy	G889	A1201	0.603	0.011	0.029	0.012	0.184	0.07	0.033	0.058	M1	M5
DMGC14	*Rosa woodsii / Stipa comata*	Dunes	G889	A2407	0.478	0.027	0.047	0.029	0.121	0.091	0.036	0.171	M1	N
DMGC15	*Artemisia cana / Stipa comata – Carex Spp*	Dunes	G889	A2407	0.778	0.01	0.019	0.011	0.068	0.031	0.015	0.068	M1	M5
SD17-APAD	*Hesperostipa comata – Symphoricarpos occidentalis – Poa pratensis / Koeleria macrantha*	Sand and Sandy	G889	Anew1	0.547	0.02	0.042	0.024	0.115	0.107	0.032	0.113	M1	N
FFA1	*Festuca campestris - Festuca idahoensis - Agropyron smithii*	Loam	G273	A3986	0.005	0.931	0.006	0.005	0.006	0.009	0.006	0.033	M2	
FFA17	*Festuca campestris - Danthonia parryi - Koeleria macrantha*	Thin	G273	A3986	0.031	0.566	0.04	0.031	0.038	0.064	0.037	0.192	M2	N
FFA2	*Festuca campestris - Festuca idahoensis - Carex spp.*	Loam	G273	A3986	0.002	0.964	0.004	0.003	0.003	0.006	0.003	0.015	M2	
FFA23	*Festuca campestris - Stipa richardsonii*	Loam	G273	A3986	0.004	0.943	0.005	0.004	0.005	0.008	0.004	0.027	M2	
FFA24	*Festuca campestris - Agropyron dasystachyum and Agropyron smithii*	Loam	G273	A3986	0.011	0.843	0.016	0.011	0.019	0.022	0.011	0.068	M2	
FFA5	*Festuca campestris - Danthonia parryi*	Loam	G273	A3986	0.005	0.922	0.007	0.006	0.006	0.011	0.005	0.038	M2	
FFA9	*Festuca campestris - Danthonia parryi - Poa pratensis*	Shallow to gravel	G273	A3986	0.004	0.937	0.005	0.005	0.005	0.009	0.004	0.03	M2	
MGA38	*Festuca hallii – Festuca idahoensis – Agropyron dasystachyum*	Loam	G273	A3988	0.015	0.808	0.02	0.013	0.024	0.028	0.013	0.079	M2	
AP-SD-A	*Hesperostipa curtiseta*	Sand and Sandy	G141	A4029	0.012	0.006	0.866	0.013	0.015	0.051	0.007	0.03	M3	
AP-SD-B	*Hesperostipa curtiseta - Carex spp.*	Sand and Sandy	G141	A4029	0.026	0.014	0.656	0.02	0.037	0.16	0.023	0.064	M3	M6
DMGA1	*Symphoricarpos occidentalis /Stipa curtiseta - Stipa comata*	Subirrigated and Overflow	G141	A4029	0.017	0.009	0.828	0.013	0.021	0.052	0.014	0.047	M3	
DMGC3	*Artemisia cana / Stipa curtiseta – Agropyron spp.*	Subirrigated and Overflow	G141	A4029	0.015	0.01	0.834	0.013	0.02	0.045	0.011	0.052	M3	

Appendix F Noise Clustering Results

Plant Community (PC) Code	PC Scientific Name	Aggregated Ecosite	Group Code	Alliance Code	M1	M2	M3	M4	M5	M6	M7	Noise	Cluster	Next best cluster fit*
DMG-LM-B	*Elymus lanceolatus - Hesperostipa curtiseta*	Loam	G141	A4029	0.029	0.013	0.625	0.015	0.177	0.059	0.022	0.06	M3	M5
LM2-APAD	*Hesperostipa curtiseta – Nassella viridula – Pascopyrum smithii*	Loam	G141	A4029	0.043	0.026	0.409	0.032	0.111	0.131	0.12	0.128	M3	N
MGA36	*Stipa curtiseta – Agropyron dasystachyum*	Loam	G141	A4029	0.026	0.013	0.698	0.015	0.096	0.064	0.026	0.061	M3	M5
MG-GR-A	*Hesperostipa curtiseta - Elymus lanceolatus - Hesperostipa comata*	Shallow to gravel	G141	A4029	0.019	0.005	0.846	0.007	0.052	0.032	0.014	0.025	M3	
MG-LM-A	*Hesperostipa curtiseta - Elymus lanceolatus*	Loam	G141	A4029	0.007	0.006	0.89	0.01	0.021	0.029	0.007	0.03	M3	
MG-LM-B	*Hesperostipa curtiseta - Elymus lanceolatus - Carex spp. - Artemisia frigida*	Loam	G141	A4029	0.007	0.004	0.905	0.005	0.025	0.028	0.008	0.018	M3	
MG-SUB-A	*Pascopyrum smithii - Hesperostipa curtiseta - Elymus lanceolatus*	Subirrigated and Overflow	G141	A4029	0.036	0.017	0.43	0.021	0.135	0.08	0.193	0.088	M3	M7
MG-TH-A	*Hesperostipa curtiseta - Elymus lanceolatus - Nassella viridula*	Thin	G141	A4029	0.01	0.008	0.853	0.014	0.024	0.038	0.011	0.042	M3	
SD2-APAD	*Hesperostipa curtiseta – Carex – Bouteloua gracilis*	Sand and Sandy	G141	A4029	0.023	0.015	0.679	0.023	0.03	0.137	0.017	0.077	M3	M6
CPA49	*Stipa curtiseta-Festuca hallii*	Loam	G332	A4043	0.031	0.019	0.419	0.068	0.04	0.3	0.025	0.099	M3	M6
NFA25	*Stipa curtiseta - Carex spp. - Agropyron spp.*	Loam	G332	A4043	0.02	0.018	0.617	0.081	0.029	0.114	0.019	0.103	M3	M6
SD1b-APAD	*Hesperostipa curtiseta – Avenula hookeri – Hesperostipa spartea*	Sand and Sandy	G889	Anew1	0.037	0.035	0.326	0.071	0.046	0.263	0.035	0.187	M3	M6
CY5-APAD	*Festuca hallii – Poa pratensis – Achnatherum richardsonii – Carex*	Clay	G332	A2304	0.017	0.019	0.023	0.707	0.02	0.086	0.018	0.109	M4	N
LM12-APAD	*Festuca hallii – Poa pratensis – Galium boreale – Carex*	Loam	G332	A2304	0.026	0.029	0.034	0.567	0.029	0.119	0.026	0.17	M4	N
LM8-APAD	*Festuca hallii – Hesperostipa spartea / Achnatherum richardsonii*	Loam	G332	A2304	0.016	0.018	0.022	0.717	0.019	0.085	0.017	0.107	M4	N
CPC29	*Symphoricarpos occidentalis/Festuca hallii*	Loam	G332	A2405	0.012	0.012	0.023	0.785	0.013	0.065	0.012	0.077	M4	N
NFC01	*Symphoricarpos occidentalis / Festuca hallii*	Loam	G332	A2405	0.003	0.003	0.005	0.95	0.003	0.013	0.003	0.02	M4	
NFC06	*Symphoricarpos occidentalis / Festuca hallii - Stipa curtiseta*	Loam	G332	A2405	0.031	0.019	0.107	0.493	0.036	0.18	0.024	0.11	M4	M6
AP-LM-A	*Festuca altaica var. hallii - Elymus lanceolatus - Hesperostipa curtiseta*	Loam	G332	A4043	0.003	0.003	0.008	0.94	0.005	0.018	0.003	0.019	M4	
CPA2	*Festuca hallii-Agropyron smithii*	Solonetzic	G332	A4043	0.009	0.009	0.013	0.843	0.01	0.045	0.01	0.06	M4	
CPA25	*Festuca hallii*	Loam	G332	A4043	0.002	0.002	0.004	0.967	0.002	0.01	0.002	0.011	M4	
CPA3	*Festuca hallii-Stipa curtiseta*	Loam	G332	A4043	0.007	0.006	0.02	0.853	0.008	0.069	0.006	0.032	M4	
MGA1	*Festuca hallii-Stipa curtiseta-Carex*	Loam	G332	A4043	0.002	0.001	0.003	0.974	0.002	0.008	0.002	0.008	M4	
MGA7	*Festuca hallii - Koeleria macrantha -Agropyron dasystachyum*	Shallow to gravel	G332	A4043	0.043	0.028	0.047	0.498	0.071	0.112	0.033	0.168	M4	N
MGA8	*Festuca hallii - Muhlenbergia cuspidata*	Thin	G332	A4043	0.034	0.025	0.093	0.346	0.057	0.276	0.044	0.124	M4	M6
NFA01	*Festuca hallii - Stipa curtiseta*	Loam	G332	A4043	0.002	0.002	0.005	0.96	0.003	0.011	0.002	0.015	M4	
NFA07	*Stipa curtiseta - Festuca hallii*	Loam	G332	A4043	0.019	0.018	0.149	0.517	0.027	0.14	0.022	0.108	M4	M3
NFA10	*Festuca hallii - Carex spp.*	Solonetzic	G332	A4043	0.008	0.007	0.011	0.866	0.01	0.046	0.008	0.045	M4	
NFA28	*Festuca hallii - Stipa curtiseta*	Sand and Sandy	G332	A4043	0.019	0.021	0.14	0.526	0.023	0.123	0.02	0.128	M4	M3
SD1a-APAD	*Festuca hallii – Avenula hookeri – Hesperostipa curtiseta – Hesperostipa spartea*	Sand and Sandy	G332	A4043	0.029	0.029	0.09	0.405	0.035	0.216	0.029	0.167	M4	M6
MGA4	*Stipa comata - Agropyron dasystachyum - Koeleria macrantha*	Loam	G141	A4029	0.135	0.013	0.143	0.015	0.521	0.088	0.023	0.06	M5	M3
FFA27	*Agropyron dasystachyum-Agropyron smithii - Stipa viridula*	Loam	G273	A3986	0.061	0.083	0.197	0.036	0.305	0.107	0.044	0.167	M5	M3
FFA29	*Agropyron dasystachyum - Agropyron smithii - Festuca campestris*	Limy	G273	A3986	0.049	0.125	0.131	0.041	0.263	0.11	0.077	0.204	M5	N
DMGA34	*Artemisia cana / Agropyron dasystachyum - Koeleria macrantha*	Solonetzic	G331	A2300	0.046	0.025	0.061	0.022	0.61	0.055	0.055	0.126	M5	N
DMG-SO-A	*Elymus lanceolatus - Hesperostipa comata - Koeleria macrantha*	Solonetzic	G331	A2300	0.019	0.003	0.008	0.002	0.937	0.008	0.01	0.012	M5	
DMG-SO-B	*Elymus lanceolatus - Koeleria macrantha - Artemisia frigida - Bouteloua gracilis*	Solonetzic	G331	A2300	0.031	0.006	0.02	0.006	0.857	0.023	0.025	0.031	M5	
MG-CY-A	*Elymus lanceolatus*	Clay	G331	A2300	0.052	0.031	0.074	0.026	0.546	0.065	0.051	0.154	M5	N
MG-CY-B	*Elymus lanceolatus - Pascopyrum smithii - Koeleria macrantha - Carex spp.*	Clay	G331	A2300	0.056	0.014	0.045	0.014	0.568	0.06	0.177	0.067	M5	M7
DMG-OV-A	*Artemisia cana - Elymus lanceolatus / Pascopyrum smithii*	Subirrigated and Overflow	G331	A3586	0.094	0.032	0.072	0.03	0.444	0.077	0.078	0.174	M5	N
DMGA5	*Stipa comata - Agropyron dasystachyum - Calamagrostis montanensis*	Loam	G331	A4389	0.126	0.007	0.019	0.007	0.768	0.021	0.015	0.038	M5	M1
DMG-LM-A	*Elymus lanceolatus - Hesperostipa comata*	Loam	G331	A4389	0.038	0.008	0.029	0.007	0.841	0.023	0.015	0.039	M5	
DMG-LM-C	*Hesperostipa comata - Elymus lanceolatus - Koeleria macrantha - Bouteloua gracilis*	Loam	G331	A4389	0.206	0.005	0.016	0.005	0.693	0.023	0.023	0.027	M5	M1
DMG-TH-A	*Hesperostipa comata - Elymus lanceolatus - Koeleria macrantha*	Thin	G331	A4389	0.096	0.003	0.01	0.003	0.849	0.012	0.009	0.017	M5	

Appendix F Noise Clustering Results

Plant Community (PC) Code	PC Scientific Name	Aggregated Ecosite	Group Code	Alliance Code	M1	M2	M3	M4	M5	M6	M7	Noise	Cluster	Next best cluster fit*
DMG-TH-B	*Koeleria macrantha - Hesperostipa comata - Elymus lanceolatus - Bouteloua gracilis*	Thin	G331	A4389	0.163	0.008	0.022	0.008	0.703	0.035	0.024	0.038	M5	M1
MGA20	*Agropyron dasystachyum - Stipa comata - Koeleria macrantha*	Thin	G331	A4389	0.176	0.008	0.03	0.008	0.696	0.032	0.013	0.038	M5	M1
MG-SUB-B	*Artemisia frigida - Pascopyrum smithii*	Subirrigated and Overflow	G331	A4389	0.126	0.019	0.094	0.021	0.351	0.12	0.175	0.095	M5	M7
MG-BD-A	*Elymus lanceolatus - Pascopyrum smithii - Artemisia frigida*	Badlands	G566	A2408	0.043	0.027	0.067	0.024	0.398	0.07	0.239	0.132	M5	M7
CPC1	*Elaeagnus commutata-Rosa acicularis/Koeleria macrantha-Calamovilfa longifolia*	Loam	G331	A4389	0.084	0.042	0.106	0.076	0.078	0.318	0.051	0.245	M6	N
LM1-APAD	*Festuca hallii – Hesperostipa spartea / Hesperostipa curtiseta*	Loam	G332	A2304	0.042	0.043	0.091	0.208	0.053	0.276	0.05	0.236	M6	N
CPC21	*Symphoricarpos occidentalis-Elaeagnus commutata/Stipa comata-Poa pratensis*	Loam	G332	A2405	0.068	0.047	0.106	0.075	0.071	0.353	0.048	0.232	M6	N
CPC5	*Symphoricarpos occidentalis-Elaeagnus commutata/Festuca hallii-Stipa curtiseta*	Loam	G332	A2405	0.039	0.028	0.1	0.264	0.041	0.344	0.03	0.154	M6	M4
NFC07	*Symphoricarpos occidentalis / Carex spp. - Festuca hallii*	Solonetzic	G332	A2405	0.035	0.032	0.073	0.297	0.044	0.311	0.041	0.167	M6	M4
NFC11	*Elaeagnus commutata / Stipa curtiseta - Festuca hallii*	Sand and Sandy	G332	A2405	0.057	0.034	0.223	0.117	0.056	0.282	0.037	0.195	M6	M3
CPA6	*Carex -Stipa curtiseta*	Loam	G332	A4043	0.041	0.034	0.155	0.119	0.049	0.386	0.042	0.174	M6	N
CPA47	*Festuca hallii - Calamovilfa longifolia*	Sand and Sandy	G889	A1201	0.036	0.025	0.076	0.307	0.038	0.351	0.028	0.14	M6	M4
MG-DN-B	*Carex spp. - Hesperostipa comata - Koeleria macrantha*	Dunes	G889	A1201	0.254	0.026	0.079	0.034	0.157	0.268	0.053	0.129	M6	M1
CPC18	*Juniperus horizontalis/Arctostaphylos uva-ursi/Calamovilfa longifolia*	Sand and Sandy	G889	A2407	0.064	0.048	0.107	0.085	0.071	0.305	0.052	0.268	M6	N
SD3-APAD	*Carex – Hesperostipa spartea / Bouteloua gracilis – Avenula hookeri*	Sand and Sandy	G889	Anew1	0.042	0.032	0.115	0.104	0.052	0.454	0.039	0.163	M6	N
SD9-APAD	*Hesperostipa spartea – Carex – Bouteloua gracilis – Juniperus horizontalis*	Sand and Sandy	G889	Anew1	0.08	0.051	0.076	0.058	0.088	0.304	0.062	0.283	M6	N
MG-SO-A	*Elymus lanceolatus / Pascopyrum smithii - Hesperostipa curtiseta - Koeleria macrantha*	Solonetzic	G141	A4029	0.045	0.021	0.256	0.024	0.187	0.107	0.26	0.1	M7	M3
DMGA16	*Agropyron smithii- Carex - Stipa comata*	Solonetzic	G331	A2300	0.003	0.001	0.002	0.001	0.006	0.003	0.977	0.006	M7	
DMGA39	*Agropyron - Poa sandbergii*	Solonetzic	G331	A2300	0.004	0.002	0.004	0.002	0.008	0.005	0.963	0.012	M7	
DMGA8	*Agropyron smithii - Artemisia frigida - Opuntia polyacantha*	Clay	G331	A2300	0.006	0.003	0.006	0.003	0.009	0.008	0.943	0.021	M7	
MGA17	*Agropyron smithii - Koeleria macrantha - Carex*	Solonetzic	G331	A2300	0.019	0.008	0.014	0.008	0.029	0.024	0.855	0.043	M7	
MG-SO-B	*Pascopyrum smithii - Carex spp. - Koeleria macrantha*	Solonetzic	G331	A2300	0.052	0.018	0.083	0.02	0.157	0.093	0.49	0.086	M7	M5
NFA12	*Agropyron smithii - Koeleria macrantha*	Solonetzic	G331	A2300	0.009	0.007	0.011	0.007	0.015	0.016	0.894	0.041	M7	
NFA18	*Agropyron smithii - Festuca hallii - Carex spp.*	Solonetzic	G331	A2300	0.025	0.017	0.032	0.045	0.037	0.066	0.678	0.101	M7	N
DMGC10	*Artemisia cana / Agropyron dasystachyum –Poa sandbergii*	Subirrigated and Overflow	G331	A3586	0.011	0.008	0.013	0.008	0.017	0.018	0.869	0.055	M7	
DMGA14	*Agropyron smithii - Stipa comata*	Sand and Sandy	G331	A4389	0.009	0.004	0.007	0.004	0.012	0.01	0.928	0.025	M7	
DMGA20	*Artemisia cana / Agropyron spp.*	Saline Wet Meadow	G331	A4389	0.007	0.004	0.007	0.005	0.011	0.011	0.928	0.028	M7	
DMGA52	*Agropyron smithii - Bouteloua gracilis*	Subirrigated and Overflow	G331	A4389	0.016	0.005	0.011	0.005	0.026	0.016	0.893	0.028	M7	
MGA21	*Agropyron - Stipa comata*	Loam	G331	A4389	0.028	0.01	0.041	0.01	0.084	0.032	0.744	0.052	M7	M5
MG-BD-B	*Pascopyrum smithii*	Badlands	G566	A2408	0.068	0.03	0.056	0.03	0.137	0.08	0.416	0.182	M7	N
ML2-APAD	*Andropogon gerardii – Poa pratensis – Carex*	Loam	G075	A4018	0.063	0.069	0.081	0.072	0.072	0.165	0.068	0.41	N	M6
MS3-APAD	*Andropogon gerardii / Poa pratensis*	Sand and Sandy	G075	A4018	0.074	0.067	0.074	0.068	0.08	0.155	0.066	0.415	N	M6
CY3-APAD	*Symphoricarpos occidentalis – Hesperostipa comata – Poa pratensis*	Clay	G141	A2309	0.148	0.049	0.082	0.061	0.12	0.197	0.073	0.271	N	M6
DMGC11	*Artemisia cana / Stipa curtiseta – Bouteloua gracilis*	Solonetzic	G141	A4029	0.074	0.057	0.14	0.061	0.096	0.156	0.072	0.345	N	M6
CU-LM-A	*Festuca altaica var. hallii*	Loam	G273	A3986	0.052	0.056	0.071	0.2	0.062	0.148	0.053	0.359	N	M6
MGA10	*Festuca idahoensis - Agropyron dasystachyum - Stipa comata*	Loam	G273	A3988	0.113	0.069	0.105	0.049	0.21	0.14	0.059	0.255	N	M6
MGA33	*Festuca idahoensis - Agropyron dasystachyum*	Clay	G273	A3988	0.07	0.087	0.088	0.065	0.121	0.13	0.067	0.373	N	M5
DMGA37	*Artemisia cana / Stipa comata - Bouteloua gracilis - Koeleria macrantha*	Shallow to gravel	G331	A3586	0.198	0.047	0.071	0.047	0.129	0.125	0.075	0.307	N	M1
CPA11	*Stipa comata/Artemisia frigida-Selaginella densa*	Loam	G331	A4389	0.205	0.048	0.071	0.051	0.151	0.135	0.057	0.28	N	M1
DMGA61	*Stipa curtiseta – Poa sandbergii – Koeleria macrantha*	Loam	G331	A4389	0.075	0.05	0.208	0.056	0.1	0.171	0.064	0.277	N	M3

Appendix F Noise Clustering Results

Plant Community (PC) Code	PC Scientific Name	Aggregated Ecosite	Group Code	Alliance Code	M1	M2	M3	M4	M5	M6	M7	Noise	Cluster	Next best cluster fit*
LM7-APAD	*Schizachyrium scoparium – Poa pratensis – Symphyotrichum laeve*	Loam	G332	A2304	0.063	0.07	0.072	0.073	0.071	0.156	0.064	0.432	N	M6
SD11-APAD	*Schizachyrium scoparium – Hesperostipa spartea – Festuca hallii*	Sand and Sandy	G332	A2304	0.056	0.057	0.066	0.133	0.063	0.168	0.057	0.399	N	M6
ER4-APAD	*Symphoricarpos occidentalis – Hesperostipa spartea – Poa pratensis*	Thin	G332	A2405	0.064	0.062	0.074	0.074	0.076	0.189	0.065	0.397	N	M6
CPA34	*Bouteloua gracilis-Stipa curtiseta/Artemisia frigida*	Loam	G332	A4043	0.065	0.045	0.146	0.114	0.091	0.211	0.058	0.271	N	M6
DMGA36	*Bouteloua gracilis - Distichlis stricta- Stipa comata*	Badlands	G566	A3978	0.166	0.04	0.074	0.043	0.15	0.14	0.141	0.247	N	M1
DMGA43	*Stipa comata-Carex stenophylla-Calamovilfa longifolia*	Sand and Sandy	G889	A1201	0.122	0.058	0.076	0.056	0.103	0.136	0.07	0.38	N	M6
DMGA69	*Calamovilfa longifolia - Stipa comata - Bouteloua gracilis*	Thin	G889	A1201	0.228	0.039	0.072	0.04	0.155	0.139	0.081	0.246	N	M1
NFA31	*Calamovilfa longifolia - Carex spp.*	Sand and Sandy	G889	A1201	0.093	0.055	0.094	0.061	0.086	0.215	0.06	0.334	N	M6
CPC16	*Juniperus horizontalis/Festuca hallii*	Sand and Sandy	G889	A2407	0.05	0.049	0.084	0.149	0.058	0.278	0.05	0.282	N	M6
CPC17	*Juniperus horizontalis/Calamovilfa longifolia-Carex spp.*	Sand and Sandy	G889	A2407	0.074	0.058	0.082	0.069	0.077	0.248	0.06	0.332	N	M6
NFC13	*Symphoricarpos occidentalis / Carex spp. - Calamovilfa longifolia*	Sand and Sandy	G889	A2407	0.069	0.065	0.084	0.078	0.072	0.156	0.059	0.417	N	M6
PEZ-DN-A	*Prunus virginiana / Carex spp.*	Dunes	G889	A2407	0.076	0.065	0.073	0.068	0.082	0.145	0.066	0.425	N	
DN2-APAD	*Juniperus horizontalis – Hesperostipa spartea – Schizachyrium scoparium / Bouteloua gracilis – Prunus pumila*	Dunes	G889	Anew1	0.068	0.061	0.072	0.065	0.08	0.201	0.065	0.387	N	M6
SD8-APAD	*Hesperostipa spartea – Bouteloua gracilis – Carex*	Sand and Sandy	G889	Anew1	0.085	0.054	0.084	0.063	0.092	0.237	0.064	0.321	N	M6

*For communities with a fuzzy membership in their assigned cluster of less than 0.80. Next best cluster is based on the cluster fuzzy membership value.

Appendix F

Supervised classification results for the non-reference communities showing the group each was classified to and the group assigned to the parent reference community based on expert review, Prairie Provinces, Canada

Appendix G Results of Supervised Classification

Non-Reference Plant Community Code	Non-Reference Plant Community Scientific Name	Group Classified To	Parent Reference Community Code*	Parent Reference Group**	Group Match***	Reference Group Basis****
AP-SD-F	*Agropyron cristatum - Carex spp.*	G889	AP-SD-B	G141	FALSE	
MG-LM-G	*Agropyron cristatum - Native grasses*	G679	MG-LM-B	G141	FALSE	
DMGA66	*Agropyron dasystachyum - Stipa comata – Psoralea lanceolata*	G331	DMGA65	G889	FALSE	
FFA14	*Agropyron dasystachyum - Stipa curtiseta - Koeleria macrantha*	G141	FFA1	G273	FALSE	
MGA32	*Agropyron dasystachyum – Koeleria macrantha*	G331	MGA20	G331	TRUE	
MGA37	*Agropyron dasystachyum – Stipa comata*	G331	MGA10	G273	FALSE	
FFA25	*Agropyron dasystachyum and Agropyron smithii - Festuca campestris*	G273	FFA24	G273	TRUE	
DMGB2	*Agropyron pectiniforme- Stipa comata / Artemisia cana*	G889	DMGB1	G679	FALSE	
NFA21	*Agropyron smithii*	G566	NFA12	G331	FALSE	
DMGA45	*Agropyron smithii - Distichlis stricta - Grindelia squarrosa*	G566	DMGC1	G331	FALSE	
DMGA59	*Agropyron smithii – Carex Spp*	G331	DMGA52	G331	TRUE	
MGA35	*Agropyron smithii –Poa sandbergii - Koeleria macrantha*	G566	MGA33	G273	FALSE	
CPA44	*Agropyron trachycaulum-Distichlis stricta*	G984	CPA40	G984	TRUE	
CPA52	*Agropyron trachycaulum-Poa pratensis*	G679	CPA49	G332	FALSE	
DN8-APAD	*Andropogon gerardii – Poa pratensis – Artemisia ludoviciana*	G075	Not Available	G889	FALSE	Ecoregion/ Ecosite
DMG-DN-E	*Artemisia cana - Hesperostipa comata - Calamovilfa longifolia*	G889	DMG-DN-D	G889	TRUE	
MGC1	*Artemisia cana / Agropyron smithii - Koeleria macrantha*	G566	MGA9	G331	FALSE	
DMGC16	*Artemisia cana / Bouteloua gracilis – Agropyron smithii - Stipa comata*	G331	DMGA22	G331	TRUE	
DMGC12	*Artemisia cana / Bouteloua gracilis – Poa sandbergii*	G331	DMGA34	G331	TRUE	
DMGA31	*Artemisia cana / Poa sandbergii - Koeleria macrantha*	G566	DMGA34	G331	FALSE	
DMGA19	*Artemisia cana/ Stipa comata-Calamovilfa longifolia*	G889	DMGA43	G889	TRUE	
NFA33	*Artemisia frigida - Carex spp.*	G889	NFA31	G889	TRUE	
AP-SD-E	*Artemisia frigida - Carex spp. - Hesperostipa comata - Koeleria macrantha*	G331	AP-LM-A	G332	FALSE	
MG-CY-C	*Artemisia frigida - Elymus lanceolatus - Carex spp. - Pascopyrum smithii*	G331	MG-CY-B	G331	TRUE	
MG-LM-E	*Artemisia frigida - Hesperostipa comata - Elymus lanceolatus*	G331	MG-LM-B	G141	FALSE	
AP-GR-B	*Artemisia frigida - Hesperostipa comata - Koeleria macrantha - Carex spp.*	G141	AP-GR-A	G141	TRUE	
DMG-LM-F	*Artemisia frigida - Hesperostipa comata - Koeleria macrantha - Elymus lanceolatus*	G331	DMG-LM-C	G331	TRUE	
MG-SD-D	*Artemisia frigida - Koeleria macrantha - Carex spp. - Hesperostipa comata - Bouteloua gracilis*	G331	MG-SD-C	G889	FALSE	
MG-GR-C	*Artemisia frigida - Koeleria macrantha - Hesperostipa comata - Bouteloua gracilis*	G331	MG-GR-A	G141	FALSE	
CPA48	*Bouteloua gracilis-Calamovilfa longifolia-Stipa comata*	G889	CPA47	G889	TRUE	
MG-LM-F	*Bouteloua gracilis - Artemisia frigida - Koeleria macrantha*	G331	MG-LM-B	G141	FALSE	
NFA09	*Bouteloua gracilis - Carex spp.*	G141	NFA07	G332	FALSE	
MG-UPSA-B	*Bouteloua gracilis - Elymus lanceolatus - Pascopyrum smithii*	G566	MG-UPSA-A	G984	FALSE	
DMGA10	*Bouteloua gracilis - Stipa comata*	G331	DMGA3	G331	TRUE	
DMGA48	*Bouteloua gracilis - Stipa comata*	G331	DMGA2	G331	TRUE	
DMG-LM-E	*Bouteloua gracilis -Hesperostipa comata - Koeleria macrantha - Pascopyrum smithii*	G331	DMG-LM-C	G331	TRUE	
DMGA53	*Bouteloua gracilis – Poa sandbergii*	G566	DMGA52	G331	FALSE	
DMGA62	*Bouteloua gracilis – Poa sandbergii – Stipa comata*	G331	DMGA3	G331	TRUE	
FFA26	*Bromus inermis - Agropyron dasystachyum and Agropyron smithii*	G679	FFA24	G273	FALSE	
MGB4	*Bromus inermis - Calamovilfa longifolia*	G679	MGA16	G889	FALSE	
LM5-APAD	*Bromus inermis – Poa pratensis – Hesperostipa curtiseta*	G679	LM1-APAD / LM2-APAD	G332	FALSE	
CPA7	*Calamovilfa longifolia-Stipa curtiseta-Koeleria macrantha*	G889	CPA47	G889	TRUE	
DN3a-APAD	*Calamovilfa longifolia – Carex – Hesperostipa curtiseta*	G889	Not Available	G889	TRUE	Ecosite
CPA5	*Carex-Poa pratensis*	G889	CPA3	G332	FALSE	
CPA8	*Carex -Koeleria macrantha*	G889	CPA6	G332	FALSE	
DN4-APAD	*Carex – Bouteloua gracilis / Calamovilfa longifolia – Hesperostipa spartea*	G889	Not Available	G889	TRUE	Ecosite
DN5-APAD	*Carex – Poa pratensis – Hesperostipa spartea*	G075	Not Available	G889	FALSE	Ecoregion/ Ecosite
SD12-APAD	*Carex – Schizachyrium scoparium*	G889	Not Available	G889	TRUE	Literature
NFA17	*Carex spp - Agropyron smithii*	G566	NFA10	G332	FALSE	
CPA4	*Carex spp.-Agropyron smithii-Festuca hallii*	G889	CPA3	G332	FALSE	
NFA26	*Carex spp. - Agropyron spp. - Stipa curtiseta*	G141	NFA25	G332	FALSE	
AP-LM-C	*Carex spp. - Artemisia frigida - Hesperostipa curtiseta - Elymus lanceolatus*	G141	AP-LM-A	G332	FALSE	
AP-DN-B	*Carex spp. - Artemisia frigida - Koeleria macrantha*	G889	Not Available	G889	TRUE	Ecosite
FFA4	*Carex spp. - Artemisia frigida - Poa pratensis*	G273	FFA2	G273	TRUE	
NFA32	*Carex spp. - Calamovilfa longifolia*	G889	NFA31	G889	TRUE	
AP-DN-A	*Carex spp. - Calamovilfa longifolia - Hesperostipa comata*	G889	Not Available	G889	TRUE	Ecosite
NFA11	*Carex spp. - Festuca hallii*	G141	NFA10	G332	FALSE	
NFA08	*Carex spp. - Festuca hallii - Stipa curtiseta*	G332	NFA07	G332	TRUE	
AP-SD-C	*Carex spp. - Hesperostipa curtiseta - Koeleria macrantha*	G141	AP-SD-B	G141	TRUE	
NFA20	*Carex spp. - Koeleria macrantha - Agropyron smithii*	G331	NFA18	G331	TRUE	
MG-DN-C	*Carex spp. - Koeleria macrantha - Hesperostipa comata*	G889	MG-DN-B	G889	TRUE	
NFA19	*Carex spp. - Poa pratensis*	G679	NFA18	G331	FALSE	
CU-LM-B	*Carex spp. - Poa pratensis - Taraxacum officinale*	G889	CU-LM-A	G332	FALSE	
NFA30	*Carex spp. - Stipa curtiseta*	G141	NFA28	G332	FALSE	
NFA29	*Carex spp. - Stipa curtiseta - Festuca hallii*	G332	NFA28	G332	TRUE	
DMGA60	*Carex spp. - Western Wheatgrass –Artemisia ludoviciana*	G566	DMGC10	G331	FALSE	
FFA10	*Danthonia parryi - Festuca campestris - Festuca idahoensis*	G273	FFA9	G273	TRUE	
FFA6	*Danthonia parryi - Festuca campestris - Poa pratensis*	G273	FFA5	G273	TRUE	
FFA18	*Danthonia parryi - Festuca campestris - Stipa curtiseta*	G273	FFA17	G273	TRUE	
CPA43	*Distichlis stricta-Hordeum jubatum*	G984	CPA40	G984	TRUE	
MG-SUBSA-C	*Distichlis spicata var. stricta - Carex spp.*	G984	Not Available	G984	TRUE	Ecosite
AP-SUBSA-E	*Distichlis spicata var. stricta - Forbs*	G984	AP-SUBSA-C	G984	TRUE	
NFA37	*Distichlis stricta*	G984	NFA35	G984	TRUE	

Appendix G Results of Supervised Classification

Non-Reference Plant Community Code	Non-Reference Plant Community Scientific Name	Group Classified To	Parent Reference Community Code*	Parent Reference Group**	Group Match***	Reference Group Basis****
CPA42	*Distichlis stricta-Hordeum jubatum-Puccinellia nuttalliana*	G984	CPA40	G984	TRUE	
DMGA44	*Distichlis stricta - Agropyron smithii*	G984	DMGA20	G331	FALSE	
NFC12	*Elaeagnus commutata / Bromus inermis - Poa pratensis*	G679	NFC11	G332	FALSE	
MG-TH-B	*Elymus lanceolatus - Hesperostipa comata - Bouteloua gracilis - Pascopyrum smithii*	G331	MG-TH-A	G141	FALSE	
CPA26	*Festuca hallii - Poa pratensis*	G332	CPA25	G332	TRUE	
FFA3	*Festuca campestris - Artemisia frigida - Festuca idahoensis*	G273	FFA2	G273	TRUE	
NFA02	*Festuca hallii - Poa pratensis*	G332	NFA01	G332	TRUE	
LM9-APAD	*Festuca hallii – Carex – Koeleria macrantha*	G332	Not Available	G332	TRUE	Dominant Species
FFA13	*Festuca idahoensis - Festuca campestris - Koeleria macrantha*	G273	FFA9	G273	TRUE	
MGA11	*Festuca idahoensis - Lupinus*	G273	MGA10	G273	TRUE	
CPA33	*Festuca saximontana-Stipa comata-Koeleria macrantha*	G889	CPA40	G984	FALSE	
DMG-DN-C	*Hesperostipa comata - Artemisia frigida*	G889	DMG-DN-A	G889	TRUE	
AP-TH-B	*Hesperostipa comata - Bouteloua gracilis*	G889	AP-TH-A	G141	FALSE	
MG-TH-C	*Hesperostipa comata - Bouteloua gracilis - Koeleria macrantha*	G331	MG-TH-A	G141	FALSE	
MG-LM-D	*Hesperostipa comata - Carex spp. - Artemisia frigida*	G331	MG-LM-B	G141	FALSE	
MG-LM-C	*Hesperostipa comata - Elymus lanceolatus*	G331	MG-LM-B	G141	FALSE	
AP-LM-D	*Hesperostipa comata - Elymus lanceolatus / Pascopyrum smithii - Artemisia frigida*	G331	AP-LM-A	G332	FALSE	
MG-GR-B	*Hesperostipa comata - Koeleria macrantha - Artemisia frigida*	G331	MG-GR-A	G141	FALSE	
AP-SD-D	*Hesperostipa comata - Koeleria macrantha - Carex spp. - Bouteloua gracilis*	G331	AP-SD-B	G141	FALSE	
DMG-DN-D	*Hesperostipa comata - Psoralidium lanceolatum - Artemisia frigida - Calamovilfa longifolia*	G889	Not Available	G889	TRUE	Ecosite
AP-LM-B	*Hesperostipa curtiseta - Elymus lanceolatus - Carex spp. - Artemisia frigida*	G141	AP-LM-A	G332	FALSE	
CY2-APAD	*Hesperostipa curtiseta – Carex – Poa pratensis – Avenula hookeri – Pascopyrum smithii*	G141	LM1-APAD / LM2-APAD	G141	TRUE	
SD5-APAD	*Hesperostipa curtiseta – Poa pratensis – Carex*	G141	SD1a-APAD/SD1b-APAD	G141	TRUE	
NFA38	*Hordeum jubatum*	G984	NFA35	G984	TRUE	
CPA41	*Hordeum jubatum-Puccinellia nuttalliana*	G984	CPA40	G984	TRUE	
DMGB7	*Hordeum jubatum – Poa pratensis - Agropyron smithii*	G984	DMGC1	G331	FALSE	
MG-TH-D	*Juniperus horizontalis*	G889	DMG-TH-A	G331	FALSE	
AP-DN-C	*Juniperus horizontalis*	G889	Not Available	G889	TRUE	Ecosite
PEZ-SUB-O	*Juniperus horizontalis - Arctostaphylos uva-ursi / Glycyrrhiza lepidota*	G889	MG-SUB-B	G331	FALSE	
MG-DN-E	*Juniperus horizontalis - Carex obtusata - Calamovilfa longifolia*	G889	MG-DN-A	G889	TRUE	
FFC4	*Juniperus horizontalis - Danthonia parryi - Stipa curtiseta*	G889	FFA17	G273	FALSE	
MG-SD-F	*Juniperus horizontalis / Carex spp. - Calamovilfa longifolia*	G889	MG-SD-A, MG-SD-B	G889	TRUE	
DMG-DN-F	*Juniperus horizontalis / Elymus lanceolatus - Calamovilfa longifolia - Artemisia frigida*	G889	DMG-DN-A,DMG-DN-B	G889	TRUE	
DMG-SO-D	*Koeleria macrantha - Artemisia frigida - Bouteloua gracilis -Elymus lanceolatus*	G331	DMG-SO-B	G331	TRUE	
MG-SO-C	*Koeleria macrantha - Artemisia frigida - Carex spp.*	G331	MG-SO-A	G141	FALSE	
DMG-SO-C	*Koeleria macrantha - Elymus lanceolatus - Artemisia frigida - Bouteloua gracilis*	G331	DMG-SO-B	G331	TRUE	
DMG-LM-D	*Koeleria macrantha - Hesperostipa comata - Artemisia frigida - Bouteloua gracilis*	G331	DMG-LM-C	G331	TRUE	
NFA22	*Opuntia polyacantha / Koeleria macrantha*	G566	NFA12	G331	FALSE	
LM3-APAD	*Pascopyrum smithii – Hesperostipa curtiseta – Carex*	G141	LM1-APAD / LM2-APAD	G141	TRUE	
MGA13	*Poa compressa - Lupinus sericeus*	G984	MGA10	G273	FALSE	
CPA27	*Poa pratensis-Agropyron trachycaulum*	G679	CPA25	G332	FALSE	
CPA46	*Poa pratensis-Bromus inermis*	G679	CPA25	G332	FALSE	
CPA20	*Poa pratensis-Distichlis stricta*	G984	CPA40	G984	TRUE	
CPA51	*Poa pratensis-Stipa curtiseta*	G141	CPA49	G332	FALSE	
AP-LM-E	*Poa pratensis - Carex spp.*	G679	AP-LM-A	G332	FALSE	
FFA19	*Poa pratensis - Festuca campestris*	G273	FFA5	G273	TRUE	
NFA03	*Poa pratensis - Festuca hallii*	G332	NFA01	G332	TRUE	
LM4-APAD	*Poa pratensis – Hesperostipa curtiseta – Artemisia*	G679	LM1-APAD / LM2-APAD	G332	FALSE	
LM6-APAD	*Poa pratensis – Symphoricarpos occidentalis – Bromus inermis – Carex*	G679	LM1-APAD / LM2-APAD	G141	FALSE	
DMGA30	*Poa sandbergii - Agropyron dasystachyum*	G566	DMGA39	G331	FALSE	
AP-SUBSA-B	*Poa spp. - Distichlis spicata var. stricta - Forbs*	G984	AP-SUBSA-A	G984	TRUE	
MG-DN-D	*Psoralidium lanceolatum - Calamovilfa longifolia - Artemisia frigida - Hesperostipa comata*	G889	Not Available	G889	TRUE	Ecosite
NFA36	*Puccinellia nuttalliana*	G984	NFA35	G984	TRUE	
CPC22	*Rosa-Elaeagnus commutata/Poa pratensis*	G679	CPC1	G331	FALSE	
FFC1	*Rubus idaeus-Rosa woodsii / Poa pratensis - Taraxacum officinale*	G679	FFA15	G273	FALSE	
PEZ-SMHSA-B	*Scirpus nevadensis*	G984	Not Available	G984	TRUE	Ecosite
CPA45	*Spartina gracilis-Juncus balticus*	G984	CPA40	G984	TRUE	
DMGA33	*Stipa comata - Artemisia frigida*	G331	DMGA23	G331	TRUE	
DMGA47	*Stipa comata - Bouteloua gracilis - Agropyron dasystachyum*	G331	DMGA2	G331	TRUE	
DMGA46	*Stipa comata - Bouteloua gracilis - Agropyron Spp.*	G331	DMGA2	G331	TRUE	
DMGA32	*Stipa comata - Glycyrrhiza lepidota*	G889	DMGC5	G889	TRUE	
MGA22	*Stipa comata - Koeleria macrantha*	G331	MGA21	G331	TRUE	
MGA3	*Stipa comata - Koeleria macrantha*	G331	MGA1	G332	FALSE	
DMGA68	*Stipa comata – Carex Spp. – Artemisia frigida*	G889	DMGA67	G889	TRUE	
DMGA64	*Stipa comata – Psoralea lanceolata - Calamovilfa longifolia*	G889	DMGA63	G889	TRUE	
CPA50	*Stipa curtiseta-Festuca hallii-Poa pratensis*	G332	CPA49	G332	TRUE	
NFA27	*Stipa curtiseta - Carex spp.*	G141	NFA25	G332	FALSE	
MGA2	*Stipa curtiseta - Festuca hallii*	G141	MGA1	G332	FALSE	
FFA28	*Stipa viridula - Artemisia frigida*	G273	FFA27	G273	TRUE	
CPC6	*Symphoricarpos occidentalis-Elaeagnus commutata/Poa pratensis*	G679	CPC5	G332	FALSE	
AP-LM-I	*Symphoricarpos occidentalis - Elaeagnus commutata / Hesperostipa curtiseta - Carex spp.*	G332	AP-LM-A	G332	TRUE	
MG-LM-H	*Symphoricarpos occidentalis - Hesperostipa curtiseta*	G141	MG-LM-B	G141	TRUE	
MG-SD-G	*Symphoricarpos occidentalis - Rosa spp. / Calamovilfa longifolia - Hesperostipa comata - Artemisia frigida*	G889	MG-SD-C	G889	TRUE	

Appendix G Results of Supervised Classification

Non-Reference Plant Community Code	Non-Reference Plant Community Scientific Name	Group Classified To	Parent Reference Community Code*	Parent Reference Group**	Group Match***	Reference Group Basis****
MGC3	*Symphoricarpos occidentalis / Carex filifolia - Koeleria macrantha*	G889	MGA20	G331	FALSE	
NFC09	*Symphoricarpos occidentalis / Festuca hallii - Bouteloua gracilis*	G332	NFC06	G332	TRUE	
NFC02	*Symphoricarpos occidentalis / Festuca hallii - Poa pratensis*	G332	NFC01	G332	TRUE	
PEZ-DN-B	*Symphoricarpos occidentalis / Hesperostipa comata - Carex spp.*	G889	Not Available	G889	TRUE	Ecosite
NFC03	*Symphoricarpos occidentalis / Poa pratensis - Festuca hallii*	G332	NFC01	G332	TRUE	
MGA12	*Symphoricarpos occidentalis / Poa pratensis - Festuca idahoensis*	G679	MGA10	G273	FALSE	
NFC10	*Symphoricarpos occidentalis / Poa pratensis - Stipa curtiseta*	G679	Not Available	G332	FALSE	Ecoregion
NFC08	*Symphoricarpos occidentalis / Populus tremuloides*	G679	NFC01	G332	FALSE	
CPC23	*Symphoricarpos occidentalis/Bromus inermis*	G679	CPC29	G332	FALSE	
CPC32	*Symphoricarpos occidentalis/Poa pratensis*	G679	CPC29	G332	FALSE	
CPC30	*Symphoricarpos occidentalis/Festuca hallii-Poa pratensis*	G332	CPC29	G332	TRUE	

* "Not available" in the Parent Reference Community Code column indicates that a reference was not assigned in the respective rangeland guide

** "Not available" in the Parent Reference Group column indicates that a reference group was unavailable because the a parent reference community was not assigned and the reference group was not able to be determined by another means.

*** "No Reference Assigned" indicates that a comparison was not possible because a parent reference community was not asssigned and the reference group was unable to be assigned by other means.

**** The Refernce Group Basis columns indicates how the reference group was determined when a parent reference community was not assigned.

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