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Great Plains Flora? Plant Geography of Eastern Montana's Lower Elevation Shrub-grass Dominated Vegetation

Matt Lavin¹ and Catherine Seibert¹

ABSTRACT

Montana plant geography at elevations below montane forests broadly includes open shrub-grass or ponderosa pine dominated dry sites and riparian-wetland systems. In contrast to conventional wisdom, the floristic composition of these settings in eastern Montana does not reflect a strong Great Plains influence. State and county geographical distribution patterns suggestive of an influence of the Great Plains flora on that of eastern Montana involve only 52 species of mostly uncommon and narrowly distributed species of dicot forbs that do not compose a common type of characteristic Great Plains plant community in the state. In addition, the floristic similarity of the grass family, *Poaceae*, which is very diverse in open dry vegetation in Montana, reveals that Montana shares many more grass species in common with Utah than with the adjacent Great Plains state of South Dakota. Instead of the Great Plains biome, the low elevation flora and vegetation of Montana appears to be part of or influenced by the Pacific Northwest, Boreal, and the Intermountain biome. From the perspective of plant identification, the volumes of the Intermountain Flora works as well as or better across the state of Montana at low elevation dry settings compared to the Flora of the Great Plains or the Flora of the Pacific Northwest. The flora and vegetation of the open dry settings of eastern Montana is generally characteristic of the Intermountain sagebrush steppe and this should be considered in "prairie" restoration programs, especially when large ungulates like bison are proposed for reintroduction.

INTRODUCTION

The Vascular Plants of Montana (Dorn 1984), the Flora of the Great Plains (McGregor and Barkley 1986), the Pacific Northwest Flora (Hitchcock and Cronquist 1973), and the Intermountain Flora (Cronquist and others 1972) all show maps that delineate a floristic or vegetation division in the state of Montana that separates the mountains and foothills generally in the western one-third from the lower elevation "plains" in the eastern two-thirds of the state. The Flora of the Great Plains encompasses all plant species from the eastern two thirds of Montana, whereas the Flora of the Pacific Northwest includes all Montana plant species. The Intermountain Flora was developed without a consideration of the Montana flora. In alignment with the Potential Natural Vegetation of the Conterminous United

States (Küchler 1964), the Grassland and Shrubland Habitat Types of Western Montana (Mueggler and Steward 1980) includes a similar map and explicitly excludes eastern Montana from the classification system of shrub-grass dominated vegetation in western Montana because of its putative fundamental differences in physiognomy and floristic composition.

With this knowledge, the first author, inexperienced with field work in eastern Montana, offered to assess the diversity and quality of the flora and vegetation of lands in central Phillips County, which were being purchased and managed by the American Prairie Foundation (APF) in conjunction with the World Wildlife Fund to reintroduce bison and other mammals to the northern Great Plains (<http://www.americanprairie.org/>). The APF plans to restore some of the original conditions of the Great Plains ecosystem in eastern Montana. They clearly invoke a conceptual model that includes eastern Montana harboring Great Plains flora and vegetation.

Instead of finding grasslands dominated by an abundance of warm season grass species during that initial vegetation reconnaissance of APF lands during 2003, what predominated the native vegetation in dry open settings in much of Phillips and adjacent Counties were a large diversity of cool season Palouse prairie grasses (for example *Agropyron spicatum*, *Festuca idahoensis*, *Koeleria macrantha*, etc.), *Artemisia tridentata*, and many other shrubs and forbs well known from the Intermountain west. For plant identification, the Flora of the Great Plains (McGregor and Barkley 1984) was difficult to use because it contained many families, genera, and species that were either lacking or not diverse in Montana. In contrast, the volumes of the Intermountain flora worked very well, especially for the identification of the grass species. This preliminary floristic evidence suggested that much of eastern Montana was more of the Intermountain than Great Plains biome.

Further reconnaissance of the flora and vegetation of eastern Montana revealed extensive forests and woodland dominated by *Pinus ponderosa* var. *scopulorum*, sagebrush steppe harboring a large diversity of short statured cool rather than tall warm season grasses, riparian areas with species characteristic of eastern deciduous forests (for example *Fraxinus pennsylvanica*, *Quercus macrocarpa*, and *Ulmus americana*), or vegetation with widespread constituents (for example *Acer negundo* and *Populus fremontii*). Species characteristic of the Great Plains, such

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tall statured warm season grasses or the cool season porcupinegrass, were difficult to locate at all or in high abundance. This initial finding prompted a more detailed investigation into the geography of Montana's vascular plants in order to determine whether its topography with mountains in the west and plains in the east actually imposes an ecological and geographic distinction on the flora of the state.

METHODS

Four types of data were gathered to test the hypothesis that the eastern low elevation flora of Montana is part of or significantly influenced by the Great Plains biome. First, geographical distributions of Great Plains species occurring in eastern Montana were inspected. Second, eastern Montana vegetation types dominated by Great Plains species or associations were identified. Third, the grasses of Montana were inspected for relative similarity to Great Plains versus Intermountain grasses. Finally, the North American distributions of species dominating low elevation habitats in Montana were inspected for geographical patterns in order to identify the relative influence of the Great Plains compared to other North American biomes such as that of the Intermountain or Pacific Northwest.

Great Plains Species Occurring in Eastern Montana

A list of plant species potentially characteristic of eastern Montana was derived primarily from Dorn (1984) by including all species assigned only to the geographic categories of "central" or "east" but not "west". This initial list was scrutinized for those species having a county distribution restricted to the eastern two-thirds of Montana. County distributions were derived from plant specimens deposited at the Montana State University Herbarium (MONT) and the University of Montana Herbarium (MONTU). This distilled list was further refined by retaining species with a distribution in North America that was primarily from the central corridor of states and provinces in Canada and the United States. Distributions among states and provinces in the USA and Canada were taken from the PLANTS Database (USDA, NRCS, 2008). This final list was then considered the extent of the influence of the Great Plains biome on eastern Montana vegetation.

Eastern Montana Vegetation Types Dominated by Great Plains Species

Plant species that characterize large scale vegetation or habitat types in Montana (Pfister and others 1977; Mueggler and Steward 1980; Montana Natural Heritage Program 2002) were especially scrutinized for their distribution both within Montana and throughout North America. Literature bearing specifically on the Rocky

Mountain flora and vegetation was not considered during this analysis because of the focus on lower elevation vegetation in Montana, below about 6,000 ft (1,830 m) or below montane forests dominated, for example, by *Pinus contorta*, *Picea engelmannii*, or *Pseudotsuga menziesii*.

The Grasses of Montana

The species enumerated in the Grasses of Montana (Lavin and Seibert 2009) were compared against the grasses listed for the adjacent plains state of South Dakota and for the more distant Intermountain state of Utah. The grass distribution data taken from the PLANTS database (USDA, NRCS 2008) was essentially derived from Cronquist and others (1972), McGregor and others (1977), VanBruggen (1985), and Welch and others (1987) and these works were consulted to validate species distributions. South Dakota and Utah comparisons were made in order to bias in favor of detecting a Great Plains influence on the flora and vegetation of eastern Montana. Because of its upland Black Hills country, South Dakota shares many western montane grasses with Montana (for example *Festuca idahoensis* and *Trisetum spicatum*) in addition to plains species shared with Montana but not Utah (for example *Muhlenbergia cuspidata*). Choosing Utah because of its Intermountain status also had the additional advantage of biasing against the detection of a predominant Intermountain influence on the flora and vegetation of Montana because Utah is much more southerly in latitude and not adjacent to Montana, in contrast to South Dakota. Comparing Montana with an adjacent state like Idaho or Wyoming would have biased the results in favor of detecting a strong Intermountain influence.

North American Geographical Distributions of Low Elevation Dominants

All native species known to characterize vegetation types across Montana and low elevations were inspected for Montana county distributions as well as North American distribution patterns. The MONT and MONTU herbaria and the PLANTS database served as the primary sources for information on geographic distribution.

Nomenclature

Binomial nomenclature followed primarily Dorn (1984) with the exception of certain grass genera where Lavin and Seibert (2009) was used. The PLANTS Database (USDA, NRCS 2008) was used only as a secondary source of binomial nomenclature because this database is prone to the uncritical adoption of any recent nomenclature. Regardless, all Latin binomials reported in this study can be entered into the PLANTS database for information on taxonomic authorship as well as nomenclatural and taxonomic synonymy.

Table 1—The 52 native species that have a primarily Great Plains distribution and that are restricted, or nearly so, to low elevation open dry settings in the eastern two-thirds of Montana. The species “reported from Montana” (Dorn 1984) have not been verified with herbarium specimens as occurring in the state. The azonal species inhabit primarily gumbo clay or rocky outcrops with sparse plant cover. The widely distributed North American grasses *Andropogon gerardii*, *Bouteloua dactyloides*, *Muhlenbergia cuspidata*, and *Panicum virgatum* are included in this list because they characterize in part Great Plains vegetation. An asterisk indicates those species represented by more than 10 collections in the holdings of MONT and MONTU.

Great Plains Species	Occurring in Intermountain Flora	Great Plains Species	Occurring in Intermountain Flora
Monocots		Dicots (continued)	
<i>Andropogon gerardii</i> *	Yes	<i>Evax prolifera</i>	No
<i>Andropogon hallii</i> *	Yes	<i>Evolvulus nuttallianus</i>	Yes
<i>Bouteloua dactyloides</i> *	Yes	<i>Happlopappus armerioides</i> *	Yes
<i>Bouteloua hirsuta</i> ^a	Yes	<i>Happlopappus multicaulis</i>	No
<i>Carex inops ssp. heliophila</i> *	Yes	<i>Heuchera richardsonii</i> (azonal)	No
<i>Dichanthelium wilcoxianum</i>	No	<i>Ipomoea leptophylla</i>	No
<i>Muhlenbergia cuspidata</i> *	No	<i>Lesquerella arenosa</i>	No
<i>Panicum virgatum</i> *	Yes	<i>Linum rigidum</i>	No
<i>Stipa spartea</i>	No	<i>Mertensia lanceolata</i> *	Yes
<i>Yucca glauca</i> *	No	<i>Opuntia macrorhiza</i> ^a	Yes
Dicots		<i>Oxytropis lambertii</i> *	Yes
<i>Amorpha canescens</i>	No	<i>Penstemon albidus</i> *	No
<i>Artemisia longifolia</i> * (azonal)	No	<i>Penstemon angustifolius</i>	Yes
<i>Asclepias stenophylla</i>	No	<i>Penstemon grandiflorus</i>	No
<i>Astragalus plattensis</i>	No	<i>Phlox andicola</i>	No
<i>Astragalus racemosus</i>	Yes	<i>Physaria brassicoides</i>	No
<i>Castilleja sessiliflora</i> *	No	<i>Polygala alba</i> *	No
<i>Dalea candida</i> *	Yes	<i>Psoralea argophylla</i> *	No
<i>Dalea enneandra</i>	No	<i>Psoralea cuspidata</i> ^a	No
<i>Dalea purpurea</i> *	No	<i>Psoralea esculenta</i> *	No
<i>Dalea villosa</i>	No	<i>Psoralea hypogaea</i>	No
<i>Erigeron bellidiastrum</i>	Yes	<i>Psoralea tenuiflora</i>	Yes
<i>Eriogonum annuum</i> *	No	<i>Suckleya vermiculatus</i>	No
<i>Eriogonum pauciflorum</i> * (azonal)	No	<i>Tradescantia bracteata</i>	No
<i>Euphorbia missurica</i>	No	<i>Tradescantia occidentalis</i> *	Yes
<i>Eustoma grandiflorum</i>	No	<i>Triodanis leptocarpa</i>	No
		<i>Viola pedatifida</i> ^a	No

^aReported From Montana

RESULTS

Great Plains Species Occurring in Eastern Montana

Of the 2,500+ species of vascular plants in Montana, 52 native species that are generally confined to the North American Great Plains biome are represented in the eastern Montana flora (table 1, figures 1-3). Seventeen of these species are represented in the Intermountain flora. The large majority of these species, 42, are dicot forbs, whereas the remaining 10 are monocots. Of the monocots, the most abundant and widely distributed is *Yucca glauca*. With the exception of the short statured *Muhlenbergia cuspidata*, there are no distinctively Great Plains grasses that are abundant in eastern Montana, as for example, *Stipa spartea*. At least three of these Great Plains species, *Artemisia*

longifolia, *Eriogonum pauciflorum*, and *Heuchera richardsonii*, are azonal and thus not characteristic of vegetation with abundant grass cover. Only six of these 52 species are indicators of habitat types (*Andropogon gerardii*, *A. hallii*, *Carex inops*, *Panicum virgatum*, *Yucca glauca*, and *Artemisia longifolia*) that are representative of Great Plains vegetation (table 2). In general, herbarium specimens and field observations of most of these 52 species within Montana are few, if any, especially when compared to the many and more abundant species that ostensibly define Intermountain vegetation types (for example, species of *Agropyron* and *Artemisia*; table 2). Three of these 52, *Opuntia macrorhiza*, *Psoralea cuspidata*, and *Viola pedatifida* (figures 2-3) have been only reported to occur in Montana.

Eastern Montana Vegetation Types Dominated by Great Plains Species

Formally recognized vegetation types from open dry sites and that are suggestive of a Great Plains influence in eastern Montana are few and rare, in contrast to the formally recognized open dry-site vegetation types more characteristic of the Intermountain region, which are many and some widely distributed (table 2). Vegetation types in eastern Montana that are dominated by the tall warm season grasses *Andropogon gerardii*, *A. hallii*, and *Panicum virgatum*, as well as the cool season *Stipa spartea*, are non-existent, imperiled, or vulnerable (table 2).

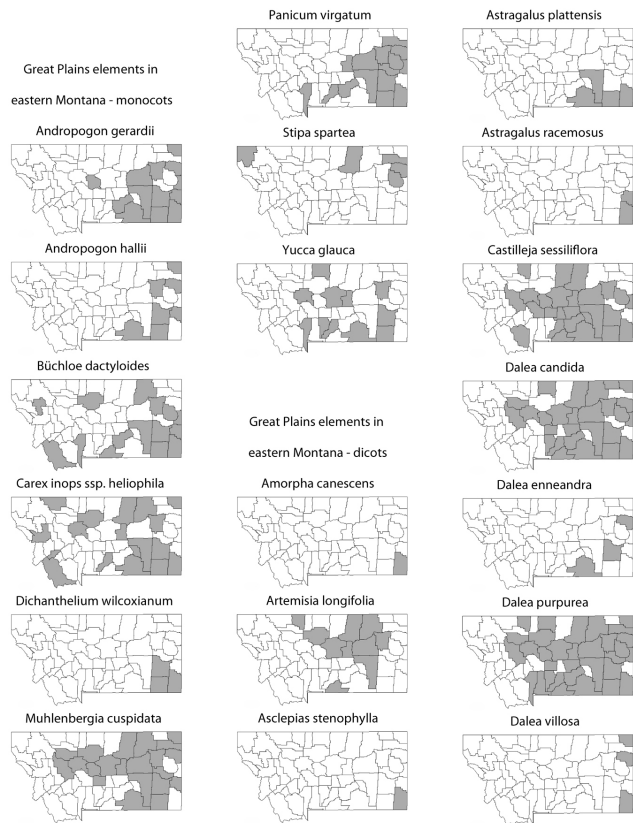


Figure 1—Great Plains elements in eastern Montana. Monocots: *Andropogon gerardii* – *Yucca glauca*. Dicots: *Amorpha canescens* – *Dalea villosa*.

The Grasses of Montana

Grass species occurring in Montana share more in common with the non-contiguous southerly state of Utah than with the adjacent plains state of South Dakota (table 3). The 207 grass species that Montana shares with Utah compare to 163 shared with South Dakota. This might be explained by the richness of certain mountain-inhabiting genera such as *Agrostis* and *Poa*. However, inspection of those species shared between just Montana and Utah reveals many low elevation grass species including both native and introduced. Most importantly, the grass species shared between just Montana and South Dakota are mostly widespread species. Only three of these, *Dichanthelium*

wilcoxianum, *Muhlenbergia cuspidata*, and *Stipa spartea*, have a truly Great Plains distribution within North America. *Dichanthelium wilcoxianum* and *Stipa spartea* are rare in Montana and are known from few specimens and relatively few counties (figure 1).

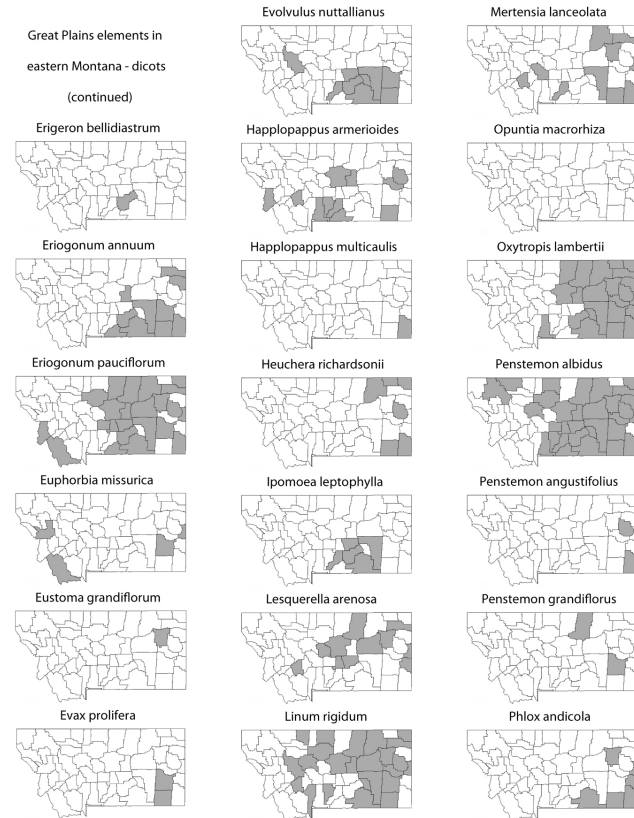


Figure 2—Great Plains dicot species with a distribution mainly or entirely in eastern Montana. The distribution map of *Opuntia macrorhiza* with no indication of a county occurrence signifies that this species is only reported to occur in eastern Montana (Dorn 1984).

North American Geographical Distributions of Low Elevation Dominants

Inspection of North American distributions of common low elevation and eastern Montana species revealed a Pacific Northwest, Boreal, Eastern Deciduous Forest, or Intermountain influence on the low elevation flora and vegetation. Individually and collectively these influences are perhaps more pronounced than the one from the Great Plains. A potentially significant Pacific Northwest influence on the lower elevation flora of Montana is possible and is exemplified by *Lysichiton americanus* and *Haplopappus carthamoides*. Such lower elevation species are found, however, in just northwestern Montana. Many species restricted in Montana to the northwestern portion of the state often had a very widespread North American distribution and no species with a primarily low elevation eastern Montana distribution was found to have a North American distribution that was exclusively from the Pacific Northwest.

A potential Boreal influence on the lower elevation flora of Montana is possible. This is exemplified by *Asclepias ovalifolia* and *Senecio congestus*, which occur in northcentral or northeastern Montana and more commonly at latitudes to the north throughout Canada (figure 3). This pattern was not detected commonly, however. An influence of the Eastern Deciduous Forests predominates in Montana along riparian or gallery forests, and is exemplified by *Fraxinus pennsylvanica*, *Populus deltoides*, *Quercus macrocarpa*, and *Ulmus americanus* (figures 3-4). These species occur as a western extension of eastern deciduous forests across the Great Plains. Common species across North America at low elevation settings may also have a predilection for eastern Montana, which is the case for *Acer negundo* and *Salix amygdaloides* (figure 4).

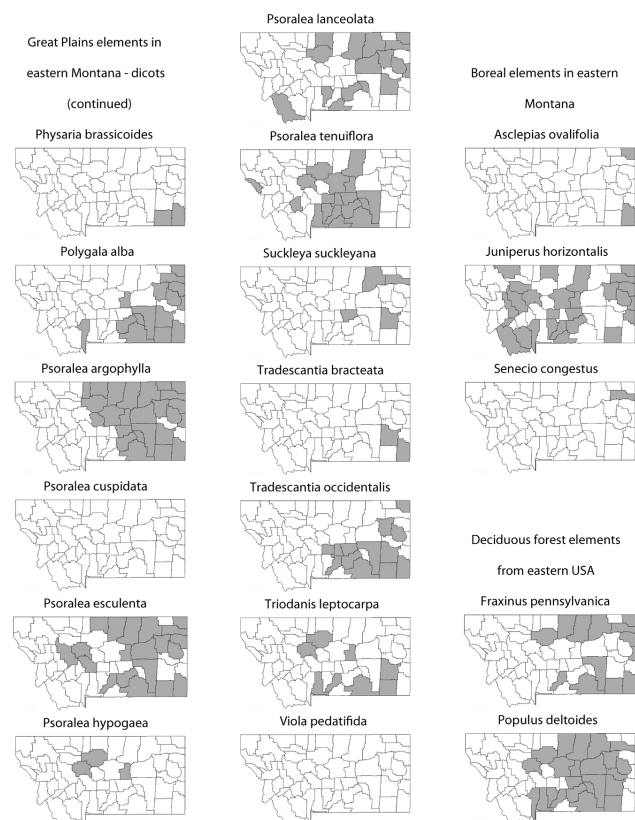


Figure 3—Distribution patterns of species occurring primarily in eastern Montana. Great Plains dicot species mainly or entirely in eastern Montana: *Physaria brassicoides* – *Viola pedatifida*. Examples of species with a primarily boreal distribution that otherwise occur in eastern Montana: *Asclepias ovalifolia* – *Senecio congestus*. Examples of species from eastern deciduous forests that occur natively in eastern Montana: *Fraxinus pennsylvanica* – *Populus deltoides*. The distribution maps of *Psoralea cuspidata* and *Viola pedatifida* with no indication of a county occurrence signifies that the corresponding species is only reported to occur in eastern Montana (Dorn 1984).

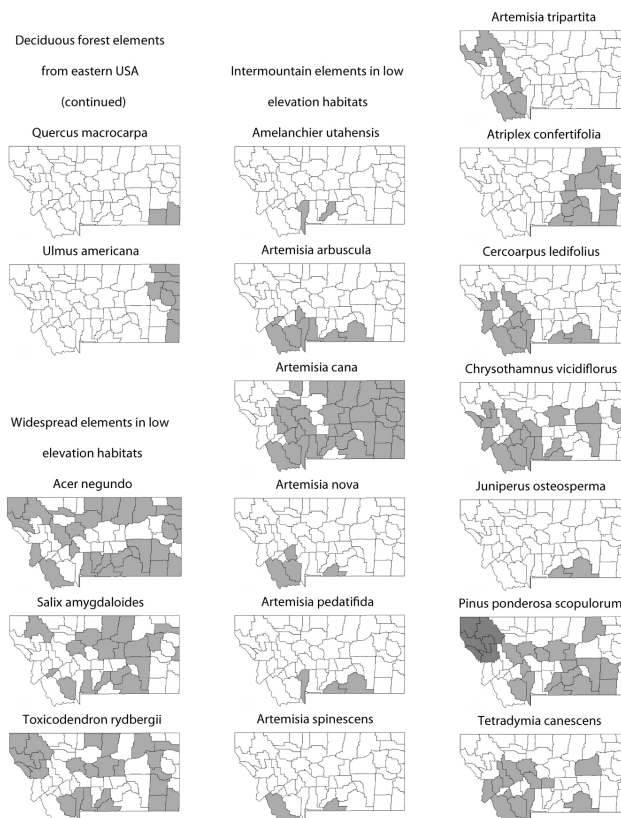


Figure 4—Distribution patterns of species occurring primarily in eastern Montana. Examples of species from eastern deciduous forests that occur natively in eastern Montana: *Quercus macrocarpa*–*Ulmus americana*. Examples of widespread North American species with a predilection for low elevation habitats especially in eastern Montana: *Acer negundo*–*Toxicodendron rydbergii*. Examples of species centered in the Intermountain region that have a predilection for low elevation habitats in Montana: *Amelanchier utahensis*–*Tetradymia canescens*. The county distribution of *Pinus ponderosa* var. *scopulorum* lies to the east of the continental divide, whereas the county distribution of var. *ponderosa* (darker gray) lies to the northwest part. Genetic and fossil evidence suggest that var. *scopulorum* migrated northward independently of var. *ponderosa* from a region including southwestern United States (Latta and Mitton 1999).

Perhaps one of the largest influences on the low elevation flora and vegetation of Montana, especially the eastern two-thirds of the state, comes from the Intermountain biome or from western North America in general. An Intermountain influence is readily exemplified by *Amelanchier utahensis*, *Artemisia arbuscula*, *Artemisia nova*, *Artemisia pedatifida*, *Artemisia spinescens*, *Artemisia tripartita*, *Cercocarpus ledifolius*, *Chrysothamnus viscidiflorus*, *Juniperus osteosperma*, *Tetradymia canescens*, and *Tetradymia spinosa* (figures 4-5). These species are found mostly in southwestern Montana and otherwise are concentrated in the Intermountain region. Notably, the two counties in the southwestern quadrant of Montana, Beaverhead and Carbon

counties (for example the two counties recorded for *A. spinescens*; figure 4) harbor many of these Intermountain elements. In addition, vegetation dominants that are widespread in western North American and that are also widespread at low elevations across Montana are exemplified by many species, especially grasses, and includes for example *Agropyron dasystachyum* and *Agropyron spicatum* (figure 5).

DISCUSSION

The four lines of evidence brought to bear on the question - to what degree does the Great Plains biome influence the flora and vegetation of eastern Montana - all point to a much greater influence of the Intermountain biome on this region. The foothills-prairie topography in Montana has little bearing on truly Great Plains floristic elements. Many of 52 Great Plains species are not common in Montana and three of these have only been reported from the state (figures 2-3). In addition, many of these 52 species belong to genera such as *Dalea*, *Eriogonum*, *Oxytropis*, *Penstemon*, and *Psoralea* that are well represented in open dry-site vegetation in the Intermountain flora (Cronquist and others 1972). Thus, the representation of these genera in the sagebrush steppe of eastern Montana is not necessarily an indication of Great Plains influence but rather the ecological predilection of such genera for open dry-site vegetation.

The finding that the low elevation dry-site vegetation in eastern Montana may be more influenced by the Intermountain than Great Plains biome is in accord with the difficulty of using the Great Plains Flora (McGregor and Barkley 1986) for plant identification in eastern Montana. The main issue is that the Great Plains Flora treats many plant taxa that are either not present, rare, or not diverse in Montana. Examples of taxa at the family level that are taxonomically diverse and abundant in the Great Plains flora but absent, rare, or not diverse in eastern Montana, include *Agavaceae*, *Alismataceae*, *Asclepidaceae*, *Caesalpinaceae*, *Cistaceae*, *Convolvulaceae*, *Euphorbiaceae*, *Fagaceae*, *Juglandaceae*, *Lauraceae*, *Linaceae*, *Lythraceae*, *Malvaceae*, *Moraceae*, *Mimosaceae*, *Nyctaginaceae*, *Platanaceae*, *Polygalaceae*, *Rubiaceae*, *Saururaceae*, *Smilacaceae*, *Solanaceae*, *Sparganiaceae*, and *Vitaceae*. Examples of this at the genus level include *Cyperus* and *Rhynchospora* (Cyperaceae), *Dalea*, *Desmodium*, and *Lespedeza* (Fabaceae), *Dichanthelium*, *Eragrostis*, *Muhlenbergia*, *Panicum*, and *Sporobolus* (Poaceae), and *Silphium* and *Vernonia* (Asteraceae). Such marked floristic distinctions suggest eastern Montana is not part of the Great Plains biome or metacommunity. That is, immigrants from the Great Plains biome into eastern Montana are not likely to successfully establish and proliferate, which is an important aspect of the metacommunity definition of Hubbell (2001).



Figure 5—Examples of species centered in the Intermountain region that have a predilection for low elevation habitats in Montana: *Tetradyimia spinosa*. Examples of vegetationally dominant western North American species that also dominate low elevation habitats from western Montana across the state to the very eastern tier of counties: *Agropyron dasystachyum* – *Shepherdia argentea*. The distribution of *Artemisia tridentata* reflects the distribution of the three main constituent subspecies, especially ssp. *tridentata* and ssp. *wyomingensis* across the state. This is also true for *Chrysothamnus nauseosus* and its two main constituents ssp. *nauseosus* and ssp. *consimilis*.

The biome maps presented in every flora and vegetation analysis involving the state of Montana (for example Dorn 1984; Mueggler and Stewart 1980) have unequivocally implicated the eastern portion of the state as being part of the Great Plains biome. According to the floristic evidence put forth in this study, the open shrub-grass dominated dry-site flora and vegetation in eastern Montana probably should not be managed as if they are Great Plains grasslands if only because they lack the abundance of productive warm season tall grass species. Indeed, the prevalence and diversity of short statured cool season grasses along with shrubby *Asteraceae* and *Chenopodiaceae* suggest that the open dry-site flora and vegetation of eastern Montana should be managed as if they are part of the Intermountain biome or metacommunity. All the evidence points to Intermountain and western North American plant species having an excellent ability immigrate into and proliferate throughout eastern Montana,

as exemplified by dominant plant species belonging to genera such as *Agropyron*, *Artemisia*, and *Atriplex*.

It is commonly asserted by APF that if the Lewis and Clark explorers had made an observation of herds of many thousands of bison in eastern Montana during the early 1800s (for example journal entry of Wednesday, May 8th, 1805; University of Nebraska Press 2005), then a benchmark for restoration of APF lands in eastern Montana should include large herds of bison in places like the Charles M. Russell National Wildlife Refuge in northcentral and eastern Montana. This benchmark not only disregards evidence that bison distributions were strongly influenced by Native Americans (for example Fisher and

Roll 1998), but it also uncritically accepts the conventional view that eastern Montana harbors Great Plains vegetation. The motivation for our study was to put forth the evidence that strongly questions this conventional view of the flora and vegetation of eastern Montana and to point to its strong Intermountain floristic affinities.

ACKNOWLEDGEMENTS

We thank Peter Lesica at the University of Montana Herbarium for facilitating access to the plant collections there. We also thank Tad Weaver for sharing his extensive insights into the vegetation of Montana.

Table 2—Low elevation dry-site vegetation types reported for the State of Montana (Montana Natural Heritage Program, 2002) that are characteristic of either Great Plains (e.g., Sims and Risser 2000) or Intermountain Provinces (e.g., West and Young 2000). State ranks: 1=critically imperiled, 2=imperiled, 3=vulnerable, 4=apparently secure, 5=demonstrably secure, ?=rank uncertain, Q=information needed.

Vegetation Types Characteristic of the Great Plains	Heritage Program State Rank
<i>Andropogon gerardii</i> - <i>Schizachyrium scoparium</i> Western Great Plains Herbaceous Vegetation	2
<i>Andropogon hallii</i> - <i>Calamovilfa longifolia</i> Herbaceous Vegetation	?
<i>Andropogon hallii</i> - <i>Carex inops</i> ssp. <i>heliophila</i> Herbaceous Vegetation	3
<i>Panicum virgatum</i> - <i>Muhlenbergia richardsonis</i> - (<i>Schizachyrium scoparium</i>) Herbaceous Vegetation	?
<i>Panicum virgatum</i> Herbaceous Vegetation (provisional)	2Q
<i>Schizachyrium scoparium</i> - <i>Bouteloua (curtipendula, gracilis)</i> - <i>Carex filifolia</i> Herbaceous Vegetation	?
<i>Schizachyrium scoparium</i> - <i>Carex inops</i> ssp. <i>heliophila</i> Herbaceous Vegetation	3
<i>Schizachyrium scoparium</i> - <i>Muhlenbergia cuspidata</i> Herbaceous Vegetation	2
<i>Yucca glauca</i> - <i>Calamovilfa longifolia</i> Shrub Herbaceous Vegetation	4
<i>Yucca glauca</i> - <i>Pseudoroegneria spicata</i> Shrub Herbaceous Vegetation	4Q
<i>Artemisia longifolia</i> - <i>Calamovilfa longifolia</i> Sparse Vegetation	3-4
<i>Artemisia longifolia</i> Badlands Sparse Vegetation	3-4
Vegetation Types Characteristic of the Intermountain Region	
<i>Amelanchier alnifolia</i> - <i>Pseudoroegneria spicata</i> Shrubland	2?
<i>Artemisia arbuscula</i> - <i>Festuca idahoensis</i> Dwarf Shrub Herbaceous Vegetation	3
<i>Artemisia arbuscula</i> - <i>Pseudoroegneria spicata</i> Dwarf Shrub Herbaceous Vegetation	3
<i>Artemisia arbuscula</i> ssp. <i>longiloba</i> - <i>Elymus lanceolatus</i> Dwarf Shrub Herbaceous Vegetation	?
<i>Artemisia arbuscula</i> ssp. <i>longiloba</i> - <i>Festuca idahoensis</i> Dwarf Shrub Herbaceous Vegetation	2
<i>Artemisia arbuscula</i> ssp. <i>longiloba</i> - <i>Pseudoroegneria spicata</i> Dwarf Shrub Herbaceous Vegetation	?
<i>Artemisia cana</i> - <i>Elymus lanceolatus</i> - <i>Nassella viridula</i> Shrub Herbaceous Vegetation	2-3?
<i>Artemisia cana</i> - <i>Elymus trachycaulus</i> Shrub Herbaceous Vegetation	?
<i>Artemisia cana</i> - <i>Festuca idahoensis</i> Shrub Herbaceous Vegetation	3?
<i>Artemisia cana</i> - <i>Leymus cinereus</i> Shrubland	?
<i>Artemisia cana</i> - <i>Pascopyrum smithii</i> Shrubland	4
<i>Artemisia cana</i> - <i>Poa pratensis</i> Shrub Herbaceous Vegetation	?
<i>Artemisia cana</i> - <i>Stipa comata</i> Shrub Herbaceous Vegetation	3
<i>Artemisia cana</i> ssp. <i>cana</i> - <i>Pascopyrum smithii</i> Shrub Herbaceous Vegetation	?
<i>Artemisia cana</i> ssp. <i>viscidula</i> - <i>Festuca idahoensis</i> Shrubland	?
<i>Artemisia nova</i> - <i>Festuca idahoensis</i> Dwarf Shrub Herbaceous Vegetation	1-2
<i>Artemisia nova</i> - <i>Pseudoroegneria spicata</i> Dwarf Shrubland	3
<i>Artemisia pedatifida</i> - <i>Atriplex gardneri</i> Dwarf Shrubland	2
<i>Artemisia pedatifida</i> - <i>Festuca idahoensis</i> Dwarf Shrub Herbaceous Vegetation	2
<i>Artemisia pedatifida</i> - <i>Pseudoroegneria spicata</i> Dwarf Shrub Herbaceous Vegetation	3

Table—2 (Continued)	
Vegetation Types Characteristic of the Intermountain Region	Heritage Program State Rank
<i>Artemisia spinescens</i> Dwarf Shrubland	?
<i>Artemisia tridentata</i> - <i>Atriplex confertifolia</i> Shrubland	4
<i>Artemisia tridentata</i> - <i>Festuca campestris</i> Shrub Herbaceous Vegetation	3
<i>Artemisia tridentata</i> - <i>Festuca idahoensis</i> Shrub Herbaceous Vegetation	4?
<i>Artemisia tridentata</i> - <i>Stipa comata</i> Shrubland	4
<i>Artemisia tridentata</i> ssp. <i>tridentata</i> - <i>Festuca idahoensis</i> Shrubland	?
<i>Artemisia tridentata</i> ssp. <i>tridentata</i> - <i>Leymus cinereus</i> Shrubland	1
<i>Artemisia tridentata</i> ssp. <i>tridentata</i> - <i>Pascopyrum smithii</i> Shrubland	3
<i>Artemisia tridentata</i> ssp. <i>tridentata</i> - <i>Pseudoroegneria spicata</i> Shrub Herbaceous Vegetation	?
<i>Artemisia tridentata</i> spp. <i>tridentata</i> - <i>Stipa comata</i> Shrub Herbaceous Vegetation	?
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> - <i>Bromus carinatus</i> Shrubland	?
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> - <i>Festuca campestris</i> Shrub Herbaceous Vegetation	?
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> - <i>Festuca idahoensis</i> - <i>Elymus trachycaulus</i> Shrubland	?
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> - <i>Festuca idahoensis</i> Shrub Herbaceous Vegetation	4
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> - <i>Festuca idahoensis</i> - <i>Pascopyrum smithii</i> Shrubland	?
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> - <i>Festuca idahoensis</i> - <i>Pseudoroegneria spicata</i> Shrubland	?
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> - <i>Festuca idahoensis</i> - <i>Stipa richardsonii</i> Shrubland	?
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> - <i>Festuca idahoensis</i> - <i>Geranium viscosissimum</i> Shrubland	?
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> - <i>Festuca idahoensis</i> - <i>Stipa occidentalis</i> Shrubland	?
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> - <i>Leymus cinereus</i> Shrubland	?
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> - <i>Pascopyrum smithii</i> Shrubland	3?
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> - <i>Poa pratensis</i> Shrub Herbaceous Vegetation	?
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> - <i>Pseudoroegneria spicata</i> Shrubland	?
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> - <i>Symphoricarpos oreophilus</i> - <i>Festuca idahoensis</i> Shrubland	?
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> - <i>Atriplex confertifolia</i> Shrubland	3
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> - <i>Bouteloua gracilis</i> Shrubland	?
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> - <i>Carex filifolia</i> Shrubland	?
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> - <i>Elymus lanceolatus</i> ssp. <i>albicans</i> Shrubland	4?
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> - <i>Pascopyrum smithii</i> Shrub Herbaceous Vegetation	?
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> - <i>Poa secunda</i> Shrubland	?
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> - <i>Pseudoroegneria spicata</i> Shrub Herbaceous Vegetation	3
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> - <i>Pseudoroegneria spicata</i> Shrubland	5?
<i>Artemisia tripartita</i> - <i>Elymus lanceolatus</i> Shrub Herbaceous Vegetation	?
<i>Artemisia tripartita</i> - <i>Festuca campestris</i> Shrub Herbaceous Vegetation	2
<i>Artemisia tripartita</i> - <i>Festuca idahoensis</i> Shrub Herbaceous Vegetation	3?
<i>Artemisia tripartita</i> - <i>Pseudoroegneria spicata</i> Shrub Herbaceous Vegetation	?
<i>Artemisia tripartita</i> ssp. <i>tripartita</i> - <i>Hesperostipa comata</i> Shrub Herbaceous Vegetation	?
<i>Atriplex confertifolia</i> - <i>Chrysothamnus nauseosus</i> Shrubland	3Q
<i>Atriplex confertifolia</i> Wyoming Basins Shrubland	1-2
<i>Atriplex gardneri</i> - <i>Artemisia spinescens</i> Dwarf Shrubland	1
<i>Atriplex gardneri</i> - <i>Artemisia tridentata</i> Dwarf Shrubland	3
<i>Atriplex gardneri</i> - <i>Endolepis dioica</i> Dwarf Shrubland	2?
<i>Atriplex gardneri</i> - <i>Monolepis nuttalliana</i> Dwarf Shrubland	2
<i>Atriplex gardneri</i> - <i>Oryzopsis hymenoides</i> Dwarf Shrubland	3
<i>Atriplex gardneri</i> - <i>Pascopyrum smithii</i> Dwarf Shrubland	3
<i>Atriplex gardneri</i> Dwarf Shrubland	2-3
<i>Krascheninnikovia lanata</i> - <i>Phlox</i> spp. Dwarf Shrubland	3Q
<i>Krascheninnikovia lanata</i> - <i>Stipa comata</i> Dwarf Shrubland	3
<i>Rhus trilobata</i> - <i>Calamovilfa longifolia</i> Shrub Herbaceous Vegetation	3Q
<i>Rhus trilobata</i> - <i>Carex filifolia</i> Shrub Herbaceous Vegetation	3

Table—2 (Continued)		Heritage Program State Rank
Vegetation Types Characteristic of the Intermountain Region		
<i>Rhus trilobata</i> - <i>Elymus lanceolatus</i> - <i>Nassella viridula</i> Shrub Herbaceous Vegetation		2-3?
<i>Rhus trilobata</i> - <i>Festuca idahoensis</i> Shrub Herbaceous Vegetation		2?
<i>Rhus trilobata</i> - <i>Pseudoroegneria spicata</i> Shrub Herbaceous Vegetation		4
<i>Rhus trilobata</i> - <i>Schizachyrium scoparium</i> Shrub Herbaceous Vegetation		3
<i>Sarcobatus vermiculatus</i> - <i>Artemisia tridentata</i> Shrubland		4
<i>Sarcobatus vermiculatus</i> - <i>Atriplex gardneri</i> Shrubland		3
<i>Sarcobatus vermiculatus</i> - <i>Distichlis spicata</i> Shrubland		2
<i>Sarcobatus vermiculatus</i> - <i>Leymus cinereus</i> Shrubland		2-3
<i>Sarcobatus vermiculatus</i> - <i>Pascopyrum smithii</i> Shrub Herbaceous Vegetation		4
<i>Sarcobatus vermiculatus</i> - <i>Pseudoroegneria spicata</i> Shrubland		3

Table 3—Poaceae in Utah (UT), Montana (MT), and South Dakota (SD) including native and introduced taxa. 0 = species absent in the state, 1 = species present in the state. Data taken from PLANTS database (USDA, NRCS, 2008) with nomenclature modified from Lavin and Seibert (2009). Utah and Montana share 207 species, Utah and South Dakota share 150, and Montana and South Dakota share 163 species. The “shared” column indicates those species shared by just two of the states. The asterisks (with line in boldface) associated with a MT-SD shared species indicate only three grass species with a truly Great Plains distribution that includes eastern Montana and South Dakota but not Utah (*Dichanthelium wilcoxianum*, *Muhlenbergia cuspidata*, and *Stipa spartea*).

Species	UT	MT	SD	Shared	Species	UT	MT	SD	Shared
<i>Aegilops cylindrica</i>	1	1	1		<i>Agropyron albicans</i>	1	1	1	
<i>Agropyron cristatum</i>	1	1	1		<i>Agropyron dasystachyum</i>	1	1	1	
<i>Agropyron elongatum</i>	1	1	1		<i>Agropyron fragile</i>	1	0	1	UT-SD
<i>Agropyron intermedium</i>	1	1	1		<i>Agropyron pseudorepens</i>	1	0	0	
<i>Agropyron repens</i>	1	1	1		<i>Agropyron scribneri</i>	1	1	0	UT-MT
<i>Agropyron smithii</i>	1	1	1		<i>Agropyron spicatum</i>	1	1	1	
<i>Agropyron trachycaulum</i>	1	1	1		<i>Agropyron trichophorum</i>	1	1	0	UT-MT
<i>Agrostis borealis</i>	0	1	0		<i>Agrostis diegoensis</i>	1	1	0	
<i>Agrostis exarata</i>	1	1	1		<i>Agrostis humilis</i>	1	1	0	UT-MT
<i>Agrostis hyemalis</i>	0	0	1		<i>Agrostis idahoensis</i>	1	1	0	UT-MT
<i>Agrostis oregonensis</i>	0	1	0		<i>Agrostis perennans</i>	0	0	1	
<i>Agrostis rossiae</i>	0	1	0		<i>Agrostis scabra</i>	1	1	0	UT-MT
<i>Agrostis semiverticillata</i>	1	0	0		<i>Agrostis stolonifera</i>	1	1	1	
<i>Agrostis tenuis</i>	1	1	0	UT-MT	<i>Agrostis thurberiana</i>	1	1	0	UT-MT
<i>Agrostis variabilis</i>	1	1	0	UT-MT	<i>Alopecurus aequalis</i>	1	1	1	
<i>Alopecurus alpinus</i>	1	1	0	UT-MT	<i>Alopecurus arundinaceus</i>	0	1	0	
<i>Alopecurus carolinianus</i>	1	1	1		<i>Alopecurus geniculatus</i>	1	1	1	
<i>Alopecurus pratensis</i>	1	1	0	UT-MT	<i>Andropogon gerardii</i>	1	1	1	
<i>Andropogon hallii</i>	1	1	1		<i>Andropogon barbinodis</i>	1	0	0	
<i>Andropogon scoparium</i>	1	1	1		<i>Andropogon ischaemum</i>	1	1	0	UT-MT
<i>Aristida adscensionis</i>	1	0	0		<i>Apera interrupta</i>	1	1	0	
<i>Aristida longispica</i>	0	0	1		<i>Aristida dichotoma</i>	0	0	1	
<i>Aristida purpurea longiseta</i>	1	1	1		<i>Aristida oligantha</i>	0	0	1	
<i>Avena barbata</i>	0	1	0		<i>Arrhenatherum elatius</i>	1	1	1	
<i>Avena sativa</i>	1	1	1		<i>Avena fatua</i>	1	1	1	
<i>Blepharidachne kingii</i>	1	0	0		<i>Beckmannia syzigachne</i>	1	1	1	
<i>Bouteloua barbata</i>	1	1	0		<i>Blepharoneuron tricholepis</i>	1	0	0	
<i>Bouteloua eripoda</i>	1	0	0		<i>Bouteloua curtispindula</i>	1	1	1	
<i>Bouteloua hirsuta</i>	1	1	1		<i>Bouteloua gracilis</i>	1	1	1	
<i>Bouteloua trifida</i>	1	0	0		<i>Bouteloua simplex</i>	1	0	0	
<i>Bromus briziformis</i>	1	1	1		<i>Bromus anomalus</i>	1	1	1	
<i>Bromus ciliatus</i>	1	1	1		<i>Bromus carinatus</i>	1	1	1	
<i>Bromus diandrus</i>	1	1	0	UT-MT	<i>Bromus commutatus</i>	1	1	0	UT-MT
<i>Bromus japonicus</i>	1	1	1		<i>Bromus inermis</i>	1	1	1	
<i>Bromus latiglumis</i>	0	1	1	MT-SD	<i>Bromus kalmii</i>	0	0	1	

Table 3 (Continued)—Poaceae in Utah (UT), Montana (MT), and South Dakota (SD) including native and introduced taxa.

Species	UT	MT	SD	Shared	Species	UT	MT	SD	Shared
<i>Bromus pubescens</i>	0	1	1	MT-SD	<i>Bromus mollis</i>	1	1	1	
<i>Bromus rigidus</i>	1	0	0		<i>Bromus pumpellianus</i>	1	1	0	UT-MT
<i>Bromus secalinus</i>	1	1	1		<i>Bromus rubens</i>	1	0	0	
<i>Bromus sterilis</i>	1	0	0		<i>Bromus squarrosus</i>	0	1	1	MT-SD
<i>Bromus vulgaris</i>	1	1	0		<i>Bromus tectorum</i>	1	1	1	
<i>Buchloe dactyloides</i>	1	1	1		<i>Bromus willdenowii</i>	1	0	0	
<i>Calamagrostis koelerioides</i>	0	1	0		<i>Calamagrostis canadensis</i>	1	1	1	
<i>Calamagrostis purpurascens</i>	1	1	1		<i>Calamagrostis montanensis</i>	0	1	1	MT-SD
<i>Calamagrostis scopulorum</i>	1	1	0	UT-MT	<i>Calamagrostis rubescens</i>	1	1	0	UT-MT
<i>Calamagrostis tweedyi</i>	0	1	0		<i>Calamagrostis stricta</i>	1	1	1	
<i>Calamovilfa longifolia</i>	0	1	1	MT-SD	<i>Calamovilfa gigantea</i>	1	0	0	
<i>Cenchrus longispinus</i>	1	1	1		<i>Catabrosa aquatica</i>	1	1	1	
<i>Chloris virgata</i>	1	0	0		<i>Chloris verticillata</i>	0	0	1	
<i>Cinna latifolia</i>	1	1	1		<i>Cinna arundinacea</i>	0	1	1	MT-SD
<i>Crypsis schoenoides</i>	1	1	0	UT-MT	<i>Crypsis alopecuroides</i>	1	1	0	UT-MT
<i>Cynosurus cristatus</i>	0	1	0		<i>Cynodon dactylon</i>	1	1	0	UT-MT
<i>Dactylis glomerata</i>	1	1	1		<i>Cynosurus echinatus</i>	0	1	0	
<i>Danthonia intermedia</i>	1	1	1		<i>Danthonia californica</i>	1	1	1	
<i>Danthonia spicata</i>	0	1	1	MT-SD	<i>Danthonia parryi</i>	0	1	0	
<i>Deschampsia atropurpurea</i>	0	1	0		<i>Danthonia unispicata</i>	1	1	1	
<i>Deschampsia danthonioides</i>	1	1	0	UT-MT	<i>Deschampsia cespitosa</i>	1	1	0	UT-MT
<i>Diarrhena americana</i>	0	0	1		<i>Deschampsia elongata</i>	1	1	0	UT-MT
<i>Dichanthelium oligoanthes</i>	1	1	1		<i>Dichanthelium lanuginosum</i>	1	1	1	
<i>Dichanthelium xanthophyllum</i>	0	0	1		<i>Dichanthelium wilcoxianum</i>	0	1	1	MT-SD*
<i>Dichanthelium linearifolium</i>	0	0	1		<i>Dichanthelium leibergii</i>	0	0	1	
<i>Digitaria adscendens</i>	1	0	0		<i>Dichanthelium villosissimum</i>	0	0	1	
<i>Digitaria sanguinalis</i>	1	1	1		<i>Digitaria ischaemum</i>	1	1	1	
<i>Echinochloa crusgalli</i>	1	1	1		<i>Distichlis stricta</i>	1	1	1	
<i>Eleusine indica</i>	1	1	1		<i>Echinochloa muricata</i>	1	1	1	
<i>Elyhordeum montanense</i>	0	0	1		<i>Elyhordeum dakotense</i>	0	0	1	
<i>Elymus aristatus</i>	1	0	0		<i>Elymus ambiguus</i>	1	1	0	UT-MT
<i>Elymus canadensis</i>	1	1	1		<i>Elymus cinereus</i>	1	1	1	
<i>Elymus elymoides</i>	1	1	1		<i>Elymus diversiglumis</i>	0	0	1	
<i>Elymus glaucus</i>	1	1	1		<i>Elymus flavescens</i>	1	1	0	UT-MT
<i>Elymus hystrix</i>	0	0	1		<i>Elymus hansenii</i>	1	0	0	
<i>Elymus interruptus</i>	0	0	1		<i>Elymus innovatus</i>	0	1	1	MT-SD
<i>Elymus macounii</i>	1	1	1		<i>Elymus junceus</i>	1	1	1	
<i>Elymus saundersii</i>	1	0	0		<i>Elymus salina</i>	1	0	0	
<i>Elymus triticoides</i>	1	1	0	UT-MT	<i>Elymus simplex</i>	1	0	0	
<i>Elymus virginicus</i>	1	1	1		<i>Elymus villosus</i>	0	0	1	
<i>Eragrostis cilianensis</i>	1	1	1		<i>Enneapogon desvauxii</i>	1	0	0	
<i>Eragrostis hypnoides</i>	1	1	1		<i>Eragrostis curvula</i>	1	0	0	
<i>Eragrostis orcuttiana</i>	1	0	0		<i>Eragrostis minor</i>	1	1	1	
<i>Eragrostis pilosa</i>	0	0	1		<i>Eragrostis pectinacea</i>	1	1	1	
<i>Eragrostis spectabilis</i>	0	0	1		<i>Eragrostis reptans</i>	0	0	1	
<i>Eremopyrum triticeum</i>	1	1	0	UT-MT	<i>Eragrostis trichodes</i>	0	0	1	
<i>Festuca arizonica</i>	1	0	0		<i>Erioneuron pulchellum</i>	1	0	0	
<i>Festuca campestris</i>	0	1	0		<i>Festuca baffinensis</i>	1	1	0	UT-MT
<i>Festuca idahoensis</i>	1	1	1		<i>Festuca dasyclada</i>	1	0	0	
<i>Festuca obtusata</i>	0	0	1		<i>Festuca minutiflora</i>	1	1	0	UT-MT
<i>Festuca rubra</i>	1	1	0	UT-MT	<i>Festuca occidentalis</i>	1	1	1	
<i>Festuca subulata</i>	1	1	1		<i>Festuca sororia</i>	1	0	0	
<i>Festuca viridula</i>	0	1	0		<i>Festuca thurberi</i>	1	0	0	
<i>Glyceria borealis</i>	1	1	1		<i>Festuca viviparoides</i>	0	1	0	

Table 3 (Continued)—Poaceae in Utah (UT), Montana (MT), and South Dakota (SD) including native and introduced taxa.

Species	UT	MT	SD	Shared	Species	UT	MT	SD	Shared
<i>Glyceria fluitans</i>	0	0	1		<i>Glyceria elata</i>	1	1	1	
<i>Glyceria striata</i>	1	1	1		<i>Glyceria grandis</i>	1	1	1	
<i>Helictotrichon</i>									
<i>mortonianum</i>	1	0	0		<i>Helictotrichon hookeri</i>	0	1	1	MT-SD
<i>Hilaria jamesii</i>	1	0	0		<i>Hierochloa odorata</i>	1	1	1	
<i>Holcus lanatus</i>	1	1	0	UT-MT	<i>Hilaria rigida</i>	1	0	0	
<i>Hordeum depressum</i>	1	0	0		<i>Hordeum brachyantherum</i>	1	1	0	UT-MT
<i>Hordeum glaucum</i>	1	0	0		<i>Hordeum geniculatum</i>	1	1	0	UT-MT
<i>Hordeum leporinum</i>	1	1	0		<i>Hordeum jubatum</i>	1	1	1	
<i>Hordeum vulgare</i>	1	1	1		<i>Hordeum pusillum</i>	1	1	1	
<i>Imperata brevifolia</i>	1	0	0		<i>Hystrix patula</i>	0	0	1	
<i>Leersia oryzoides</i>	1	1	1		<i>Koeleria nitida</i>	1	1	1	
<i>Leptochloa fusca</i>									
<i>fascicularis</i>	1	1	1		<i>Leersia virginica</i>	0	0	1	
<i>Leucopoa kingii</i>	1	1	1		<i>Leptochloa panicea</i>	1	0	1	UT-SD
<i>Lolium perenne</i>	1	1	1		<i>Lolium multiflorum</i>	1	1	0	UT-MT
<i>Lolium temulentum</i>	0	1	1	MT-SD	<i>Lolium persicum</i>	0	1	0	
<i>Melica smithii</i>	0	1	1	MT-SD	<i>Melica bulbosa</i>	1	1	1	
<i>Melica stricta</i>	1	0	0		<i>Melica spectabilis</i>	1	1	0	UT-MT
<i>Milium effusum</i>	0	0	1		<i>Melica subulata</i>	0	1	1	MT-SD
<i>Muhlenbergia andina</i>	1	1	0	UT-MT	<i>Monroa squarrosa</i>	1	1	1	
<i>Muhlenbergia asperifolia</i>	1	1	1		<i>Muhlenbergia arsenei</i>	1	0	0	
<i>Muhlenbergia filiculmnis</i>	1	0	0		<i>Muhlenbergia cuspidata</i>	0	1	1	MT-SD*
<i>Muhlenbergia frondosa</i>	0	0	1		<i>Muhlenbergia filiformis</i>	1	1	1	
<i>Muhlenbergia mexicana</i>	1	1	1		<i>Muhlenbergia glomerata</i>	1	1	1	
<i>Muhlenbergia montana</i>	1	1	0	UT-MT	<i>Muhlenbergia minutissima</i>	1	1	1	
<i>Muhlenbergia porteri</i>	1	0	0		<i>Muhlenbergia pauciflora</i>	1	0	0	
<i>Muhlenbergia racemosa</i>	1	1	1		<i>Muhlenbergia pungens</i>	1	0	1	UT-SD
<i>Muhlenbergia schreberi</i>	1	0	1	UT-SD	<i>Muhlenbergia richardsonis</i>	1	1	1	
<i>Muhlenbergia thurberi</i>	1	0	0		<i>Muhlenbergia sylavatica</i>	0	0	1	
<i>Oryzopsis asperifolia</i>	1	1	1		<i>Muhlenbergia wrightii</i>	1	0	0	
<i>Oryzopsis exigua</i>	1	1	0	UT-MT	<i>Oryzopsis contracta</i>	0	1	0	
<i>Oryzopsis micrantha</i>	1	1	1		<i>Oryzopsis hymenoides</i>	1	1	1	
<i>Oryzopsis pungens</i>	0	0	1		<i>Oryzopsis miliacea</i>	1	0	0	
<i>Oryzopsis webberi</i>	1	0	1	UT-MT	<i>Oryzopsis racemosa</i>	0	0	1	
<i>Panicum capillare</i>	1	1	1		<i>Panicum bulbosum</i>	1	0	0	
<i>Panicum flexile</i>	1	0	1		<i>Panicum dichotomiflorum</i>	1	1	1	
<i>Panicum miliaceum</i>	1	1	1		<i>Panicum hallii</i>	1	0	0	
<i>Panicum virgatum</i>	1	1	1		<i>Panicum obtusum</i>	1	0	0	
<i>Paspalum setaceum</i>	0	0	1		<i>Paspalum distichum</i>	1	0	0	
<i>Phalaris arundinacea</i>	1	1	1		<i>Pennisetum glaucum</i>	1	0	1	UT-SD
<i>Phippsia algida</i>	0	1	0		<i>Phalaris canariensis</i>	1	1	1	
<i>Phleum pratense</i>	1	1	1		<i>Phleum alpinum</i>	1	1	1	
<i>Piptantherum racemosum</i>	0	0	1		<i>Phragmites australis</i>	1	1	1	
<i>Poa annua</i>	1	1	1		<i>Poa alpina</i>	1	1	0	UT-MT
<i>Poa bigelovii</i>	1	0	0		<i>Poa arida</i>	1	1	1	
<i>Poa bulbosa</i>	1	1	1		<i>Poa bolanderi</i>	1	0	0	
<i>Poa compressa</i>	1	1	1		<i>Poa canbyi</i>	0	0	1	
<i>Poa cusickii</i>	1	1	0	UT-MT	<i>Poa curta</i>	1	0	0	
<i>Poa grayana</i>	1	1	0	UT-MT	<i>Poa fendleriana</i>	1	1	1	
<i>Poa juncifolia</i>	1	1	1		<i>Poa interior</i>	1	1	1	
<i>Poa leibergii</i>	1	0	0		<i>Poa leptocoma</i>	1	1	0	UT-MT
<i>Poa lettermanii</i>	1	1	0	UT-MT	<i>Poa palustris</i>	1	1	1	
<i>Poa pattersonii</i>	1	1	0	UT-MT	<i>Poa pratensis</i>	1	1	1	
<i>Poa reflexa</i>	1	1	0	UT-MT	<i>Poa rupicola</i>	1	1	0	UT-MT
<i>Poa secunda</i>	1	1	1		<i>Poa stenantha</i>	0	1	0	
<i>Poa suksdorfii</i>	1	0	0		<i>Poa sylvestris</i>	0	0	1	
<i>Poa trivialis</i>	1	1	1		<i>Poa wheeleri</i>	1	1	0	UT-MT
<i>Polypogon interruptus</i>	1	0	0		<i>Polypogon monspeliensis</i>	1	1	1	
<i>Puccinellia cusickii</i>	0	1	0		<i>Puccinellia distans</i>	1	1	1	
<i>Puccinellia fasciculata</i>	1	0	0		<i>Puccinellia lemmonii</i>	1	1	0	UT-MT
<i>Puccinellia nuttalliana</i>	1	1	1		<i>Puccinellia pauciflora</i>	1	1	1	
<i>Puccinellia simplex</i>	1	0	0		<i>Redfieldia flexuosa</i>	1	1	1	

Table 3 (Continued)—Poaceae in Utah (UT), Montana (MT), and South Dakota (SD) including native and introduced taxa.

Species	UT	MT	SD	Shared	Species	UT	MT	SD	Shared
<i>Schedonnardus paniculatus</i>	1	1	1		<i>Schedonorus arundinacea</i>	1	1	1	
<i>Schedonorus pratensis</i>	1	1	1		<i>Schismus barbatus</i>	1	0	0	
<i>Schizachne purpurascens</i>	1	1	1		<i>Sclerochloa dura</i>	1	1	0	UT-MT
<i>Scleropogon brevifolius</i>	1	0	0		<i>Scolochloa festucacea</i>	1	1	1	
<i>Secale cereale</i>	1	1	1		<i>Setaria faberi</i>	0	0	1	
<i>Setaria italica</i>	0	1	1	MT-SD	<i>Setaria pumila</i>	1	1	1	
<i>Setaria verticillata</i>	1	1	1		<i>Setaria viridis</i>	1	1	1	
<i>Sorghastrum nutans</i>	1	1	1		<i>Sorghum bicolor</i>	1	1	1	
<i>Sorghum halepense</i>	1	1	1		<i>Spartina gracilis</i>	1	1	1	
<i>Spartina pectinata</i>	1	1	1		<i>Sphenopholis obtusata</i>	1	1	1	
<i>Sporobolus aroides</i>	1	1	1		<i>Sporobolus compositus</i>	1	1	1	
<i>Sporobolus contractus</i>	1	0	0		<i>Sporobolus cryptandrus</i>	1	1	1	
<i>Sporobolus flexuosus</i>	1	0	0		<i>Sporobolus giganteus</i>	1	0	0	
<i>Sporobolus heterolepis</i>	0	1	1	MT-SD	<i>Sporobolus neglectus</i>	0	1	1	MT-SD
<i>Sporobolus pulvinatus</i>	1	0	0		<i>Sporobolus vaginiflorus</i>	0	0	1	
<i>Stipa arida</i>	1	0	0		<i>Stipa bloomeri</i>	1	0	0	
<i>Stipa comata</i>	1	1	1		<i>Stipa coronata</i>	1	0	0	
<i>Stipa lettermanii</i>	1	1	0	UT-MT	<i>Stipa nelsonii</i>	1	1	0	UT-MT
<i>Stipa neomexicana</i>	1	0	0		<i>Stipa nevadensis</i>	1	0	0	
<i>Stipa occidentalis</i>	1	1	1		<i>Stipa pinetorum</i>	1	1	0	UT-MT
<i>Stipa richardsonii</i>	0	1	1		<i>Stipa scribneri</i>	1	0	0	
<i>Stipa spartea</i>	0	1	1	MT-SD*	<i>Stipa speciosa</i>	1	0	0	
<i>Stipa thurberiana</i>	1	1	0	UT-MT	<i>Stipa viridula</i>	1	1	1	
<i>Stipa webberi</i>	1	0	0		<i>Stipa williamsii</i>	1	1	0	UT-MT
<i>Taeniatherum caputmedusae</i>	1	1	0	UT-MT	<i>Tridens muticus</i>	1	0	0	
<i>Triplasis purpurea</i>	0	0	1		<i>Trisetum canescens</i>	1	1	0	UT-MT
<i>Trisetum cernuum</i>	0	1	0		<i>Trisetum orthochaetum</i>	0	1	0	
<i>Trisetum spicatum</i>	1	1	1		<i>Trisetum wolffi</i>	1	1	0	UT-MT
<i>Triticum aestivum</i>	1	1	1		<i>Ventenata dubia</i>	0	1	0	
<i>Vulpia bromoides</i>	1	1	0	UT-MT	<i>Vulpia microstachys</i>	1	1	0	UT-MT
<i>Vulpia myuros</i>	1	1	0	UT-MT	<i>Vulpia octoflora</i>	1	1	1	
<i>Zea mays</i>	1	1	1		<i>Zizania palustris</i>	0	1	1	MT-SD

Total Poaceae species in each state: UT=284, MT=249, and SD=208

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