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Blue Earth County, MN

General Description

Wetland Prairie (WP) communities are herbaceous plant communities dominated by graminoid species with a forb component that can approach codominance with the graminoids. The tall grasses big bluestem *(Andropogon gerardii)* and prairie cordgrass *(Spartina pectinata)* are the most important graminoids. The most common associates are Indian grass *(Sorghastrum nutans)* and switchgrass *(Panicum virgatum)*, also tall grasses, and mat muhly grass *(Muhlenbergia richardsonis)*, a short-stature species. Sedges *(Carex* spp.) are common in WP communities but are typically a subordinate component; woolly sedge *(C. pellita)* is the most important. Shrubs are often present, usually sparse in southern Minnesota but becoming abundant northward. These include prairie rose *(Rosa arkansana)*, a low semi-shrub, and taller shrubs such as red-osier dogwood *(Cornus sericea)* and several willows *(Salix* spp.). The main vegetation layer is usually less than 40in (1m) high, although some forbs and the flowering stalks of many of the grasses elongate well above this height as the season progresses.

The herbaceous dominance of WP communities is closely tied to the frequent occurrence of fire. In circumstances where fire frequency or intensity is reduced, more fire-tolerant shrubs and trees can persist, forming wet brush-prairie communities that are considered members of the WP system. Wet brush-prairies are characterized by an abundance of shrubs—and of suckers and saplings of quaking aspen and balsam poplar—that alters the aspect from that of grassland to shrubland or brushland, although herbaceous prairie plants remain a major component of the vegetation. In the absence of fire, wet brush-prairies rapidly succeed to woodland. Today, most wet brush-prairies occur in the Tallgrass Aspen Parklands Province of northwestern Minnesota.

WP communities almost always occur in association with Upland Prairie (UP) communities, usually as inclusions in landscapes dominated by the latter. Historically, they were common in the Eastern Broadleaf Forest (EBF) Province in the prairie- and savanna-dominated Oak Savanna Subsection of the MIM and in the Rochester Plateau Subsection of the PPL, becoming uncommon to rare in the more dissected Blufflands Subsection of the PPL, where UP communities occur mainly on steep slopes in a woodland- and forest-dominated landscape. WP communities were also common in the Anoka Sand Plain Subsection of the MIM, notably in the Mississippi valley train, a

broad band of outwash flanking the Mississippi River, where shallow, braided channels in the outwash surface were occupied by WP communities and the channel bars by UP communities. The larger body of the Anoka Sand Plain away from the valley train was dominated by savannas, brushlands, and woodlands; the wetlands here were probably predominantly Wet Meadow/Carr (WM) communities associated with the shallow water table. WP communities, however, were probably not uncommon, especially on the margins of the wet meadows. Elsewhere in the EBF Province, WP communities were mostly confined to its western edge, adjacent to the continuous prairie of the Prairie Parkland (PPA) Province, although they extended more deeply into the EBF Province at a few places towards its north end. Very little native wetland prairie remains today; conversion to cropland, succession to woodland and forest, and urban and suburban development have destroyed more than 99 percent of the wetland prairies present in the EBF Province before Euro-American settlement.

Natural History

Frequent fire (with return intervals less than 10 years) is critical for the occurrence of wetland prairies. The association of wetland prairies with larger upland prairies noted above is explained by their dependence upon proximity to upland prairies for a fire regime adequate to establish and maintain them, as their limited size and the increased influence of wet conditions reduces the likelihood of ignition and spread within them.

Fire frequency is responsive to climate and to landscape properties. The most important factors are the frequency and intensity of drying events that create flammable conditions, and the absence of topographic and water features that impede the spread of fire. Vegetation itself may facilitate or impede the spread of fire: deciduous forests are much more resistant to fire than grasslands, which burn readily. The size of a fire-prone landscape is also an important influence on the fire return interval at points within it, as ignition events generally increase with area, as does the average extent of individual fires. The combination of a drier climate and a topographically subdued landscape with few lakes in the PPA Province west of the EBF Province resulted in the strong dominance of the entire PPA Province by prairie communities. Increasingly moist climatic conditions eastward, together with greater topographic relief and much higher density of lakes dramatically altered the fire environment in most of the EBF Province, which was dominated by woodland and forest communities. The distribution of prairie communities in the EBF Province noted above reflects the location of fire-prone landscapes in the province. In the Anoka Sand Plain Subsection of the MIM, UP communities were primarily savannas rather than open prairies, probably reflecting this subsection's isolation by surrounding forests from more extensive prairie regions and consequently from fires originating in them. All fires in this subsection had to originate within its relatively small area. In contrast, there was no significant barrier to the spread of fires into the Oak Savanna Subsection of the MIM from the prairie-dominated region of the PPA Province to the west and south, increasing the frequency of fires in this part of the EBF Province sufficiently that open prairies rather than savannas predominated.

WP communities were historically subject to grazing and browsing by large mammals including bison, elk, and deer. The role these animal activities played in shaping WP communities is unclear, but they probably influenced relative abundances of plant species through their effects on regeneration and competitive interactions. Mechanical disturbance of the soil by hooves provided a regeneration niche for short-lived species that depend on frequent germination from seed to persist in the community. Reduction in the height and density of the canopy of tall grasses from grazing prevented competitive exclusion of smaller-stature plant species. Large grazers can produce greater disturbance in WP communities than in UP communities, as wet soils are vulnerable to greater mechanical disturbance by the hooves of these heavy animals than are drier soils. However, bison and elk may have avoided wetland prairies when soils were soft, as there would have been ample upland prairie available. On the other

hand, during drier periods, wetland prairies provided superior forage and were probably preferentially grazed. It is not known whether the long-term absence of grazing will result in the disappearance of species from WP communities.

Soil-moisture conditions in WP communities are intermediate between those in UP and WM communities. WP communities typically receive surface runoff but are subjected to only brief, periodic inundation. Although the water table usually persists in the lower part of the rooting zone for much of the growing season, most of the plant rooting zone is not saturated except for brief periods during snowmelt or after heavy rains. As a result, anoxic conditions rarely persist long enough to cause mortality in plants incapable of transporting oxygen to their roots. In some situations, upward seepage of groundwater is enough to keep the surface soil permanently moist but not enough to saturate it. Moisture stress is an infrequent experience for plants in WP communities in the EBF Province. In the western part of the state where evapotranspiration regularly exceeds precipitation, translocated salts concentrate in many low areas, making water uptake by plants difficult. A distinctive variant of wet prairie occupies these saline places, but no occurrences of this have been documented in the EBF Province. Soils that support WP communities are classified as mollisols (very dark, base-rich mineral soils). Textures vary, including clays, silts, loams, and sands. At present, no floristic differences associated with these textural variations are recognized, but additional data collection and analysis may support subdivision based on this factor.

Plant Adaptations

Adaptations to frequent fire are prominent in the flora of the WP System. First, is the overwhelming predominance of herbaceous plants that, unlike woody plants, do not lose much investment when fire destroys their aboveground parts. However, shrubs are more important in WP communities than in UP communities, as greater productivity resulting from greater availability of water allows shrubs to maintain their root structure despite frequent destruction of above-ground parts. The perennating organs of most of the plants—buds, tubers, root collars, or other tissue from which new growth originates—are generally deep enough below the soil surface to escape damage in prairie fires. Although this is not as true of shrubs, the moist soil conditions provide some buffering of high temperatures at the soil surface during fires, increasing their chances for survival. In general, plants in WP communities invest heavily in belowground growth: biomass below ground in tallgrass prairies is estimated to be two to four times that above ground. There are several selective forces that produce this result, but sequestering nitrogen—a limiting nutrient in tallgrass prairies—from loss in fire is probably one. Related to this is sequestration of nutrient and energy reserves to support rapid regrowth following grazing. The graminoid life form is itself an adaptation to grazing, as the meristematic tissue from which new growth arises is at the base of the plant where it is inaccessible to grazers, which consume only easily replaceable leaf tissue.

Because severe water limitation is not frequent in WP communities in the EBF Province, adaptations to cope with this are not common in plants of this system. Saline wet prairies are an exception, as the salinity of the soil water makes its uptake by plants difficult, but these are not known to occur in the EBF Province. Although water is seldom limiting, the dominant graminoids of the WP System are C_4 grasses, indicating that its efficient use is still favored. (In WM communities, in contrast, where conditions are wetter, the dominant graminoids are usually less-water-efficient C_3 sedges.) The challenge in wetter systems—that of providing oxygen to roots in water-logged soil—is also not a significant force in shaping the composition of WP communities. Consequently, most of the plants of this system have no adaptations to cope with soil anoxia.

Floristic Regions

WP communities in Minnesota are grouped into two floristic regions based on differences in species composition, the Southern Floristic (WPs) Region and the Northern Floristic

(WPn) Region (Figure WP-1). Only the WPs Region is well-represented in the EBF Province. Communities of the WPn Region are present in the northern end of the province, but are rare enough that they are not described in this guide. Differences between the floristic regions are subtle. The composition of the dominant graminoids is remarkably constant throughout the WP System, but there are some differences in the composition of forbs and less-important graminoids. In addition, shrubs are more common in WPn communities.

Most of the species that are restricted to the WPs Region occur in only part of the region; restriction to the southeastern corner of the state is the most frequent pattern. Table WP-1 lists the most geographically widespread species with at least moderately high fidelity to one of the floristic regions. None of the indicators for the WPs Region has high frequency for communities in that floristic region because the species occurs in only part of the region, or because it is uncommon, or both. Low frequency values for indicators of the WPn Region are mostly attributable to the second factor. Species that are reliably present in WP communities in one floristic region tend to be present with high frequency in communities of the other region as well. Tufted hair grass *(Deschampsia cespitosa)*, which has high frequency only in the WPn Region, is a notable exception. These facts raise questions about the validity of these two floristic regions. Additional data and analysis may support moving the boundary or creating different floristic regions. Another possibility is the elimination of floristic regions within the WP System. Rather than being an indication of ecologically coherent regions, the geographic variation in species composition of WP communities may be best interpreted as simply the result of independently determined range limits of some of the component species.

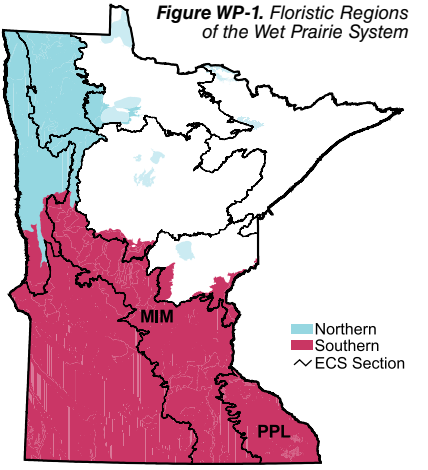

Figure WP-1. *Floristic Regions of the Wet Prairie System*

Table WP-1. *Plants useful for differentiating the Northern and Southern Floristic Regions of the Wetland Prairie System.*

	Common Name	Scientific Name	frequency (%) UPn	UPs
Northern Floristic Region	Seaside arrowgrass	*Triglochin maritima*	27	6
	Bebb's willow	*Salix bebbiana*	43	10
	Crawe's sedge	*Carex crawei*	12	2
	Slender willow	*Salix petiolaris*	54	10
	Kalm's lobelia	*Lobelia kalmii*	20	-
	White aster-like goldenrod	*Solidago ptarmicoides*	20	-
	Bog birch	*Betula pumila*	43	-
	Tufted hair grass	*Deschampsia cespitosa*	64	-
Southern Floristic Region	Gray-headed coneflower	*Ratibida pinnata*	-	27
	Canada tick trefoil	*Desmodium canadense*	-	22
	Skyblue aster	*Aster oolentangiensis*	-	22
	Wild garlic	*Allium canadense*	-	16
	Cup plant	*Silphium perfoliatum*	-	12
	Tussock sedge	*Carex stricta*	1	24
	Veiny pea	*Lathyrus venosus*	1	18
	Prairie phlox	*Phlox pilosa*	4	33