

# 2006 Vegetation Survey of the Valentine National Wildlife Refuge

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The Valentine National Wildlife Refuge (VNWR), located in north central Cherry County, was established in 1934. Tolstead (1942) studied the grasslands of northern Cherry County, (including the Valentine National Wildlife Refuge) with a focus on describing the dominant species of grassland types and determining the relationships between vegetation distribution and environmental variables and management practices. In addition, refuge staff have conducted studies on the effects of management, particularly grazing, on vegetation. The purpose of this study was to: (1) document all vascular plant species present on the refuge; (2) collect data on rare plant species and high quality native plant community occurrences; and (3) provide management recommendations for rare plants and plant communities.

## Methods

Plant surveys were conducted from May 17 through October 6, 2006. The Cherry County Soil Survey (Hammer 2005) and satellite imagery were utilized to identify habitat types present on the refuge. Walking surveys were conducted at various times throughout the field season within various examples of each habitat. Voucher specimens for approximately 90% of the vascular plant species encountered were collected and deposited at the VNWR and/or the University of Nebraska-Lincoln herbariums. Nebraska Natural Heritage Program (NHHP) Ecological Community Survey Forms and Rare Plant Survey Forms were completed to document native plant communities and rare plants (S1 or S2 species) respectively. Plant community nomenclature follows Steinauer and Rolfsmeier (2003). Vascular plant nomenclature follows Kaul, et al. (2006).

## Results

### Plant Communities

The following ten native plant communities were documented on the refuge: Sandhill dune prairie, Sandhill dry valley prairie, tallgrass prairie, northern cordgrass wet prairie, western alkaline meadow, Sandhills freshwater marsh, Sandhills fen, green ash woodland, spring seep, and Sandhills aquatic wetland. The following are brief descriptions of these plant communities as they occur on the VNWR. More detailed, statewide descriptions are provided in Steinauer and Rolfsmeier (2003).

#### Sandhills Dune Prairie

Sandhills dune prairie is the most common plant community on the refuge occurring on dune sands and covering approximately 45,000 acres or 62% of the refuge. Dominant species include: prairie sand reed (*Calamovilfa longifolia*), sand bluestem (*Andropogon hallii*), sun sedge (*Carex heliophila*), prairie sunflower (*Helianthus petiolaris*), sand lovegrass (*Eragrostis trichodes*) sand muhly (*Muhlenbergia pungens*), and needle-and-thread (*Hesperostipa comata*). Steep north-facing slopes are often dominated by shrubs including choke cherry (*Prunus virginiana*), poison ivy (*Toxicodendron rydbergii*), and wolfberry (*Symphoricarpos occidentalis*). Other common species include sand cherry (*Prunus pumila*), hairy grama (*Bouteloua hirsuta*), yucca (*Yucca glauca*), sand dropseed (*Sporobolus cryptandrus*), sand paspalum (*Paspalum setaceum*), and switchgrass (*Panicum virgatum*)

Condition & Threats: The sandhill dune prairie on the refuge is generally in good condition. The primary threats to this community are the invasion of eastern red cedar (*Juniperus virginiana*), black locust (*Robinia pseudoacacia*), and leafy spurge (*Euphorbia esula*). Eastern red cedar and black locust were planted by CCC personnel in the 1930's (Lindvall 2006) and are locally common in Sandhill dune prairie. Leafy spurge is currently unknown from this community on the refuge, but has the potential to invade if left unchecked.

**Rare species:** The federally endangered blowout penstemon (*Penstemon haydenii*) occurs within blowouts of Sandhills dune prairie on the refuge. Reduction of fire frequency and modern range management practices have resulted in an increase in vegetation cover and a loss of habitat (blowouts) for this species throughout its range in the Sandhill region of Nebraska. USFWS should consider designation of a portion of the refuge (perhaps 1000 acres initially) as blowout penstemon habitat, with management focused on formation and maintenance of habitat that would allow for a self-sustaining population of this species. Management recommendations would include increased fire frequency and heavier grazing pressure to reduce vegetation cover and favor the formation of blowouts. A potential location for this intense management are the dunes within management units 7B1, 7B2, 8C1, 8C2, 8D2, and 8E1 south of Pelican Lake, as roads and lakes in the vicinity would provide secure firebreaks for prescribed burning operations.

**Exemplary Sites:** All sites observed were generally of equal quality.

### **Sandhill Valley Prairies (Meadows)**

The prairies of the sandhill valleys, commonly referred to as meadows, are divided into three plant communities that are distributed along a dry to wet moisture gradient as follows: Sandhills dry valley prairie, tallgrass prairie, and northern cordgrass wet prairie. Distribution of these three communities within the meadows is frequently patchy and difficult to differentiate, as small changes in elevation and associated depth to the water table result in significant shifts in species composition over short distances. As a result, many of the meadows are a complex mosaic of these three communities with sizeable areas where the vegetation is transitional and does not fit neatly into the classification system.

**Sandhills dry valley prairie** occupies the driest sites within Sandhill valleys. On the VNWR it is most commonly found on Els and Impage soils. Tolstead (1942) referring to this community as the “True-Prairie Zone” found it to be most common where the minimum depth to the water table was between 4.5 – 6.5 ft. Sandhills dry valley prairie is transitional between Sandhills dune prairie and tallgrass prairie, and is characterized by a dominance of switchgrass (*Panicum virgatum*). On drier, low sandy rises, little bluestem is frequently the dominant species. Other common species include: white sage (*Artemisia ludoviciana*), prairie rose (*Rosa arkansana*), Scribner’s panicum (*Panicum oligosanthes*), western ragweed (*Ambrosia psilostachya*), prairie sandreed, June grass (*Koeleria macrantha*), stiff sunflower (*Helianthus pauciflorus*), lead plant (*Amorpha canescens*), yarrow (*Achillea millefolium*), stiff goldenrod (*Solidago rigida*), Missouri goldenrod (*S. missouriensis*), wild licorice (*Glycyrrhiza lepidota*) and smooth scouring rush (*Equisetum laevigatum*). Indian grass (*Sorghastrum nutans*) is frequently co-dominant with switchgrass within the dry valley prairie/tallgrass prairie transition.

**Condition & Threats:** Sandhill dry valley prairie on the VNWR is generally in good condition although many sites have high densities of Kentucky bluegrass. Leafy spurge and eastern red cedar have the potential to invade Sandhills dry valley prairie, but both are currently uncommon.

**Rare species:** No rare species were recorded from Sandhills dry valley prairie during the 2006 surveys.

**Exemplary Sites:** Although Sandhills dry valley prairie is common on the refuge, the most extensive stand and the best example of this community is located in the valley southeast of Cow Lake (Habitat units 25A, 26B1-4, and 27A1).

**Tallgrass prairie** occupies the middle range of the moisture gradient within Sandhill meadows and is transitional between Sandhill dry valley prairie and northern cordgrass wet prairie. Tolstead (1942) referring to this community as the “Mesophytic Tall-Grass Zone”, found it to be most common where the maximum water table levels ranged from 0.9-2.3 ft. and minimum levels between 2.9-4.9 ft. On VNWR, the tallgrass prairie zone is characterized by a dominance of big bluestem (*Andropogon gerardii*) with Kentucky bluegrass frequently co-dominant. Wild licorice, Nuttall’s sunflower (*H. nuttallii*), and sawtooth sunflower (*Helianthus grosseserratus*) are the most common forbs, regularly forming extensive, dense patches. These two sunflowers intergrade in central Nebraska and are difficult to differentiate. Both are present on VNWR, though it appears that Nuttall’s sunflower is the most common. Other common species found in tallgrass prairie on the refuge include Indiangrass, switchgrass, prairie

cordgrass (*Spartina pectinata*), Maximilian's sunflower (*Helianthus maximiliani*), stiff sunflower, Canada goldenrod (*Solidago canadensis*), leadplant, poison ivy (*Toxicodendron rydbergii*), willowleaf aster (*Aster praealtus*), western ragweed, viscid goldentop (*Euthamia gymnospermoides*), and Baltic rush (*Juncus balticus*). Species diversity is greatly reduced on hayed sites where the exotic cool-season grasses, redtop (*Agrostis stolonifera*) and timothy (*Phleum pratense*), are typically co-dominant with big bluestem.

**Condition & Threats:** Annual haying and the introduction of exotic legumes and cool-season grasses to increase production have severely degraded the vast majority of this prairie type within the Sandhills (Steinauer and Rolfsmeier 2003). Due to limited use of annual haying as a management practice, the majority of the tallgrass prairie on the VNWR has relatively high species diversity and fairly low levels of exotic species (other than Kentucky bluegrass), and represents some of the best remaining examples of this community as it is expressed within the Sandhills.

Although the condition of the tallgrass prairie on the refuge is better than that typically found on private lands, there is room for improvement. The practice of creating waterfowl nesting habitat by allowing a dense accumulation of standing dead vegetation, has decreased the vigor of native vegetation and created an environment favorable for Kentucky bluegrass, which is very common to abundant on the majority of the tallgrass prairie sites. If current management continues it is likely that there will be further decline in native species vigor, resulting in conditions favorable for the invasion of other exotic species, including leafy spurge, Canada thistle (*Cirsium arvense*), yellow bedstraw (*Galium verum*) and reed canarygrass (*Phalaris arundinacea*), which are presently uncommon or absent within the tallgrass prairie community.

**Exemplary Sites:** The best quality tallgrass prairies are generally found in the eastern half of the refuge. The following areas support the highest quality sites surveyed in 2006: habitat units 25A, 26A1, 26B1-4 in meadows associated with Cow Lake; pasture 29A1 on the south side of Sweetwater Valley; 16A1 at the east end of Dewey Lake; habitat units 34C1 & 34B3S; and habitat units 35B & 35C.

**Rare species:** western prairie fringed orchid (*Platanthera praeclara*), mat muhly (*Muhlenbergia richardsonis*), and northern adders tongue (*Ophioglossum pusillum*).

**Northern Cordgrass Wet Prairie** occupies the wettest portions of the Sandhill meadows. On annually hayed meadows, dominance is shifted to native cool-season species including a diverse assemblage of sedges (*Carex* spp.), which is referred to in Steinauer and Rolfsmeier (2003) as the northern sedge wet meadow community. This shift in species composition appears to be a result of the annual haying and for the purpose of this report, northern sedge wet meadow is included within the northern cordgrass wet prairie community.

On the VNWR this community is characterized by a dominance of prairie cordgrass (*Spartina pectinata*) with wild licorice and Nuttall's sunflower frequently co-dominant. Other common species include woolly sedge (*Carex pellita*), Emory's sedge (*C. emoryi*), Sartwell's sedge (*C. sartwellii*), pointed broom sedge (*C. scoparia*), bald spikerush (*Eleocharis erythropoda*), baltic rush (*Juncus balticus*), Dudley's rush (*Juncus dudleyi*), common hedge nettle (*Stachys pilosus*), meadow willow (*Salix petiolaris*), Canada goldenrod (*Solidago canadensis*), late goldenrod (*Solidago gigantea*), panicked aster (*Aster lanceolatus*), willow leaf aster (*A. praealtus*), northern reedgrass (*Calamagrostis stricta*), blue joint (*C. canadensis*), reed canarygrass, and swamp smartweed (*Polygonum coccineum*). On hayed sites, redtop, timothy and sedges are frequently co-dominant with prairie cordgrass, and forb diversity is generally low.

**Condition & Threats:** As with tallgrass prairie, the northern cordgrass wet prairie on the VNWR is significant in that it provides the most extensive examples of this community in the Sandhills that are not subject to annual haying. The condition of this community is generally good. The major threats at this time include reed canarygrass and Canada thistle invasion. Both species are present within the community and are likely to spread if appropriate management actions are not taken. Garrison creeping foxtail (*Alopecurus arundinaceus*), although currently rare on the refuge, is an additional threat. Yellow bedstraw

and the non-native variety of common reed (*Phragmites australis*) were not found on the refuge, but both species have the potential to invade this community.

Rare species: western prairie fringed orchid (*Platanthera praeclara*), northern adders tongue (*Ophioglossum pusillum*), purple stem beggarticks (*Bidens connata* var. *gracilipes*), brown bog sedge (*Carex buxbaumii*), few-flowered spikerush (*Eleocharis quinqueflora*), Wolf's sedge (*Eleocharis wolfii*) slender fimbry (*Fimbristylis autumnalis*), pull-up muhly (*Muhlenbergia filiformis*), and river grass (*Scolochloa festucacea*)

Exemplary Sites: The highest quality sites occur in the same meadows listed under tallgrass prairie.

**Western alkaline meadow** occurs on alkaline sites within meadows and is characterized by a dominance of inland saltgrass (*Distichlis spicata*) and western wheatgrass (*Elymus smithii*). Other characteristic species include plains bluegrass (*Poa arida*), scratch grass (*Muhlenbergia asperifolia*), oak-leaf goosefoot (*Chenopodium glaucum*), and seablite (*Suaeda calceoliformis*). Occurrences on the VNWR are generally small (< 1 acre) and may be better considered as inclusions within the northern cordgrass wet prairie community. The community is generally found in association with alkaline lakes with the most the most extensive examples noted in 2006 being associated with Pelican, School and 21 Lakes.

Condition & Threats: Occurrences are small and have low species diversity. Canada thistle invasion is a potential threat.

Rare species: none

Exemplary Sites: No exemplary sites of this community are present on VNWR

### **Marshes, Seeps, Fens**

The emergent wetland communities, Sandhill freshwater marsh, Sandhill fen, and spring seep, regularly intergrade with each other and are frequently difficult to differentiate. Marshes are characterized in Steinauer and Rolfsmeier (2003) as being flooded for most of the growing season, while fens and seeps are saturated with ground water seepage but rarely flooded except near flowing springs. Fens differ from seeps in having a surface layer of mucky peat greater than 30 cm thick while seeps generally have little to no organic soil formation. The somewhat vaguely defined marsh seep community (Steinauer and Rolfsmeier 2003) exhibits characteristics common to marshes, seeps, and fens. There are areas on the refuge that support vegetation characteristic of the marsh seep community, but for the purpose of this report this vegetation is considered as transitional between marshes seeps and/or fens and is not included in plant community descriptions.

**Sandhills freshwater marsh** occurs along the margin of Sandhill lakes and in other low areas within Sandhill valleys. Dominant species include: broadleaf cattail (*Typha latifolia*), narrowleaf cattail (*T. angustifolia*), common reed (*Phragmites australis*), swamp smartweed (*Polygonum amphibium*), burreed (*Sparganium eurycarpum*), arrowhead (*Sagittaria latifolia*), hardstem bulrush (*Schoenoplectus acutus*), and rip gut sedge (*Carex lacustris*).

Condition & Threats: Occurrences on the margins of Sandhill lakes are generally of the highest quality, as populations associated with depressions within Sandhill valleys are often choked with narrow-leaf cattail, an exotic species. Canada thistle and reed canarygrass are relatively common along the margins in a zone transitional to northern cordgrass wet prairie. Purple loosestrife (*Lythrum salicaria*) and the non-native strain of common reed are not present at this time but have the potential to invade this community

Rare Species: simple stem burreed (*Sparganium emersum*), grass-leaf arrowhead (*Sagittaria graminea*), clammy hedge hyssop (*Gratiola neglecta*), northern mannagrass (*Glyceria borealis*), Fraser's marsh-St. John's-wort (*Triadenum fraseri*)

Five **Sandhill fens** were documented on the VNWR in 2006 (Figure 1). A standard characteristic used to delineate Sandhills fens is the presence of a peat layer greater than 30 cm thick. No soil cores were taken on the VNWR and all fens were delineated by the presence of the following fen indicator species: fen

tussock sedge (*Carex aquatilis*), bog-aster (*Aster borealis*), flattop aster (*Doellingeria umbellata*), woolly-fruit sedge (*Carex lasiocarpa*), tall cottongrass (*Eriophorum angustifolium*), and bog buckbean (*Menyanthes trifoliata*). The most common species on these fens include: meadow willow, broad-leaf cattail, marsh fern (*Thelypteris palustris*), arrowhead (*Sagittaria latifolia*), rip gut sedge, common reed and fen tussock sedge.

Condition & Threats: Although the Sandhill fens on VNWR are generally in good condition floristically, they are relatively small (1 to 110 acres) in comparison to other fens within Cherry County (Steinauer et al. 1996). Exotic species are uncommon, but reed canarygrass, the non-native variety of common reed, and purple loosestrife are all potential threats.

Rare species: flattop aster, Fraser's marsh-St. John's-wort, fen tussock sedge, woolly-fruit sedge, tall cottongrass, bog buckbean, northern adder's-tongue, western prairie fringed orchid, and Loesel's twayblade (*Liparis loeselii*).

Exemplary Sites: The Dewey Lake fen is the largest and highest quality fen on the refuge. It has good species diversity and supports a variety of rare species including woolly fruit sedge, which is known from only three other sites in Nebraska. Mounding, a characteristic feature of many Sandhill fens (Steinauer et al. 1996), occurs only on south side of the Dewey Lake, although this portion of the fen is somewhat degraded and dominated by common reed. Despite being small, the Calf Camp Valley fen has very high species diversity and an assortment of rare species including western prairie fringed orchid which was previously unknown from this community.

On the VNWR **spring seeps** most commonly occur on the margins of Sandhill valleys containing lakes. Occurrences are generally small although an extensive seep zone is present along the southern shore of Dad's Lake. The most common species present include: round-leaf monkey flower (*Mimulus glabratus*), cut-leaf water parsnip (*Berula erecta*), bottlebrush sedge (*Carex hystericina*), bearded sedge (*Carex comosa*), fen willow herb (*Epilobium leptophyllum*), marsh fern (*Thelypteris palustris*), northern clearweed (*Pilea fontana*), crowned beggarticks (*Bidens trichosperma*), and dotted smartweed (*Polygonum punctatum*).

Exemplary Sites: Seeps on the south side of Dad's Lake provide the highest quality example of this community.

Threats: Exotic species invasion is the greatest threat to this community. Reed canary grass and Canada thistle are present in many occurrences including along the southern shore of Dad's Lake. Purple loosestrife and non-native common reed are potential invaders.

Rare Species: no rare species noted

**Sandhills Aquatic Wetland** refers to the submerged and floating leaved aquatic vegetation present in refuge lakes. The most common species include: sago pondweed (*Potamogeton pectinatus*), flat-stalk pondweed (*P. friesii*), flat-stem pondweed (*P. zosteriformis*), clasping-leaf pondweed (*P. richardsonii*), small pondweed (*P. pusillus*), coontail (*Ceratophyllum demersum*), and Siberian water milfoil (*Myriophyllum sibiricum*). White-stem pondweed (*Potamogeton praelongus*) is fairly common in the highest quality examples of this community. Other regularly represented species include: slender naiad (*Najas flexilis*), southern naiad (*N. guadalupensis*), common waterweed (*Elodea canadensis*), and slender waterweed (*E. nuttallii*). Variable pondweed (*Potamogeton gramineus*), Illinois pondweed (*P. illinoensis*), floating leaf pondweed (*P. natans*), yellow pond lily (*Nuphar variegata*), white water-crowfoot (*Ranunculus longirostris*) and the duckweeds and watermeals (*Lemna trisulca*, *L. minor*, *Spirodela polyrrhiza*, and *Wolffia columbiana*) are locally common to abundant in shallow waters.

Exemplary Sites/Condition: Watt's Lake, Rice Lake, Duck Lake, and Little Hay Lake support the highest quality examples of the Sandhills aquatic wetland community. All of these lakes have very high species

diversity and large populations of the rare species white stem pondweed and flat-stalk pondweed. Center Lake and West Long Lake also support good examples of this community, but species diversity is somewhat lower than the lakes cited above. The rest of the lakes on the refuge have relatively sparse submerged and floating leaf vegetation. In some lakes, such as Clear Lake, West Twin Lake, East Twin Lake, and Dad's Lake this is apparently the result of naturally high alkalinity (Tolstead 1942). Other lakes however, have been severely impacted by carp (*Cyprinus carpio*), which have been inadvertently introduced to the refuge. The negative impacts are the result of carp foraging by grubbing on lake bottoms which uproots and destroys aquatic vegetation. Grubbing also stirs up sediments, significantly increasing turbidity and reducing the amount of sunlight available to submersed species.

**Threats:** Carp are the greatest threat to this community. The current practice of pumping lakes dry to kill all fish appears to work well, as Watts Lake which was renovated in the 1970s now supports one of the highest quality Sandhill aquatic wetland communities on the refuge. The exotic curly pondweed (*Potamogeton crispus*) is a potential threat. Although not known from the VNWR it has been found in Cherry County. Once established this species can form extremely dense stands that severely impact aquatic habitats.

**Rare species:** Yellow pond lily (*Nuphar variegata*), white-stem pondweed (*Potamogeton praelongus*), flat stalk pondweed (*P. friesii*), and straight leaf pondweed (*P. strictifolius*) are present within this community. Flat-stalk pondweed and straight leaf pondweed are very similar and difficult to differentiate in the field. Based on collections, it appears that flat-stalk pondweed is relatively common on the refuge. Straight-leaf pondweed was collected only once and appears to be rare, but may have been missed during collecting. Further collections are needed to document its abundance.

**Green Ash – Elm Canyon Bottom Woodland (Hackberry - Green Ash Woodland).** Although most closely allied with the green ash – elm canyon bottom woodland community, the native woodlands on VNWR do not fit well into the Nebraska plant community classification of Steinauer and Rolfsmeier (2003). Hackberry – green ash woodland more accurately describes this association which is characterized by an open canopy of hackberry (*Celtis occidentalis*) and green ash (*Fraxinus pennsylvanica*). These native woodlands are rare on VNWR, occurring in narrow bands on steep north-facing slopes associated with the southern shores of Pelican and Dad's Lakes. Choke cherry (*Prunus virginiana*) is dominant in the shrub layer with wild plum (*P. americana*) locally common and eastern red cedar scattered. Species diversity is relatively low with the most common herbaceous species being long beak sedge (*Carex sprengei*), hairy wild-rye (*Elymus villosus*), Kentucky bluegrass, Pennsylvania pellitory (*Parietaria pennsylvanica*), poison ivy (*Toxicodendron rydbergii*), and little seed rice grass (*Oryzopsis micrantha*).

Black walnut (*Juglans nigra*) is present in woodlands on the south side of Dewey Lake that were planted by CCC crews in the 1930s and is not native to the refuge (Lindvall 2006). These same crews were responsible for the other green ash, black locust, eastern red cedar, and domestic grape plantings scattered across the refuge.

**Threats:** Eastern red cedar is scattered within this community, but over time will become more common if left untreated. Black locust has the potential to invade these woodlands and displace native species. Cattle trampling is a threat to the understory vegetation, with the Pelican Lake woodland having already sustained significant damage.

**Exemplary sites:** The Dad's Lake woodland is of fairly high quality, although Kentucky bluegrass is locally common to abundant. The Pelican Lake site has been heavily impacted by cattle, resulting in extensive areas of open, unvegetated sand and a fairly high exotic species component.

**Rare species:** none

## Vascular Plant Species

A total of 504 species of vascular plants from 88 families were recorded during the surveys. Seventy-two species (15%) are exotic and 28 are NNHP rare species (Table 1). A list of vascular plant species with relative abundance and habitat preference is provided in Appendix 1.

<b>Species</b>	<b>Common Name</b>	<b>Family</b>	<b>Occurrences</b>
<i>Bidens connata</i> . var. <i>gracilipes</i>	Purple-stem Beggarticks	Asteraceae	1
<i>Carex aquatilis</i>	Fen Tussock Sedge	Cyperaceae	8
<i>Carex buxbaumii</i>	Brown Bog Sedge	Cyperaceae	5
<i>Carex lasiocarpa</i>	Wooly-fruit Sedge	Cyperaceae	1
<i>Cyperus engelmannii</i>	Englemann's Flat Sedge	Cyperaceae	3
<i>Doellingeria umbellata</i>	Flat-top Aster	Asteraceae	2
<i>Eleocharis coloradoensis</i>	Dwarf Spikerush	Cyperaceae	3
<i>Eleocharis quinqueflora</i>	Few-flowered Spikerush	Cyperaceae	1
<i>Eleocharis wolfii</i>	Wolf's Spikerush	Cyperaceae	26
<i>Eriophorum angustifolium</i>	Tall Cottongrass	Cyperaceae	1
<i>Fimbristylis autumnalis</i>	Slender Fimbry	Cyperaceae	2
<i>Glyceria borealis</i>	Northern Mannagrass	Poaceae	2
<i>Gratiola neglecta</i>	Clammy Hedge-hyssop	Scrophulariaceae	1
<i>Liparis loeselii</i>	Loesel's Twayblade	Orchidaceae	2
<i>Menyanthes trifoliata</i>	Bog Bean	Menyanthaceae	8
<i>Muhlenbergia filiformis</i>	Pull-up Muhly	Poaceae	1
<i>Muhlenbergia richardsonis</i>	Mat Muhly	Poaceae	3
<i>Nuphar variegata</i>	Yellow pond lily	Nymphaeaceae	4
<i>Ophioglossum pusillum</i>	Northern Adder's Tongue	Ophioglossaceae	9
<i>Penstemon haydenii</i>	Blowout Penstemon	Scrophulariaceae	1
<i>Platanthera praeclara</i>	Western Prairie Fringed Orchid	Orchidaceae	1
<i>Populus tremuloides</i>	Quaking Aspen	Salicaceae	2
<i>Potamogeton friesii</i>	Flat-stalk Pondweed	Potamogetonaceae	4
<i>Potamogeton praelongus</i>	White-stem Pondweed	Potamogetonaceae	4
<i>Potamogeton strictifolius</i>	Straight-leaf Pondweed	Potamogetonaceae	1
<i>Sagittaria graminea</i>	Grassleaf Arrowhead	Alismataceae	3
<i>Scolochloa festucacea</i>	River Grass	Poaceae	2
<i>Sparganium emersum</i>	Simple-stem Bur-reed	Sparganiaceae	2
<i>Triadenum fraseri</i>	Fraser's Marsh St. John's-wort	Clusiaceae	9

## Management Recommendations

### Prescribed Fire

Prescribed fire needs to be utilized more regularly on the VNWR. The role of fire in the maintenance of prairie systems including the Sandhills is well documented. Pool (1914) and Tolstead (1942) both indicate

that fire was more common in the Sandhills prior to settlement. Bragg (1985) determined a presettlement fire return interval of approximately 3.5 years within the oak pine bluff forest of the Niobrara River on the northern limit of the Sandhills in north central Nebraska.

Fire is most needed in the meadow zone, where the lack of regular litter removal has decreased the vigor of native species facilitating the invasion of Kentucky bluegrass and potentially allowing for the expansion of reed canarygrass and Canada thistle. It also appears that lack of regular disturbance is promoting a shift to forb dominated vegetation with many meadows dominated by sunflowers (*Helianthus* spp.) and wild licorice (*Glycyrrhiza lepidota*). The current practice of using intense spring grazing in lieu of fire appears to work well, but it is not implemented frequently enough. It is recommended that meadows with high densities of Kentucky bluegrass receive annual prescribed fire and spring grazing until bluegrass populations are reduced. Early spring burning followed by intense mid and late spring grazing is an effective method of controlling many exotic cool-season grasses. All wet meadows should be burned or grazed every three years on average to remove standing vegetation and promote native plant vigor. Timing of the disturbance should be varied so as to not promote any specific group of plants.

Areas of Sandhill dune prairie should be included in fire planning, however the fire return interval will need to be longer than that of meadows due to the increased time required to produce sufficient fuel to carry a fire. If used in conjunction with grazing, fire within this community may create more habitat for blowout penstemon, a federally endangered species. Reduction of fire frequency and modern range management practices have resulted in an increase in vegetation cover and a loss of habitat (blowouts) for this species throughout its range in the Sandhills of Nebraska. USFWS should consider designation of a portion of the refuge (perhaps 1000 acres initially) as blowout penstemon habitat, with management focused on formation and maintenance of habitat that would allow for a self-sustaining population of this species. Management recommendations would include increased fire frequency and heavier grazing pressure to reduce vegetation cover and favor the formation of blowouts. A potential location for this intense management are the dunes within management units 7B1, 7B2, 8C1, 8C2, 8D2, and 8E1 south of Pelican Lake, as roads and lakes in the vicinity would provide secure firebreaks for prescribed burning operations.

Fire can also serve as the primary tool in halting the spread of eastern red cedar. Stands of sprouting woody vegetation (black locust and Russian olive) within burn units scheduled for prescribed burning should be eliminated prior to burning. Failure to do so will result in the spread of these species through vigorous root sprouting.

### **Exotic Species**

Exotic species invasion is currently the greatest threat to the ecological integrity of the VNWR and requires immediate attention. Control/eradication of exotic species is time consuming and expensive, and additional resources need to be directed toward this issue. It is highly recommended that the VNWR seriously consider hiring additional personnel, possibly two season employees, whose primary focus is on exotic species management. Specific duties should include: locating and documenting the location of exotic species populations; researching the most up to date and effective control methods; implementation of control strategies; and monitoring the effectiveness of control efforts.

The following are brief descriptions of exotic species of concern on the refuge and potential control strategies.

**Reed canarygrass** (*Phalaris arundinacea*) is well established on the VNWR. If left unchecked, this aggressive invader has the potential to form monospecific stands in meadows and other wetlands, greatly reducing native plant species diversity and degrading habitat for wildlife species. Although at this time reed canarygrass most commonly occurs as small clumps or patches in wetland habitats on the refuge,

extensive stands are present within management unit 24C2, where it is the dominant species; management unit 24C4 where it is dominant in low drainages; and at the west end of Little Hay Lake.

The following control strategies are adapted from Tu (2004) and Reinhardt Adams and Galatowitsch (2006). Prevention of new populations by maintaining a diverse healthy grassland system is the most efficient and cost effective management strategy. Although grazing and fire alone will not control this species proper use of these management tools can improve vegetation vigor and assist in slowing the spread of this species within wet meadow communities on the refuge. Care should be taken to not spread seeds on mowing equipment or other machinery. Scattered individual plants or small patches should be spot sprayed or wicked with appropriate herbicide. Reinhardt Adams and Galatowitsch (2006) found that, late August to early September was the most effective time to apply herbicide (2% glyphosate solution) in the upper Midwest due to increased translocation of glyphosate to rhizomes. Burning or intense grazing in the spring prior to herbicide treatment is recommended to remove standing dead vegetation allowing for improved herbicide contact with green vegetation. Vegetation removal also aids in reducing the seed bank by promoting seed germination through increased light exposure. Larger distinct patches can be treated in a similar manner, with the addition of a summer mowing treatment to prevent seed production. Initial management should focus on eliminating small patches of plants before they expand to form large monocultures. As with all exotic species control efforts, the effectiveness of control efforts need to be monitored and periodically reevaluated.

**Canada thistle** (*Cirsium arvense*) and is well established on the refuge. A refuge wide survey for this species was not conducted, but populations encountered during the 2006 inventory are provided in Figure 2. This species is currently being managed with herbicides on the refuge and it is recommended that current management continue.

According to Nuzzo (1997) maintaining a vigorous stand of native vegetation through regular prescribed burning is one of the most effective means of preventing the spread of this species into native habitats. Implementation of a prescribed burn program to supplement short-term intense grazing is recommended.

**Black locust** (*Robinia pseudoacacia*) an exotic tree planted on the refuge in the 1930's is one of the few invaders of the Sandhills dune prairie vegetation. This species forms dense clones, which eventually displace virtually all native plant species. Black locust is most prevalent in the vicinity of Hackberry and Dewey Lakes where it occurs in stands up to 15 acres in size, but is also present northeast of North Marshy Lake and along the Highway 183 right-of-way on the south side of Calf Camp Valley (Figure 3). This is a difficult to control species that requires immediate attention before it spreads further and becomes an even greater problem.

The following control strategy is adapted from Wisconsin Department of Natural Resources (2004). Chemical control is required, as black locust resprouts profusely after cutting, girdling, or burning. Triclopyr formulated for dilution in diesel fuel or mineral oil is currently the herbicide of choice for black locust. It can be applied to cut stumps or to a girdle cut at standing height. Many of the black locust stands on the refuge consist of a core of large trees with dense stands of sprouts/saplings surrounding them. It is recommended that initial treatments be conducted on the large trees at the clone center, as the herbicide will be translocated via roots to the surrounding sprouts. A foliar application of fosamine ammonium (Krenite), which kills plants by inhibiting leaf bud growth and flower formation in the spring, is recommended for control of saplings stands. Fosamine ammonium should be applied at the end of the growing season. In order to effectively curb regeneration, every branch or stem must be sprayed because missed stems will leaf out the following spring. For clones in which sprouts are too tall for spraying equipment, it may be necessary to brush-cut stands first and treat resprouts with fosamine ammonium. Black locust is difficult to eradicate, and multiple treatments of both herbicides will likely be required.

**Leafy spurge** (*Euphorbia esula*) populations encountered during the 2006 inventory are provided in Figure 2. The current treatment of a fall application of Plateau herbicide appears to be working satisfactorily in keeping this species at an acceptable level.

**Kentucky Bluegrass** (*Poa pratensis*) is very common in the tallgrass prairie and Sandhills dry valley prairie community types. Much of this infestation is likely the result of a decrease in the vigor of native warm season grasses due to the long disturbance interval utilized on the refuge. Initiation of a prescribed fire program will do much to decrease Kentucky bluegrass density. It is recommended that meadows with high densities of Kentucky bluegrass receive annual prescribed fire and spring grazing until bluegrass populations are reduced. All wet meadows should be burned or grazed every three years on average to remove standing vegetation and promote native plant vigor.

**Eastern red cedar** can be effectively controlled by prescribed fire and/or cutting. The most efficient method is to conduct a prescribed burn and follow up with cutting of surviving cedars. Control of this species will be on going, as there is a large seed source present within the sandhills.

**Russian olive** (*Elaeagnus angustifolia*) is scattered on the refuge. Control measures need to be initiated before it becomes well established and more difficult to control. Chemical treatment is required as Russian olive readily sprouts after cutting or burning. Trees should be cut as close to ground level as possible with stumps immediately treated with an appropriate herbicide. Due to vigorous sprouting following fire, Russian olives within burn units should be eradicated prior to conducting a burn. Failure to do so will result in numerous, difficult to control root sprouts.

**Garrison creeping foxtail** (*Alopecurus arundinaceus*) an exotic cool-season grass commonly planted in Sandhill wet meadows to increase forage quality, has the potential to invade wet meadows on the refuge. It is currently rare on VNWR having been found only on the south side of East Twin Lake (Figure 2). Management recommendations include elimination of the existing patch via treatment with appropriate herbicide and periodic monitoring of meadows to detect new infestations at an early stage.

**Common reed** (*Phragmites australis*) The highly invasive, non-native genotype of common reed is present in Nebraska and has the potential to invade wetlands on the refuge. Although the native genotype is very common on the refuge, to date, the non-native genotype has not been found. As with most invasive species, early detection is critical for control efforts. To assist in this effort, all staff members need to become familiar with the two strains and how to differentiate them. Characteristics of leaf sheaths and stem texture are the best features for separating the two varieties. Leaf sheaths on the native strain fall off in the fall, or are very easily removed, while the introduced strain has leaf sheaths that stay on the plant and are difficult to remove. The stem texture (after sheaths removed) of the native strain is smooth, while the stems of the introduced strain are ribbed, with ribs being visible with the naked eye. Additional morphological differences between the two genotypes is available from Blosssey (2002).

**Purple loosestrife** (*Lythrum salicaria*) Although purple loosestrife is well established on the Niobrara River and is beginning to invade Sandhill wetlands, it was not found on the VNWR during the 2006 surveys. It is likely that this species will eventually make its way to the refuge. To assist with early detection, all staff members need to be able to readily identify this species. Special attention should be given to differentiating purple loosestrife from the native and somewhat similar appearing winged loosestrife (*Lythrum alatum*) which is fairly common on the refuge.

**Yellow bedstraw** (*Galium verum*) has been found in Sandhill meadows in Cherry County. Although, it was not noted on the refuge, this species is a potential invader of wet meadows and will require regular monitoring to detect infestations before they become well established.

**Curly pondweed** (*Potamogeton crispus*) is currently not known from the refuge but it is present in Cherry County and is a potential threat to open water aquatic habitats. Once established curly pondweed can form dense stands which have the capacity to outcompete native species resulting in decreased species diversity and aquatic habitat degradation. Periodic monitoring of lakes for this species is recommended. This species is known to spread via plant fragments on contaminated boats. If curly pondweed is found in any refuge lake, restriction on boat traffic in the infected lake is recommended.

## **Summary**

Vegetation surveys of the VNWR were conducted from May 17 - October 6, 2006. The following ten native plant communities were documented on the refuge: Sandhill dune prairie, Sandhill dry valley prairie, tallgrass prairie, northern cordgrass wet meadow, western alkaline meadow, Sandhill freshwater marsh, Sandhill fen, spring seep, Sandhill aquatic wetland, and hackberry – green ash woodland. A total of 505 vascular plant species were documented on the refuge with voucher specimens deposited at VNWR and University of Nebraska-Lincoln herbariums. Exotic species invasion was found to be the greatest threat to the native vegetation on the refuge. Management recommendations include greater use of prescribed fire in vegetation management and an increase in resources devoted to exotic species management including the hiring of additional personnel focused on exotic species control.

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## Appendix 1 Vascular Species List

### Valentine National Wildlife Refuge 2006

**Abbreviations:** alk = western alkaline meadow; dunes = Sandhill dune prairie; dvp = Sandhill dry valley prairie; fen = Sandhills fen; lake = Sandhills aquatic wetland; marsh = Sandhill freshwater marsh; seep = spring seep; tgp = tallgrass prairie; wm = northern cordgrass wet prairie/northern sedge wet meadow; wood = green ash woodland

#### Aceraceae

*Acer negundo* L. (box elder) occasional wood

#### Adoxaceae

*Sambucus canadensis* L. (elderberry) occasional in mesic thickets

#### Agavaceae

*Yucca glauca* Nutt. (yucca) common dunes

#### Alismataceae

*Alisma triviale* Pursh (common water-plantain) locally common marsh

*Sagittaria cuneata* Sheldon (arum-leaf arrowhead) occasional lake shores

*Sagittaria graminea* Michx. (grass-leaf arrowhead) uncommon lake shores

*Sagittaria latifolia* Willd. (common arrowhead) common lake shores, marsh, fen

*Sagittaria rigida* Pursh (stiff arrowhead) uncommon lake shores

#### Amaranthaceae

*Amaranthus arenicola* I.M. Johnston (sandhills pigweed) common dunes

*Amaranthus tuberculatus* (Moq.) Sauer (water-hemp) locally common lake shores, marsh

*Froelichia floridana* (Nutt.) Moq. (plains snake-cotton) common dunes

*Froelichia gracilis* (Hook.) Moq. (slender snake-cotton) uncommon dunes

#### Anacardiaceae

*Rhus aromatica* Ait. (skunkbrush sumac) uncommon brush north facing slope south side of Dad's Lake

*Toxicodendron rydbergii* (Small *ex* Rydb.) Greene (western poison-ivy) common dunes, dvp, tgp

#### Apiaceae

*Berula erecta* (Huds.) Coville (cutleaf-water-parsnip) locally common seep

*Cicuta bulbifera* L. (bulbous water-hemlock) occasional marsh, fen

*Cicuta maculata* L. (common water-hemlock) fairly common wm

*Conium maculatum* L. (poison-hemlock) exotic uncommon wood

*Sanicula canadensis* L. (Canadian sanicle) uncommon wood

*Sium suave* Walt. (hemlock water-parsnip) locally common marsh, seep

#### Apocynaceae

*Apocynum cannabinum* L. (Indian-hemp) common dvp, tgp, wm

*Asclepias arenaria* Torr. (sand milkweed) common dunes

*Asclepias incarnata* L. (swamp milkweed) occasional wm and marsh

*Asclepias speciosa* Torr. (showy milkweed) common dvp, tgp

*Asclepias stenophylla* Gray (narrowleaf milkweed) uncommon dvp

*Asclepias syriaca* L. (common milkweed) common dvp, tgp

*Asclepias verticillata* L. (whorled milkweed) occasional tgp, wm

*Asclepias viridiflora* Raf. (green milkweed) uncommon dvp

#### Asteraceae

*Achillea millefolium* L. (yarrow) common dvp, tgp

*Ambrosia artemisiifolia* L. (annual ragweed) common roadsides and disturbed soils  
*Ambrosia psilostachya* DC. (western ragweed) common dunes, dvp, tgp  
*Ambrosia trifida* L. (giant ragweed) uncommon disturbed areas  
*Antennaria neglecta* Greene (field pussytoes) occasional dvp  
*Artemisia biennis* Willd. (biennial wormwood) uncommon wm somewhat alkaline  
*Artemisia campestris* L. (western sage) common dunes, dvp  
*Artemisia filifolia* Torr. (sandsage) uncommon Highway 83 road cuts  
*Artemisia frigida* Willd. (fringed sage) uncommon rocked roadsides  
*Artemisia ludoviciana* Nutt. (white sage) common dunes, dvp  
*Aster borealis* (Torr. & Gray) Prov. [*Symphotrichum boreale*] (bog-aster) uncommon fen  
*Aster ericoides* L. ssp. *pansus* (Blake) A.G. Jones [*Symphotrichum ericoides* var. *pansum*] (heath aster) locally common wm, tgp  
*Aster falcatus* Lindl. ssp. *commutatus* (Torr. & Gray) A.G. Jones [*Symphotrichum falcatum*] (rough heath aster) occasional dvp  
*Aster lanceolatus* Willd. ssp. *hesperius* (Gray) Semple & Chmiel. [*Symphotrichum lanceolatum* ssp. *hesperium*] (panicled aster) occasional wm, marsh  
*Aster lanceolatus* Willd. ssp. *lanceolatus* [*Symphotrichum lanceolatum* ssp. *lanceolatum*] (panicled aster) common wm, marsh  
*Aster oblongifolius* Nutt. [*Symphotrichum oblongifolium*] (aromatic aster) uncommon dunes  
*Aster praealtus* Poir. var. *nebrascensis* (Britt.) Wieg. [*Symphotrichum praealtum*] (willowleaf aster) common wm, marsh  
*Bidens cernua* L. (bur-marigold) common wm, marsh  
*Bidens comosa* (Gray) Wieg. (leafy-bract beggarticks) occasional wm/marsh transition  
*Bidens connata* Muhl. ex Willd. var. *gracilipes* Fern. [*Bidens sandbergii*] (purple-stem beggarticks) uncommon wm/marsh transition  
*Bidens frondosa* L. (devil's-pitchfork) locally common marsh, lake shores  
*Bidens trichosperma* (Michx.) Britt. (crowned beggarticks) common marsh, lake shores  
*Bidens vulgata* Greene (tall beggarticks) occasional marsh, lake shores  
*Brickellia eupatorioides* (L.) Shinnars (false boneset) common dunes, dvp  
*Cirsium arvense* (L.) Scop. (Canadian thistle) exotic common wm, marsh  
*Cirsium canescens* Nutt. (platte thistle) common dunes, dvp  
*Cirsium flodmanii* (Rydb.) Arthur (Flodman's thistle) uncommon tgp  
*Cirsium undulatum* (Nutt.) Spreng. (wavy-leaf thistle) uncommon rocked roadsides  
*Cirsium vulgare* (Savi) Ten. (bull thistle) exotic locally common all except dunes  
*Conyza canadensis* (L.) Cronq. (horseweed) common dunes, dvp, tgp  
*Crepis runcinata* (James) Torr. & Gray (dandelion hawk's-beard) hayed wm  
*Dieteria canescens* (Pursh) Nutt. (hoary aster) uncommon dunes (edge of blowouts)  
*Doellingeria umbellata* (P. Mill.) Nees (flattop aster) uncommon fen  
*Erechtites hieraciifolia* (L.) Raf. ex DC. (burnweed) locally common wm, marsh  
*Erigeron bellidiastrum* Nutt. (western fleabane) common dunes  
*Erigeron strigosus* Muhl. ex Willd. (daisy fleabane) locally common dunes, dvp, tgp  
*Eupatorium maculatum* L. (spotted joe pye weed) common marsh, fen  
*Eupatorium perfoliatum* L. (common boneset) common marsh, fen  
*Euthamia gymnospermoides* Greene (viscid goldentop) common dvp, tgp, wm  
*Gnaphalium jaliscense* Greenm. (jalisco cudweed) locally common wm  
*Gnaphalium stramineum* Kunth (cotton-batting-cudweed) locally common wm  
*Grindelia squarrosa* (Pursh) Dunal (curly-cup gumweed) occasional roadsides & parking areas  
*Helenium autumnale* L. (sneezeweed) uncommon marsh  
*Helianthus grosseserratus* Martens (sawtooth sunflower) common tgp, wm  
*Helianthus maximiliani* Schrad. (Maximilian's sunflower) common tgp  
*Helianthus nuttallii* Torr. & Gray (Nuttall's sunflower) common tgp, wm

*Helianthus pauciflorus* Nutt. (stiff sunflower) common dunes dvp, tgp  
*Helianthus petiolaris* Nutt. (prairie sunflower) common dunes, dvp  
*Heterotheca stenophylla* (A. Gray) Shinnery var. *angustifolia* (Rydb.) Semple occasional dunes  
*Heterotheca villosa* (Pursh) Shinnery (hairy golden-aster) occasional dunes, dvp  
*Hymenopappus filifolius* Hook. (threadleaf woollywhite) uncommon dunes  
*Hymenopappus tenuifolius* Pursh (old plainsman) occasional dvp  
*Iva xanthifolia* Nutt. (giant marsh-elder) locally common severely disturbed sands  
*Lactuca ludoviciana* (Nutt.) Riddell (western wild lettuce) common tgp, wm  
*Lactuca pulchella* (Pursh) DC. [*Mulgedium pulchellum*](showy blue lettuce) occasional dvp, tgp  
*Lactuca serriola* L. (prickly lettuce) exotic common dvp, tgp  
*Leucanthemum vulgare* Lam. (ox-eye daisy) exotic uncommon hayed wm  
*Liatris punctata* Hook. (dotted gayfeather) uncommon dunes, dvp  
*Liatris squarrosa* (L.) Michx. (plains gayfeather) common dunes, dvp  
*Lygodesmia juncea* (Pursh) D. Don ex Hook. (skeletonplant) common dunes, dvp  
*Oligoneuron rigidum* (L.) Small (stiff goldenrod) common dvp, tgp  
*Ratibida columnifera* (Nutt.) Woot. & Standl. (prairie coneflower) common dvp  
*Rudbeckia hirta* L. (black-eyed-susan) common tgp, dvp  
*Senecio riddellii* Torr. & Gray (Riddell's ragwort) common dunes  
*Senecio tridenticulatus* Rydb. (sandhills ragwort) occasional dunes, dvp  
*Shinneryoseris rostrata* (Gray) S. Tomb (beaked-skeletonplant) dunes  
*Solidago canadensis* L. (Canada goldenrod) common tgp, wm, marsh  
*Solidago gigantea* Ait. (late goldenrod) common wm, marsh  
*Solidago missouriensis* Nutt. (Missouri goldenrod) common dunes, dvp  
*Solidago nemoralis* Ait. (gray goldenrod) occasional dunes, dvp  
*Solidago rigida* L. (stiff goldenrod) common dvp, tgp  
*Sonchus arvensis* L. (field sow-thistle) exotic uncommon disturbed wm, marsh  
*Taraxacum officinale* G.H. Weber ex Wiggers (dandelion) exotic occasional hayed wm  
*Thelesperma megapotamicum* (Spreng.) Kuntze (rayless greenthread) occasional dvp  
*Tragopogon dubius* Scop. (goat's-beard) exotic common dvp, tgp  
*Vernonia fasciculata* Michx. (common Ironweed) occasional wm  
*Xanthisma spinulosum* (Pursh) D. Morgan & R. Hartman (cutleaf ironplant) common dunes, dvp  
*Xanthium strumarium* L. (cocklebur) occasional on disturbed mesic to wet sands

### Balsaminaceae

*Impatiens capensis* Meerb. (orange jewelweed) common marsh, fen

### Boraginaceae

*Cryptantha fendleri* (Gray) Greene (sand-dune cat's-eye) locally common dunes  
*Hackelia deflexa* (Wahlenb.) Opiz (nodding stickseed) uncommon wood  
*Hackelia virginiana* (L.) I.M. Johnston (common stickseed) uncommon wood  
*Lappula redowskii* (Hornem.) Greene (hairy sheepburr) uncommon dunes  
*Lithospermum carolinense* (Walt. ex J.F. Gmel.) MacM. (hairy puccoon) common dunes  
*Lithospermum incisum* Lehm. (fringed puccoon) common dunes

### Brassicaceae

*Arabis hirsuta* (L.) Scop. (hairy rockcress) uncommon tgp  
*Berteroa incana* (L.) DC. (hoary false alyssum) exotic uncommon roadsides  
*Camelina microcarpa* DC. (small flowered false flax) exotic uncommon roadsides  
*Capsella bursa-pastoris* (L.) Medik. (shepherd's-purse) exotic uncommon roadsides  
*Erysimum asperum* (Nutt.) DC. (western wallflower) common dunes, dvp  
*Lepidium densiflorum* Schrad. (common pepperwort) common disturbed areas  
*Lesquerella ludoviciana* (Nutt.) S. Wats. (common bladderpod) common dunes, dvp

*Rorippa curvipes* Greene (bluntleaf yellowcress) locally common lake shores  
*Rorippa palustris* (L.) Bess. (bog yellowcress) locally common marsh, lakeshores  
*Sisymbrium altissimum* L. (tumble-mustard) exotic scattered to common disturbed habitats  
*Thlaspi arvense* L. (pennycress) exotic occasional roadsides

### **Cactaceae**

*Coryphantha vivipara* (Nutt.) Britt. & Rose (plains pincushion cactus) uncommon dunes  
*Opuntia fragilis* (Nutt.) Haw. (brittle prickly-pear) common dunes, dvp  
*Opuntia macrorhiza* Engelm. (plains prickly pear) common dunes, dvp

### **Caesalpiaceae**

*Gleditsia triacanthos* L. (honey locust) exotic occasional wood

### **Campanulaceae**

*Campanula aparinoides* Pursh (marsh bellflower) locally common wm  
*Lobelia siphilitica* L. (great blue lobelia) common tgp, wm  
*Lobelia spicata* Lam. (pale-spike lobelia) occasional tgp, wm  
*Triodanis perfoliata* (L.) Nieuwl. (clasping-leaf Venus'-looking-glass) uncommon disturbed sands

### **Cannabaceae**

*Cannabis sativa* L. (hemp) exotic uncommon wood  
*Humulus lupulus* L. (common hop) uncommon wood margin

### **Caprifoliaceae**

*Symphoricarpos occidentalis* Hook. (wolfberry) common dunes, dvp

### **Caryophyllaceae**

*Cerastium brachypodum* (Engelm. ex Gray) B.L. Robins. (short-stalk chickweed) uncommon dvp, tgp  
*Cerastium fontanum* Baumg. (common chickweed) exotic uncommon hayed wm  
*Dianthus armeria* L. (Deptford pink) exotic uncommon hayed wm  
*Silene antirrhina* L. (sleepy catchfly) occasional tgp, wm  
*Silene latifolia* Poir. (white-campion) exotic uncommon roadside  
*Stellaria longifolia* Muhl. ex Willd. (stichwort) common wm, marsh, fen

### **Celastraceae**

*Celastrus scandens* L. (American bittersweet) occasional dunes, wood

### **Celtidaceae**

*Celtis occidentalis* L. (hackberry) occasional wood

### **Ceratophyllaceae**

*Ceratophyllum demersum* L. (coontail) common lake

### **Chenopodiaceae**

*Chenopodium berlandieri* Moq. (pitseed goosefoot) common tgp, wm  
*Chenopodium fremontii* S. Wats. (Fremont's goosefoot) occasional wood  
*Chenopodium glaucum* L. (oak-leaf goosefoot) exotic alk, lake shore  
*Chenopodium pratericola* Rydb. (desert goosefoot) common dunes, dvp  
*Chenopodium rubrum* L. (red goosefoot) common wm, marsh  
*Chenopodium simplex* (Torr.) Raf. (maple-leaf goosefoot) occasional wood  
*Chenopodium subglabrum* (S. Wats.) A. Nels. (smooth goosefoot) uncommon dunes  
*Cycloloma atriplicifolium* (Spreng.) Coult. (winged-pigweed) common dunes  
*Kochia scoparia* (L.) Schrad. (kochia) exotic uncommon roadsides  
*Salsola collina* Pallas (slender Russian-thistle) exotic common dunes  
*Salsola tragus* L. (prickly thistle-thistle) exotic occasional dunes disturbed sites

*Suaeda calceoliformis* (Hook.) Moq. (seablite) uncommon alk

### **Cleomaceae**

*Cleome serrulata* Pursh (rocky mountain beeplant) common dunes, dvp

*Polanisia jamesii* (Torr. & Gray) Iltis (James' clammyweed) common dunes

### **Clusiaceae**

*Hypericum majus* (Gray) Britt. (Canadian St. John's-wort) occasional wm, marsh

*Triadenum fraseri* (Spach) Gleason (Fraser's marsh-St. John's-wort) occasional marsh, fen

### **Commelinaceae**

*Commelina erecta* L. (narrow-leaf dayflower) occasional dunes

*Tradescantia occidentalis* (Britt.) Smyth (prairie spiderwort) common dunes, dvp

### **Convolvulaceae**

*Cuscuta cephalanthi* Engelm. (buttonbush dodder) occasional dunes

*Cuscuta cuspidata* Engelm. (cusp dodder) occasional dunes

*Ipomoea leptophylla* Torr. (bush morning-glory) common dunes

### **Cornaceae**

*Cornus sericea* L. (redosier) locally common marsh fen

### **Crassulaceae**

*Penthorum sedoides* L. (ditch-stonecrop) occasional marsh

### **Cupressaceae**

*Juniperus virginiana* L. (eastern red-cedar) common dunes, plantings

### **Cyperaceae**

*Bolboschoenus fluviatilis* (Torr.) Soják (river bulrush) common marsh lake shores

*Carex aquatilis* Wahlenb. (fen tussock sedge) occasional to locally common in fen

*Carex atherodes* Spreng. (slough sedge) occasional to locally common marsh

*Carex aurea* Nutt. (golden sedge) occasional wm

*Carex brevior* (Dewey) Mackenzie (short-beak sedge) occasional dvp, tgp

*Carex buxbaumii* Wahlenb. (brown bog sedge) occasional wm

*Carex comosa* Boott (bearded sedge) occasional marsh, fen

*Carex crawei* Dewey (Crawe's sedge) occasional hayed wm

*Carex diandra* Schrank (lesser tussock sedge) occasional fen

*Carex eleocharis* Bailey (needleleaf sedge) common dvp

*Carex emoryi* Dewey (Emory's sedge) common wm

*Carex heliophila* Mackenzie (sun sedge) common dunes

*Carex hystericina* Muhl. ex Willd. (bottlebrush sedge) locally common marsh, fen, seep

*Carex interior* Bailey (prairie star sedge) occasional wm, fen

*Carex lacustris* Willd. (ripgut sedge) common marsh, fen

*Carex lasiocarpa* Ehrh. (woolly-fruit sedge) uncommon fen

*Carex nebrascensis* Dewey (Nebraska sedge) locally common wm marsh fen

*Carex pellita* Muhl ex Willd. (woolly sedge) common wm

*Carex praegracilis* W. Boott (clustered field sedge) locally common dvp, tgp, alk

*Carex sartwellii* Dewey (Sartwell's sedge) locally common wm

*Carex scoparia* Schkuhr ex Willd. (pointed broom sedge) common tgp, wm

*Carex sprengei* Dewey ex Spreng. (long-beak sedge) locally common wood

*Carex stipata* Muhl. ex Willd. (sawbeak sedge) occasional marsh

*Carex tetanica* Schkuhr (rigid sedge) uncommon hayed wm

*Carex vulpinoidea* Michx. (fox sedge) occasional wm

*Cyperus bipartitus* Torr. (shining flatsedge) uncommon lake shores  
*Cyperus diandrus* Torr. (umbrella flatsedge) uncommon lake shores  
*Cyperus erythrorhizos* Muhl. (red-root flatsedge) uncommon lake shores  
*Cyperus engelmannii* Steud. (Englemann's flatsedge) uncommon lake shores  
*Cyperus schweinitzii* Torr. (sand flatsedge) common dunes  
*Cyperus squarrosus* L. (awned flatsedge) common lake shores  
*Cyperus strigosus* L. (straw-colored flatsedge) common wm, marsh, lake shores  
*Eleocharis acicularis* (L.) Roemer & J.A. Schultes (needle spikerush) common marsh, lake shores  
*Eleocharis coloradoensis* (Britt.) Gilly (dwarf spikerush) uncommon lake shores  
*Eleocharis compressa* Sullivant (flat-stem spikerush) common tgp, wm  
*Eleocharis elliptica* Kunth (bog spikerush) occasional tgp, wm  
*Eleocharis erythropoda* Steud. (bald spikerush) common wm, marsh, lake shores  
*Eleocharis palustris* (L.) Roemer & J.A. Schultes (common spikerush) common marsh, lake shores  
*Eleocharis quinqueflora* (F.X. Hartmann) Schwarz (few-flower spikerush) rare wm  
*Eleocharis wolfii* (Gray) Gray ex Britt. (Wolf's spikerush) occasional wm, marsh  
*Eriophorum angustifolium* Honckeny (tall cottongrass) rare fen  
*Fimbristylis autumnalis* (L.) Roemer & J.A. Schultes (slender fimbry) rare wm  
*Lipocarpa drummondii* (Nees) G. Tucker (Drummond's halfchaff sedge) rare wm  
*Schoenoplectus acutus* (Muhl. ex Bigelow) A. & D. Löve (hardstem bulrush) common marsh, fen  
*Schoenoplectus pungens* (Vahl) Palla (three-square bulrush) common wm, marsh, lake shores  
*Schoenoplectus tabernaemontani* (K.C. Gmel.) Palla (soft-stem bulrush) common marsh, lake shores  
*Scirpus pendulus* Muhl. (rufous bulrush) rare hayed wm

#### Dryopteridaceae

*Cystopteris fragilis* (L.) Bernh. (brittle bladder fern) uncommon wood  
*Onoclea sensibilis* L. (sensitive fern) common wm, marsh, fen, seep  
*Woodsia oregana* D.C. Eat. (Oregon cliff fern) uncommon wood

#### Elaeagnaceae

*Elaeagnus angustifolia* L. (Russian olive) exotic occasional tgp, wm

#### Equisetaceae

*Equisetum arvense* L. (common horsetail) occasional tgp, wm  
*Equisetum laevigatum* A. Braun (smooth scouringrush) common dvp, tgp

#### Euphorbiaceae

*Croton texensis* (Klotzsch) Muell.-Arg. (Texas croton) occasional dunes  
*Euphorbia esula* L. (leafy spurge) exotic occasional tgp, dvp, dunes  
*Euphorbia geyeri* Engelm. (Geyer's spurge) common dunes  
*Euphorbia glyptosperma* Engelm. (ridge-seed spurge) common dunes  
*Euphorbia maculata* L. (spotted spurge) common disturbed areas  
*Euphorbia marginata* Pursh (snow-on-the-mountain) rare disturbed areas  
*Euphorbia missurica* Raf. (prairie spurge) common dunes

#### Fabaceae

*Amorpha canescens* Pursh (leadplant) common dunes, dvp, tgp  
*Amorpha fruticosa* L. (false indigo-bush) occasional marsh  
*Astragalus canadensis* L. (Canada milkvetch) rare tgp  
*Astragalus ceramicus* Sheldon (bird's-egg milkvetch) occasional dunes (blowouts)  
*Astragalus crassicaarpus* Nutt. (ground-plum) rare dunes  
*Caragana arborescens* Lam. (Siberian peashrub) exotic uncommon dunes, dvp  
*Dalea candida* Michx. ex Willd. (white prairie-clover) occasional dunes, dvp  
*Dalea purpurea* Vent. (purple prairie-clover) occasional dunes, dvp

*Dalea villosa* (Nutt.) Spreng. (silky prairie-clover) common dunes  
*Desmodium canadense* (L.) DC. (Canada tick-clover) occasional tgp, wm  
*Glycyrrhiza lepidota* Pursh (wild licorice) common tgp, wm  
*Lathyrus polymorphus* Nutt. (showy vetchling) common dunes  
*Lespedeza capitata* Michx. (round-head bush-clover) common tgp  
*Lotus purshianus* F.E. & E.G. Clem. (deer vetch) common dvp, tgp, wm  
*Medicago sativa* L. (black medic) exotic common hayed wm  
*Melilotus albus* Medik. (white sweet-clover) exotic occasional dvp, tgp  
*Melilotus officinalis* (L.) Lam. (yellow sweet-clover) exotic occasional dvp, tgp  
*Pedimelum argophyllum* (Pursh) J. Grimes (silver-leaf scurfpea) occasional dvp, tgp  
*Pedimelum digitatum* (Nutt. ex Torr. & Gray) Isely (palm-leaf scurfpea) occasional dunes  
*Psoraleidum lanceolatum* (Pursh) Rydb. (lemon scurfpea) common dunes  
*Robinia pseudoacacia* L. (black locust) exotic common uplands  
*Strophostyles leiosperma* (Torr. & Gray) Piper (slick-seed wild pea) occasional sparsely vegetated sands  
*Trifolium campestre* Schreb. (low hop clover) exotic occasional hayed wm, roadsides  
*Trifolium hybridum* L. (Alsike clover) exotic occasional hayed wm  
*Trifolium pratense* L. (red clover) exotic occasional hayed wm  
*Trifolium repens* L. (white clover) exotic occasional hayed wm, roadsides

#### **Gentianaceae**

*Gentiana andrewsii* Griseb. (bottle gentian) occasional tgp, wm  
*Gentiana puberulenta* J. Pringle (downy gentian) uncommon tgp

#### **Grossulariaceae**

*Ribes americanum* P. Mill. (American black current) occasional wm, marsh, fen  
*Ribes odoratum* H. Wendl. (buffalo currant) occasional dvp, low dunes

#### **Haloragaceae**

*Myriophyllum sibiricum* Komarov (Siberian water milfoil) common lake

#### **Hydrocharitaceae**

*Elodea canadensis* Michx. (common waterweed) common lake  
*Elodea nuttallii* (Planch.) St. John (slender waterweed) occasional lake  
*Najas flexilis* (Willd.) Rostk. & Schmidt (slender naiad) occasional to locally common lake  
*Najas guadalupensis* (Spreng.) Magnus (southern naiad) uncommon lake

#### **Hydrophyllaceae**

*Ellisia nyctelea* (L.) L. (waterpod) uncommon wm

#### **Iridaceae**

*Sisyrinchium montanum* Greene (meadow blue-eyed grass) uncommon hayed wm

#### **Juglandaceae**

*Juglans nigra* L. (black walnut) exotic rare wood (planted on south shore of Dewey Lake)

#### **Juncaceae**

*Juncus alpinoarticulatus* Chaix (northern green rush) occasional tgp, wm  
*Juncus arcticus* Willd. var. *balticus* (Willd.) Traut. [*J. balticus*] (Baltic rush) common tgp, wm  
*Juncus canadensis* J. Gay ex Laharpe (Canada rush) occasional to locally common wm  
*Juncus dudleyi* Wieg. (Dudley's rush) common wm, marsh  
*Juncus interior* Wieg. (inland rush) occasional dvp, tgp  
*Juncus longistylis* Torr. (long-style rush) uncommon wm  
*Juncus marginatus* Rostk. (grassleaf rush) occasional tgp, wm  
*Juncus nodosus* L. (knotted rush) occasional tgp, wm

*Juncus scirpoides* Lam. (needle-pod rush) occasional tgp, wm

*Juncus torreyi* Coville (Torrey's rush) occasional tgp, wm

### **Juncaginaceae**

*Triglochin maritima* L. (alkali arrowgrass) occasional wm (semi-alkaline)

### **Lamiaceae**

*Hedeoma hispida* Pursh (rough false-pennyroyal) occasional dvp

*Lycopus americanus* Muhl. ex W. Bart. (common water-horehound) locally common wm, marsh

*Lycopus asper* Greene (western water-horehound) common wm, marsh

*Lycopus uniflorus* Michx. (northern water-horehound) locally common wm, marsh

*Mentha arvensis* L. (field mint) common wm, marsh

*Monarda fistulosa* L. (wild bergamot) occasional wood margins

*Nepeta cataria* L. (catnip) exotic occasional wood

*Prunella vulgaris* L. (self heal) occasional hayed wm

*Pycnanthemum virginianum* (L.) T. Dur. & B.D. Jackson ex B.L. Robins. & Fern. (Virginia mountain mint) uncommon tgp, wm

*Scutellaria galericulata* L. (marsh skullcap) locally common marsh, fen

*Scutellaria lateriflora* L. (mad-dog skullcap) locally common marsh, fen

*Scutellaria parvula* Michx. (small skullcap) occasional tgp, wm

*Stachys pilosa* Nutt. (common hedge-nettle) common wm, marsh

*Teucrium canadense* L. (American germander) common wood wm, marsh

### **Lemnaceae**

*Lemna minor* L. (common duckweed) common marsh, lake

*Lemna trisulca* L. (forked duckweed) locally common lake

*Spirodela polyrrhiza* (L.) Schleid. (greater duckweed) common marsh, lake

*Wolffia borealis* (Engelm. ex Hegelm.) Landolt ex Landolt & Wildi (northern watermeal) occasional marsh, lake

*Wolffia columbiana* Karst. (common watermeal) locally common marsh, lake

### **Lentibulariaceae**

*Utricularia macrorrhiza* Le Conte (greater bladderwort) common marsh, lake

### **Liliaceae**

*Asparagus officinalis* L. (asparagus) exotic occasional dvp, tgp

*Hypoxis hirsuta* (L.) Coville (yellow stargrass) uncommon hayed wm

*Smilacina stellata* (L.) Desf. [*Maianthemum stellatum*] (starry false Solomon's seal) uncommon wood

### **Linaceae**

*Linum rigidum* Pursh (stiff flax) common dunes dvp

*Linum sulcatum* Riddell (grooved yellow flax) uncommon tgp

### **Loasaceae**

*Mentzelia nuda* (Pursh) Torr. & Gray (sand-lily) common dunes

### **Lythraceae**

*Lythrum alatum* Pursh (winged loosestrife) occasional wm, marsh

*Rotala ramosior* (L.) Koehne (lowland toothcup) uncommon drying open sands

### **Menyanthaceae**

*Menyanthes trifoliata* L. (bog buckbean) occasional fen

### **Moraceae**

*Maclura pomifera* (Raf.) Schneid. (osage orange) exotic rare west end of Dewey Lake

*Morus alba* L. (white mulberry) exotic occasional wood

### **Nyctaginaceae**

*Mirabilis hirsuta* (Pursh) MacM. (pale four-o'clock) occasional dvp

*Mirabilis linearis* (Pursh) Heimerl var. *linearis* (narrow-leaf four o'clock) uncommon dvp

### **Nymphaeaceae**

*Nuphar variegata* Dur. (yellow pond-lily) locally common lake

### **Oleaceae**

*Fraxinus pennsylvanica* Marsh. (green ash) native and exotic locally common wood, plantings

### **Onagraceae**

*Calylophus serrulatus* (Nutt.) Raven (plains yellow primrose) common dunes

*Circaea lutetiana* L. (enchanter's nightshade) occasional woodland margins

*Epilobium ciliatum* Raf. (fringed willowherb) occasional seep, marsh, fen

*Epilobium leptophyllum* Raf. (fen willowherb) occasional seep, marsh, fen

*Ludwigia polycarpa* Short & Peter (many-fruited seedbox) occasional seep, marsh

*Oenothera latifolia* (Rydb.) Munz (pale evening primrose) dunes

*Oenothera nuttallii* Sweet (white-stem evening primrose) occasional dunes

*Oenothera rhombipetala* Nutt. ex Torr. & Gray (fourpoint evening primrose) occasional dunes

*Oenothera villosa* Thunb. (common evening primrose) occasional wm, marsh

### **Ophioglossaceae**

*Ophioglossum pusillum* Raf. (northern adder's-tongue) occasional wm, fen

### **Orchidaceae**

*Liparis loeselii* (L.) L.C. Rich. (Loesel's twayblade) rare fen

*Platanthera aquilonis* Sheviak [*Habenaria hyperborea*] (northern green orchid) rare fen

*Platanthera praeclara* Sheviak & Bowles (western prairie fringed orchid) uncommon tgp, wm

### **Oxalidaceae**

*Oxalis dillenii* Jacq. (slender yellow wood-sorrel) occasional hayed wm, roadsides

### **Papaveraceae**

*Argemone polyanthemus* (Fedde) G.B. Ownbey (prickly poppy) occasional dunes

### **Phrymaceae**

*Phryma leptostachya* L. (lopseed) occasional wood margins

### **Pinaceae**

*Pinus banksiana* Lamb. (jack pine) exotic rare plantings

*Pinus ponderosa* P.& C. Lawson (ponderosa pine) exotic locally common windbreaks

### **Plantaginaceae**

*Plantago major* L. (common plantain) exotic uncommon parking areas

*Plantago patagonica* Jacq. (woolly plantain) locally common dunes, dvp

### **Poaceae**

*Agropyron cristatum* (L.) Gaertn. (crested wheatgrass) exotic uncommon roadsides

*Agrostis hyemalis* (Walt.) B.S.P. (tickle grass) occasional wm, marsh, lake shores

*Agrostis scabra* Willd. (rough bentgrass) occasional wm, marsh, lake shores

*Agrostis stolonifera* L. [*Agrostis gigantea*] (redtop) exotic locally common tgp, wm

*Alopecurus aequalis* Sobol. (short-awn meadow foxtail) occasional wm, marsh

*Alopecurus arundinaceus* Poir. (creeping foxtail) exotic wm

*Andropogon gerardii* Vitman (big bluestem) common tgp, wm

*Andropogon hallii* Hack. (sand bluestem) common dunes  
*Aristida purpurea* Nutt. (purple three-awn) uncommon dunes  
*Bouteloua gracilis* (Willd. ex Kunth) Lag. ex Griffiths (blue grama) common dvp  
*Bouteloua hirsuta* Lag. (hairy grama) common dunes  
*Bromus ciliatus* L. (fringed brome) uncommon *Salix petiolaris* thickets  
*Bromus inermis* Leyss. (smooth brome) exotic locally common roadsides, former croplands  
*Bromus japonicus* Thunb. ex Murr. (Japanese brome) exotic common dvp, dunes  
*Bromus latiglumis* (Shear) A.S. Hitchc. (ear-leaf brome) uncommon wood/seep margin  
*Bromus tectorum* L. (downy brome) exotic locally common dvp, dunes  
*Calamagrostis canadensis* (Michx.) Beauv. (bluejoint) locally common wm, marsh  
*Calamagrostis stricta* (Timm) Koel. (northern reedgrass) locally common wm  
*Calamovilfa longifolia* (Hook.) Scribn. (prairie sandreed) common dunes, dvp  
*Cenchrus longispinus* (Hack.) Fern. (sandbur) occasional dvp, dunes  
*Digitaria sanguinalis* (L.) Scop. (hairy crabgrass) exotic uncommon roadsides  
*Distichlis spicata* (L.) Greene (inland saltgrass) locally common alk  
*Echinochloa muricata* (Beauv.) Fern. (rough barnyard grass) occasional wm, marsh  
*Eleusine indica* (L.) Gaertn. (goosegrass) exotic uncommon parking areas  
*Elymus canadensis* L. (Canada wildrye) occasional dunes, dvp, tgp  
*Elymus repens* (L.) Gould (quackgrass) exotic locally common roadsides, oldfields  
*Elymus smithii* (Rydb.) Gould (western wheatgrass) occasional dvp, tgp, alk  
*Elymus trachycaulus* (Link) Gould ex Shinners (slender wheatgrass) occasional tgp  
*Elymus villosus* Muhl. ex Willd. (hairy wildrye) occasional wood  
*Eragrostis cilianensis* (All.) Vign. ex Janchen (stinkgrass) exotic occasional roadsides  
*Eragrostis pectinacea* (Michx.) Nees ex Steud. (Carolina lovegrass) occasional roadsides, lake shores  
*Eragrostis spectabilis* (Pursh) Steud. (purple lovegrass) occasional dunes, dvp  
*Eragrostis trichodes* (Nutt.) Wood (sand lovegrass) common dunes  
*Festuca subverticillata* (Pers.) Alexeev (nodding fescue) uncommon wood  
*Glyceria borealis* (Nash) Batchelder (northern mannagrass) uncommon marsh, lake  
*Glyceria grandis* S. Wats. (tall mannagrass) occasional marsh  
*Glyceria striata* (Lam.) A.S. Hitchc. (fowl mannagrass) occasional wm, marsh  
*Hordeum jubatum* L. (foxtail barley) locally common wm, alk  
*Koeleria macrantha* (Ledeb.) J.A. Schultes (junegrass) common dunes, dvp  
*Leersia oryzoides* (L.) Sw. (rice cutgrass) common wm, marsh  
*Leptochloa fusca* (L.) Kunth (bearded sprangletop) occasional wm  
*Muhlenbergia asperifolia* (Nees & Meyen ex Trin.) Parodi (scratch grass) uncommon alk  
*Muhlenbergia filiformis* (Thurb. ex S. Wats.) Rydb. (pull-up muhly) rare wm  
*Muhlenbergia mexicana* (L.) Trin. (Mexican muhly) occasional wm, marsh, seep, fen  
*Muhlenbergia pungens* Thurb. (sand muhly) common dunes  
*Muhlenbergia racemosa* (Michx.) B.S.P. (marsh muhly) uncommon wood  
*Muhlenbergia richardsonis* (Trin.) Rydb. (mat muhly) uncommon tgp  
*Oryzopsis micrantha* (Trin. & Rupr.) Thurb. [*Piptatherum micranthum*] (little-seed ricegrass) uncommon wood  
*Panicum acuminatum* Sw. [*Dichantherium acuminatum*] (tapered spring panicum) common dvp tgp  
*Panicum capillare* L. (witchgrass) common drying wetlands  
*Panicum oligosanthos* J.A. Schultes var. *scribnerianum* (Nash) Fern. [*Dichantherium oligosanthos*] (Scribner's panicum) common dunes dvp tgp  
*Panicum virgatum* L. (switchgrass) common dunes dvp tgp wm  
*Panicum wilcoxianum* Vasey [*Dichantherium wilcoxianum*] (Wilcox's spring panicum) common dunes  
*Paspalum setaceum* Michx. (sand paspalum) dunes  
*Phalaris arundinacea* L. (reed canarygrass) exotic locally common wm, marsh  
*Phleum pratense* L. (timothy) exotic locally common tgp, wm

*Phragmites australis* (Cav.) Trin. ex Steud. (common reed) common marsh, fen, lake  
*Poa arida* Vasey (plains bluegrass) uncommon alk  
*Poa compressa* L. (Canada bluegrass) exotic occasional dvp, tgp  
*Poa palustris* L. (marsh bluegrass) exotic uncommon wm, marsh  
*Poa pratensis* L. (Kentucky bluegrass) exotic common dvp, tgp, wm  
*Redfieldia flexuosa* (Thurb.) Vasey (blowout grass ) locally common dunes (blowouts)  
*Schizachyrium scoparium* (Michx.) Nash (little bluestem) common dunes, dvp  
*Scolochloa festucacea* (Willd.) Link (river grass) uncommon marsh, lake margins  
*Setaria viridis* (L.) Beauv. (green foxtail) exotic uncommon roadsides  
*Sorghastrum nutans* (L.) Nash (Indian grass) common dvp, tgp  
*Spartina pectinata* Bosc ex Link (prairie cordgrass) common tgp, wm  
*Sphenopholis obtusata* (Michx.) Scribn. (wedgegrass) occasional wm, lake shores  
*Sporobolus cryptandrus* (Torr.) Gray (sand dropseed) common dunes, dvp  
*Stipa comata* Trin. & Rupr. [*Hesperostipa comata*] (needle-and-thread) common dunes, dvp  
*Stipa spartea* Trin. [*Hesperostipa spartea*] (porcupine grass) uncommon dunes  
*Triplasis purpurea* (Walt.) Chapman (purple sandgrass) locally common dunes  
*Vulpia octoflora* (Walt.) Rydb. [*Festuca octoflora*] (six-weeks fescue) common dunes, dvp  
*Zizania palustris* L. (Wild rice) common marsh, lake

#### **Polemoniaceae**

*Collomia linearis* Nutt. (slender collomia) uncommon dunes  
*Ipomopsis longiflora* (Torr.) V. Grant (showy ipomopsis) occasional dunes  
*Phlox andicola* E. Nels. (plains phlox) uncommon dunes

#### **Polygalaceae**

*Polygala verticillata* L. (whorled milkwort) uncommon tgp, wm

#### **Polygonaceae**

*Eriogonum annuum* Nutt. (annual wild buckwheat) common dunes, dvp  
*Polygonum achoreum* Blake (leathery knotweed) occasional roadsides  
*Polygonum amphibium* L. (water smartweed) common wm, marsh  
*Polygonum aviculare* L. (wireweed) occasional road ditches  
*Polygonum coccineum* Muhl. ex Willd. (swamp smartweed) common marsh, lake  
*Polygonum convolvulus* L. (black bindweed) exotic occasional tgp, wm  
*Polygonum lapathifolium* L. (nodding smartweed) occasional wm, marsh  
*Polygonum pensylvanicum* L. (Pennsylvania smartweed) uncommon marsh, road ditches  
*Polygonum persicaria* L. (lady's-thumb smartweed) exotic occasional wm, marsh  
*Polygonum punctatum* Ell. (dotted smartweed) common marsh, lake shores  
*Polygonum sagittatum* L. (arrow-leaf tearthumb) occasional marsh, fen  
*Polygonum scandens* L. (climbing false buckwheat) uncommon wood margin  
*Rumex acetosella* L. (sheep sorrel) exotic uncommon dvp  
*Rumex britannica* L. (great water dock) occasional marsh, fen  
*Rumex crispus* L. (curly dock) exotic occasional wm, marsh  
*Rumex fueginus* Phil. (golden dock) exotic occasional marsh, lake shores  
*Rumex stenophyllus* Ledeb. (narrow-leaf dock) exotic uncommon wm, marsh  
*Rumex venosus* Pursh (wild begonia) common dunes

#### **Pontederiaceae**

*Zosterella dubia* (Jacq.) Small [*Heteranthera dubia*] (water star-grass) occasional lake

#### **Portulacaceae**

*Portulaca oleracea* L. (common purslane) uncommon disturbed sands

### Potamogetonaceae

- Potamogeton foliosus* Raf. (leafy pondweed) uncommon lake, stock tanks  
*Potamogeton friesii* Rupr. (flat-stalk pondweed) common lake  
*Potamogeton gramineus* L. (variable pondweed) locally common lake  
*Potamogeton illinoensis* Morong (Illinois pondweed) occasional to locally common lake  
*Potamogeton natans* L. (floating-leaf pondweed) occasional lake  
*Potamogeton pectinatus* L. [*Stuckenia pectinata*] (sago pondweed) common lake  
*Potamogeton praelongus* Wulfen (white stem pondweed) locally common lake  
*Potamogeton pusillus* L. (small pondweed) common lake  
*Potamogeton richardsonii* (Benn.) Rydb. (clasping-leaf pondweed) common lake  
*Potamogeton strictifolius* Benn. (straight-leaf pondweed) uncommon lake  
*Potamogeton zosteriformis* Fern. (flat-stem pondweed) common lake

### Primulaceae

- Lysimachia hybrida* Michx. (lanceleaf loosestrife) occasional wm  
*Lysimachia thrysiflora* L. (water loosestrife) occasional wm, marsh

### Ranunculaceae

- Anemone cylindrica* Gray (candle anemone) uncommon wood margins  
*Ranunculus longirostris* Godr. (longbeak white crow's-foot) locally common lake, stock tanks  
*Ranunculus pensylvanicus* L. f. (Pennsylvania buttercup) occasional marsh  
*Thalictrum dasycarpum* Fisch. & Avé-Lall. (meadow rue) uncommon tgp, wm

### Rosaceae

- Agrimonia gryposepala* Wallr. (tall agrimony) occasional seep  
*Amelanchier alnifolia* (Nutt.) Nutt. ex M. Roemer (Saskatoon serviceberry) locally common wood  
*Dryocallis arguta* (Pursh) Rydb. (prairie cinquefoil) occasional to locally common tgp dvp  
*Geum aleppicum* Jacq. (yellow avens) common wm, marsh  
*Geum canadense* Jacq. (white avens) occasional wood  
*Potentilla norvegica* L. (Norwegian cinquefoil) occasional wm  
*Potentilla recta* L. (sulfur cinquefoil) exotic uncommon dvp  
*Potentilla rivalis* Nutt. (brook cinquefoil) occasional wm, marsh  
*Prunus americana* Marsh. (wild plum) common thickets  
*Prunus pumila* L. (sand cherry) common dunes, dvp  
*Prunus virginiana* L. (choke cherry) common dunes, wood  
*Rosa arkansana* Porter (prairie rose) common dunes, dvp  
*Rosa woodsii* Lindl. (western wild rose) common dunes, wood edges  
*Rubus occidentalis* L. (black raspberry) uncommon wood

### Rubiaceae

- Galium aparine* L. (annual bedstraw) uncommon wood  
*Galium tinctorium* (L.) Scop. (stiff marsh bedstraw) common wm, seep, marsh  
*Galium trifidum* L. (scrambling marsh bedstraw) common marsh, fen  
*Galium triflorum* Michx. (sweet-scented bedstraw) uncommon wood

### Salicaceae

- Populus deltoides* Bartr. ex Marsh. (plains cottonwood) scattered in valleys  
*Populus tremuloides* Michx. (trembling aspen) exotic? uncommon (two clones) valleys  
*Salix amygdaloides* Anderss. (peach-leaf willow) common wm, marsh, lake shores  
*Salix eriocephala* Michx. (diamond willow) uncommon wm, marsh  
*Salix exigua* Nutt. (sandbar willow) common wm, tgp  
*Salix fragilis* L. (crack willow) exotic uncommon roadside (near hdqts.)  
*Salix humilis* Marsh. (prairie willow) occasional tgp, wm

*Salix petiolaris* Sm. (meadow willow) common marsh, fen  
*Salix* × *rubens* Schrank [*S. alba* X *S. fragilis*] (hybrid crack willow) exotic uncommon Pony Lake

### Scrophulariaceae

*Agalinis tenuifolia* (Vahl) Raf. (slender false foxglove) occasional to locally common wm, lake shores  
*Chaenorhinum minus* (L.) Lange (lesser toadflax) exotic uncommon parking areas  
*Gratiola neglecta* Torr. (clammy hedge-hyssop) rare mud flats  
*Lindernia dubia* (L.) Pennell (false pimpernel) occasional wm, marsh  
*Mimulus glabratus* Kunth (round-leaf monkey-flower) occasional seep  
*Mimulus ringens* L. (Alleghany monkey-flower) occasional marsh  
*Penstemon angustifolius* Nutt. ex Pursh (narrowleaf beardtongue) occasional dunes  
*Penstemon gracilis* Nutt. (slender beardtongue) occasional tgp  
*Penstemon haydenii* S. Wats. (blowout penstemon) uncommon dunes (blowouts)  
*Verbascum thapsus* L. (common mullein) exotic uncommon disturbed sites

### Smilacaceae

*Smilax lasioneura* Hook. (common carrion-flower) uncommon wood

### Solanaceae

*Physalis heterophylla* Nees (clammy ground-cherry) common dunes, dvp  
*Physalis hispida* (Waterfall) Cronq. (sandhills ground-cherry) locally common dunes, dvp  
*Solanum ptychanthum* Dunal (black nightshade) occasional dunes (brushy slopes)

### Sparganiaceae

*Sparganium emersum* Rehmman (simple-stem bur-reed) uncommon lake shores  
*Sparganium eurycarpum* Engelm. ex Gray (large-fruit bur-reed) common marsh

### Thelypteridaceae

*Thelypteris palustris* Schott (marsh fern) common marsh, seep, fen

### Typhaceae

*Typha angustifolia* L. (narrow-leaf cattail) exotic common marsh, fen  
*Typha latifolia* L. (broadleaf cattail) common marsh, fen

### Ulmaceae

*Ulmus americana* L. (American elm) occasional wood

### Urticaceae

*Boehmeria cylindrica* (L.) Sw. (false nettle) common marsh, fen  
*Parietaria pennsylvanica* Muhl. ex Willd. (Pennsylvania pellitory) common wood  
*Pilea fontana* (Lunell) Rydb. (northern clearweed) common marsh, seep, fen  
*Urtica dioica* L. (stinging nettle) common marsh, fen

### Verbenaceae

*Verbena bracteata* Lag. & Rodr. (prostrate vervain) occasional dvp, tgp, roadsides  
*Verbena hastata* L. (blue vervain) common wm, marsh  
*Verbena stricta* Vent. (hoary vervain) common dvp, tgp

### Violaceae

*Viola nephrophylla* Greene (northern bog violet) occasional wm, fen  
*Viola pedatifida* G. Don (prairie violet) uncommon dvp, tgp

### Vitaceae

*Parthenocissus vitacea* (Knerr) A.S. Hitchc. (woodbine) common thickets  
*Vitis riparia* Michx. (riverbank grape) occasional dunes (brushy slopes), wood

## **Zygophyllaceae**

*Tribulus terrestris* L. (puncture vine) exotic occasional on heavily disturbed soils