

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.

Species	Common Name	Family	Occurrences
<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 Blossey (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.) Shinnery (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
Liatis punctata Hook. (dotted gayfeather) uncommon dunes, dvp
Liatis 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 caroliniense (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 macrorhiza 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

Phymaceae

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 oligosanthes J.A. Schultes var. *scribnerianum* (Nash) Fern. [*Dichantherium oligosanthes*] (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