

# Terrestrial Ecological Systems and Natural Communities of Nebraska

(Version IV – March 9, 2010)

By

Steven B. Rolfsmeier  
Kansas State University Herbarium  
Manhattan, KS 66506

and

Gerry Steinauer  
Nebraska Game and Parks Commission  
Aurora, NE 68818

A publication of the

NEBRASKA NATURAL HERITAGE PROGRAM  
NEBRASKA GAME AND PARKS COMMISSION  
LINCOLN, NEBRASKA



# TABLE OF CONTENTS

<b>Chapter 1: Introduction</b> .....	1
Terrestrial Ecological System Classification.....	1
Ecological System Descriptions.....	2
Terrestrial Natural Community Classification.....	3
Vegetation Hierarchy.....	4
Natural Community Nomenclature.....	5
Natural Community Ranking.....	6
Natural Community Descriptions.....	8
<b>Chapter 2: Ecological Systems of Nebraska</b> .....	10
Upland Forest, Woodland, and Shrubland Systems.....	10
Eastern Upland Oak Bluff Forest.....	10
Eastern Dry-Mesic Bur Oak Forest and Woodland.....	12
Great Plains Dry Upland Bur Oak Woodland.....	15
Great Plains Wooded Draw, Ravine and Canyon.....	17
Northwestern Great Plains Pine Woodland.....	20
Upland Herbaceous Systems.....	23
Central Tall-grass Prairie.....	23
Central Mixed-grass Prairie.....	26
Western Great Plains Sand Prairie.....	28
Northwestern Great Plains Mixed-grass Prairie.....	31
Western Great Plains Mixed-grass Prairie.....	32
Riparian Systems.....	34
Northwestern Great Plains Riparian.....	34
Wetland Systems.....	36
Eastern Floodplain Wetland.....	36
Western Great Plains Floodplain.....	39
Eastern Great Plains Wet-Meadow, Prairie and Marsh.....	42
Western Great Plains Open Freshwater Depression Wetland.....	44
Western Great Plains Closed Depression Wetland.....	46
Western Great Plains Saline Depression Wetland.....	49
Upland Sparsely Vegetated Systems.....	51
Western Great Plains Badlands.....	51
Western Great Plains Cliff and Outcrop.....	53
<b>Chapter 3: Terrestrial Natural Communities of Nebraska</b> .....	56
Wetland Forest and Woodland Communities.....	56
Eastern Riparian Forest.....	56
Cottonwood-Peachleaf Willow Riparian Woodland.....	59
Eastern Cottonwood-Dogwood Riparian Woodland.....	62
Cottonwood-Diamond Willow Woodland.....	64
Cottonwood Riparian Woodland.....	66
Peachleaf Willow Woodland.....	68
Upland Forest and Woodland Communities.....	69
Red Oak-Basswood-Ironwood Forest.....	69
Oak-Hickory-Ironwood Forest.....	72

Bur Oak-Basswood-Ironwood Forest.....	74
Mesic Bur Oak Forest and Woodland.....	76
Dry-Mesic Bur Oak Forest and Woodland.....	78
Sandstone Upland Bur Oak Woodland.....	81
Dry Upland Bur Oak Woodland.....	83
Paper Birch Springbranch Canyon Forest.....	85
Basswood-Ironwood Springbranch Canyon Forest.....	87
Green Ash- Elm- Hackberry Canyon Bottom Woodland.....	89
Green Ash-Eastern Red Cedar Scarp Woodland.....	91
Ponderosa Pine Forest.....	93
Dry-Mesic Ponderosa Pine Woodland.....	95
Dry Ponderosa Pine Open Woodland and Savanna.....	97
Pine-Juniper Scarp Woodland.....	99
Rocky Mountain Juniper Woodland.....	101
Wetland Shrubland Communities.....	103
Sandbar Willow Shrubland.....	103
Riparian Dogwood-False Indigobush Shrubland.....	105
Upland Shrubland Communities.....	106
Buckbrush Shrubland.....	106
Buffaloberry Shrubland.....	108
Skunkbrush Sumac Shrubland.....	109
Chokecherry-Plum Shrub Thicket.....	111
Mountain Mahogany Shrubland.....	112
Wetland Herbaceous Communities.....	114
Freshwater Seep.....	114
Prairie Fen.....	116
Sandhills Fen.....	118
Eastern Cordgrass Wet Prairie.....	120
Eastern Sedge Wet Meadow.....	122
Eastern Saline Meadow.....	123
Northern Cordgrass Wet Prairie.....	125
Sandhills Wet Meadow.....	127
Western Alkaline Meadow.....	130
Western Subirrigated Alkaline Meadow.....	132
Wheatgrass Playa Grassland.....	133
Western Sedge Wet Meadow.....	135
Playa Wetland.....	137
Spikerush Vernal Pool.....	138
Eastern Bulrush Deep Marsh.....	140
Cattail Shallow Marsh.....	142
Eastern Saline Marsh.....	144
Sandhills Hardstem Bulrush Marsh.....	146
Reed Marsh.....	148
Western Alkaline Marsh.....	150
Eastern Pondweed Aquatic Wetland.....	152
American Lotus Aquatic Wetland.....	153

Northern Pondweed Aquatic Wetland.....	155
Water-lily Aquatic Wetland.....	157
Saline/Alkaline Aquatic Wetland.....	159
Upland Herbaceous Communities.....	161
Upland Tall-grass Prairie.....	161
Dakota Sandstone Tall-grass Prairie.....	163
Lowland Tall-grass Prairie.....	165
Missouri River Valley Dune Grassland.....	167
Missouri River Floodplain Terrace Grassland.....	169
Southern Sand/Gravel Prairie.....	170
Loess Mixed-grass Prairie.....	172
Northern Loess/Shale Bluff Prairie.....	174
Eastern Sand Prairie.....	176
Sandhills Mesic Tall-grass Prairie.....	178
Sandhills Dune Prairie.....	180
Sandhills Dry Valley Prairie.....	183
Sandsage Prairie.....	185
Western Sand Prairie.....	187
Threadleaf Sedge Western Mixed-grass Prairie.....	188
Northwestern Mixed-grass Prairie.....	190
Wheatgrass Western Mixed-grass Prairie.....	193
Great Plains Gravel-Cobble Prairie.....	195
Western Floodplain Terrace Grassland.....	197
Silver Sagebrush Shrub Prairie.....	199
Greasewood Shrub Prairie.....	201
Wetland Sparsely Vegetated Communities.....	202
Perennial Sandbar.....	202
Sandbar/Mudflat.....	204
Upland Sparsely Vegetated Communities.....	205
Eastern Sandstone Bluff and Cliff.....	205
Northern Chalk Bluff and Cliff.....	207
Western Sandstone Cliff.....	209
Rock Outcrop.....	210
Badlands.....	212
Riverine Gravel Flats.....	213
<b>Chapter 4: References.....</b>	<b>216</b>

# CHAPTER 1: INTRODUCTION

Over two decades ago, The Nature Conservancy (TNC) and state natural heritage programs developed the “coarse filter/fine filter” approach to preserving biological diversity (Grossman et al. 1994). This approach involves identification and protection of natural communities (coarse filter) as well as rare species (fine filter). Identifying and protecting representative examples of natural communities ensures conservation of most species, biotic interactions and ecological processes. Those species that “fall through” the community filters are generally the rare species. Identification and protection of viable occurrences of rare species serves as the fine filter for preserving biological diversity. Using communities as a coarse filter assures that conservation efforts are working to protect a more complete spectrum of biological diversity, not just those species whose priority conservation status has been documented. By protecting communities many species not generally targeted for conservation, such as poorly known groups like fungi and invertebrates, are protected. Furthermore, communities are an important tool for systematically characterizing the current pattern and condition of ecosystems and landscapes. The *Terrestrial Ecological Systems and Natural Communities of Nebraska (Version IV)* was developed primarily as a tool to aid in the conservation of biological diversity by providing a systematic classification of the natural communities found in the state.

In some cases, land managers and other conservationists have found natural community classifications too fine-scale and complex for vegetation mapping and other land management projects. In recent years the need for a broader scale ecological classification unit for conservation and resource management efforts on a national and state level became obvious. To fulfill this need, this document, for the first time, includes a classification of the ecological systems of Nebraska (ecological systems are broader scale classification units than natural communities).

## TERRESTRIAL ECOLOGICAL SYSTEM CLASSIFICATION

In 2002, NatureServe and its natural heritage program partners developed an ecological systems classification that includes nearly 600 types for the coterminous United States, southern Alaska and adjacent portions of Mexico and Alaska (Comer 2002 and NatureServe 2007). NatureServe (2008) listed and provided range-wide descriptions for the ecological systems they believed occurred in Nebraska.

For this document, we have refined NatureServe’s ecological systems classification for Nebraska, defined 19 ecological systems for the state and provided system descriptions specific to Nebraska. The following eight system types identified for Nebraska by NatureServe (2008) were not included in the present classification:

- 1) North-Central Interior Maple-Basswood Forest
- 2) Western Great Plains Dry Bur Oak Forest and Woodland
- 3) Western Great Plains Sandhills Steppe
- 4) Western Great Plains Short-Grass Prairie
- 5) Western Great Plains Tall-Grass Prairie
- 6) Western Great Plains Wooded Draw and Ravine
- 7) Northwestern Great Plains Canyon
- 8) Rocky Mountain Lower Montane-Foothill Shrubland

We concluded, based on our field experience and review of the pertinent literature, that some of these types do not occur in Nebraska, others were recircumscribed into other system types.

NatureServe (Comer 2002) defined ecological systems as “a group of plant community types [natural communities] that tend to co-occur within landscapes with similar ecological processes [often fire, grazing, or flooding], substrates, and/or environmental gradients.” An ecological system will typically manifest itself in a landscape at intermediate geographic scales of tens to thousands of hectares and will persist for 50 or more years.

The Nebraska Terrestrial Ecological System Classification includes upland types, wetland types and complexes of wetlands and uplands (riparian systems). Subterranean and riverine systems are not included in this classification. As with the Terrestrial Natural Community Classification, the systems classification deals only with natural or near-natural types - those types that are unmodified or only marginally modified by humans.

## **ECOLOGICAL SYSTEM DESCRIPTIONS**

Descriptions of Nebraska’s ecological systems are provided in this document. The descriptions provide an account of system nomenclature, concept summary, distribution, environment, vegetation, ecological dynamics, and other information. The specific fields included in the descriptions are as follows:

**STATE NAME** - The system name provided by the authors specifically for use in Nebraska is provide in bold at the beginning of each description.

**ELEMENT CODE** – A unique nine digit code given to each system by NatureServe (2007).

**GLOBAL NAME** – The system name provided by NatureServe (2007) in their international systems classification. When the global name is not provided in the description, the global name is the same as the state name.

**CONCEPT SUMMARY:** A summary of the key vegetation, environmental, soil and distribution characteristics on which the system is based.

**DISTRIBUTION** - The Nebraska and range-wide distribution of each system.

**EPA ECORGIONS** – The ecoregion(s), as defined by Chapman et al. (2001), in which a system occurs or potentially occurs in Nebraska.

**COMMUNITIES INCLUDED** – A list of the natural community types that compose the system in Nebraska and a discussion of these communities.

**ENVIRONMENT** - A summary of the environmental conditions known to be associated with the system in Nebraska.

**VEGETATION** – A summary of the system’s vegetation, including physiognomic structure and species composition in Nebraska.

DYNAMICS – A summary of the natural and man-induced disturbances that influence the system in Nebraska.

COMMENTS – Other general comments, mostly with regard to similarity to other systems and classification issues.

## TERRESTRIAL NATURAL COMMUNITY CLASSIFICATION

This document defines and describes 83 natural community types, including 48 upland types and 35 wetland types, for the state. By definition, natural communities consist of reoccurring groups of species that respond similarly to a complex of climatic, soil, topographic, geologic, hydrologic, historical, and other site attributes. The underlying assumption is that vegetation is the best indicator of the environmental features. The communities included in this classification were defined primarily based on their plant composition (existing and not potential vegetation) and to a lesser extent by soils, hydrology, geology, and other site attributes. This classification includes early seral communities (e.g. Willow Sandbar) through late seral communities (e.g. Eastern Riparian Forest). The stream (riverine), lake (lacustrine), and non-native terrestrial communities (e.g. planted grasslands) of Nebraska are not included in this classification.

In the past, an obstacle to using natural communities as conservation units was the lack of a consistent national classification scheme. To overcome this problem, TNC, in conjunction with state heritage programs, developed a standardized hierarchical system to facilitate the identification and classification of vegetated terrestrial communities (Grossman et al. 1994) and published the *U.S. National Vegetation Classification* (Grossman et al. 1998). Anderson and others (1998) provided a list of the classification units for the United States. Faber-Langendoen (1999) published a version of the classification for the midwestern United States, which included Nebraska. In 2001, NatureServe, a nonprofit organization that provides scientific information and tools to help guide conservation, took over responsibilities for maintaining and updating the national vegetation classification from TNC.

The *Terrestrial Ecological Systems and Natural Communities of Nebraska (Version IV)* and all previous versions of this classification have been structured after and have been crosswalked with the *U.S. National Vegetation Classification*. The natural communities defined for Nebraska have been incorporated into the national classification (viewable at [www.natureserve.org](http://www.natureserve.org)), the exception being some newly defined types.

In 1989, the Nebraska Natural Heritage Program (NNHP) first classified and described the terrestrial natural communities of Nebraska (Steinauer 1989). The descriptions were based primarily on information gathered from published and unpublished literature with little field data to verify the classification. The natural communities included in this document were for the most part rather broadly defined and the descriptions somewhat general.

In 1995, the NNHP began conducting extensive field sampling of the natural community types in the state. These data have been used to refine the classification and develop more detailed descriptions of the state's natural community types. Three previous unpublished versions of the *Terrestrial Natural Communities of Nebraska* were produced by the NNHP, Version I in 1997 (Steinauer and Rolfsmeier 1997), Version II in 2000 (Steinauer and Rolfsmeier 2000), and Version III in 2003 (Steinauer and Rolfsmeier 2003), all based on updated information.

The classification of natural community types, or other ecological units, is a somewhat subjective process as the pattern of vegetation on the landscape is rarely found in discrete, easily definable units. For this document we have classified the Nebraska landscape into natural community types (and ecological systems) to the best of our abilities using the knowledge gained from our own fieldwork and from the work of other plant ecologists as described in the literature. Other individuals assigned with the same task would have likely produced a somewhat different classification.

## VEGETATION HIERARCHY

As previously mentioned, the *Terrestrial Natural Communities of Nebraska (Version IV)* is structured on the national community classification hierarchy originally developed by TNC. The top level of the national classification is divided into three “systems”: terrestrial, aquatic, and subterranean. Terrestrial communities are those with rooted vegetation including rooted aquatic vegetation. Aquatic communities are deep, open water communities without rooted vegetation. Subterranean communities are caves (Nebraska has no natural caves). This classification includes only terrestrial communities, which includes those communities commonly referred to as uplands and wetlands.

Wetland communities have the following diagnostic characteristics which are absent in upland communities: 1) vegetation dominated by hydric macrophytes, 2) hydric soils, and 3) periodic or permanent flooding at mean depths of < 2 meters, or soil that is saturated to the surface at some time during the growing season (Cowardin et al. 1979). Wetlands include open water communities lacking hydric macrophytes, but with all of the following characteristics: 1) area < 8 ha (20 ac), 2) lacking active wave-formed or bedrock shoreline features, and 3) water depth in the deepest part of the basin less than 2 m at low water. Many of Nebraska’s natural “lakes” (e.g. Sandhill lakes) fall within the classification parameters of wetlands.

In this document, the natural community types are arranged by the following physiognomic classes: 1) forests and woodlands, 2) shrublands, 3) herbaceous communities, and 4) sparsely vegetated communities. Within each physiognomic class the communities are further arranged by wetland and upland types.

The physiognomic class is determined for each community type by assessing the relative percentage of canopy cover of the plant form (i.e. tree, shrub or herbaceous) comprising the upper most strata. The physiognomic classes are defined as follows:

Forests - Forests are dominated by trees > 5 m tall with generally > 60% canopy cover. The canopies of most forest trees are not widely spreading and are often confined to the upper third of the stem. Two layers of trees are nearly always prominent in forests.

Woodlands - Woodlands have a tree layer >5 m tall with generally 25 to 60% canopy cover. The tree canopy is often discontinuous (clumped). The lower canopy branches are widely spreading, are often visibly longer than in forest trees, and may originate halfway up the stem. Only one layer of trees is usually prominent in woodlands.

Shrublands - Shrublands have a shrub layer < 5 m tall with generally > 25% canopy cover. Tree cover is < 25%.



Herbaceous Communities - Herbaceous communities are dominated by a layer of graminoids and/or other herbaceous plants with a canopy cover > 25%. Tree and shrub cover are both < 25%.

Sparsely Vegetated Communities - Sparsely vegetated communities have a herbaceous cover < 25%. Tree and shrub cover are also both < 25%. Sparsely vegetated communities also have soil that is thin or absent with parent material near or at the surface. In some sparsely vegetated communities (e.g. sandbar/mudflat) the community is maintained indefinitely at an early seral stage by periodic natural disturbance.

The natural communities in this document have been defined at what is generally referred to as the plant association level. To standardize and ensure consistency, the definition of a plant association put forth by the Third International Botanical Congress (Flahault and Schroter 1910) has been adapted for use by NatureServe in their national natural community classification (Grossman et al. 1998) and in this classification. The Botanical Congress defined a plant association as “a plant community of definite floristic composition, presenting a uniform physiognomy, and growing in uniform habitat conditions.” It is necessary to clarify the following points regarding this definition:

- 1) “Habitat” refers to the combination of environmental conditions and ecological processes influencing the community.
- 2) Uniformity of physiognomy and habitat conditions may include patterned heterogeneity (e.g. swale and swell topography in a meadow or vegetation zones in a wetland).
- 3) As a rule, communities reoccur over the landscape.

## NATURAL COMMUNITY NOMENCLATURE

The global names assigned to each natural community type in this document are from NatureServe’s national classification (Anderson et al. 1998). The global names are based on the scientific names of the diagnostic plant species found in the community over its entire range. Some diagnostic species included in the global name do not play a predominant role in the community type in Nebraska’s portion of the communities’ range.

Examples occur where two or more community types within this document share the same global name. For example Eastern Sand Prairie, Sandhills Dry Valley Prairie, and Western Sand Prairie all have the global name *Calamovilfa longifolia* – *Hesperostipa comata* Herbaceous Vegetation. These are cases where the Nebraska community types have been more narrowly defined than the global types and there exists only one global type in which to place the Nebraska types. Some Nebraska community types have listed two or more global names. For example, Lowland Tallgrass Prairie has both *Andropogon gerardii* – *Panicum virgatum* – *Helianthus grosseserratus* Herbaceous Vegetation and *A. gerardii* – *Sorghastrum nutans* – (*Sporobolus heterolepis*) – *Liatris* spp. – *Ratibida pinnata* Herbaceous Vegetation listed as global names. In these cases, Nebraska’s definition of the community appears to encompass more than one global community type so all pertinent global names are listed. There are also instances, where no global name is provided for the Nebraska community type (e.g. Missouri

River Floodplain Terrace Grassland). These are cases where NatureServe has not yet designated a global name for the community type or the equivalent global community cannot be determined.

Within the global names, plant species that occur in the same vegetation strata (e.g. canopy, subcanopy, shrub or herbaceous layer) are separated by the “-“ symbol and those species that occur in different strata of the vegetation are separated by the “/” symbol (e.g. *Fraxinus pennsylvanica* – *Ulmus americana* / *Ostrya virginiana* Canyon Woodland). In some cases the diagnostic species were unknown or in question and environmental modifiers or broad vegetation or geographic modifiers are used as placeholders until the diagnostic species become known with more certainty (e.g. *Pascopyrum smithii* – *Stipa comata* Central Mixedgrass Herbaceous Vegetation). There are situations where the diagnostic species may not be found within every occurrence of a community. When this occurs on a range-wide perspective, the species is placed within parentheses in the global name (e.g. *Schizachryium scoparium* – *Bouteloua curtipendula* – *Bouteloua hirsuta* – (*Yucca glauca*) Herbaceous Vegetation). NatureServe has documented some communities that contain two diagnostic species, but neither of the diagnostic species is consistently present in all occurrences. In this situation, both of the diagnostic species names are put in parentheses, for example, (*Cornus drummondii*) – (*Rhus glabra*, *Prunus* spp.) Shrubland.

State names for the community types (those in bold at the top of the descriptions) are based on the most characteristic biotic or abiotic features of the community type in Nebraska (e.g. Upland Tallgrass Prairie and Western Alkaline Marsh). State names are comparable to common names for plant species and are designed for more general use.

## NATURAL COMMUNITY RANKING

The natural community types included in this classification have been ranked on a scale of 1 to 5 according to their relative rarity and endangerment on a state (state rank) and range-wide (global rank) perspective. The NNHP assigned the state ranks and NatureServe assigned the global ranks. The two major criteria that determine the ranks (state and global) are the total number of occurrences and the total area (acreage) of the community type on a Nebraska and range-wide perspective. Measures of geographic range, trends in status (expanding or shrinking range or number of occurrences) and condition of remaining occurrences, threats, and fragility are secondary factors that were considered in the ranking process.

The ranking system is intended to help set conservation priorities, whereby more endangered community types are considered higher priority for conservation efforts. However, it should be recognized that for the coarse filter approach to conservation to be effective, representative examples of all community types need to be conserved.

Although the ranking methods are standardized, applying conservation ranks to communities is nonetheless a somewhat subjective process. The relative importance of and amount of information available for ranking each community type varies. Ranks are assigned based on the best available information and have been refined over time. The ranking procedure provides a reasonable estimate of the community rarity and threat, although some degree of error is inherent in the ranking process. The definitions of state and global ranks are as follows:

### State Ranks

S1 = Critically imperiled in the state - at very high risk of extirpation or elimination due to extreme rarity (often 5 or fewer occurrences), very steep declines, or other factors.

S2 = Imperiled in the state - at high risk of extirpation or elimination due to very restricted range, very few occurrences, steep declines, or other factors.

S3 = Vulnerable in the state - at moderate risk of extirpation or elimination due to a restricted range, relatively few occurrences, recent and widespread declines, or other factors.

S4 = Apparently secure in the state - uncommon but not rare, some cause for long-term concern due to declines or other factors.

S5 = Secure in the state – common, widespread and abundant.

S#? = Small degree of uncertainty about the rank in the state.

S#S# = A numeric range rank (e.g. S1S3, S1S3) is used to indicate a larger range of uncertainty about the exact status of a natural community type in the state.

### Global Ranks

G1 = Critically imperiled at range-wide level - at very high risk of extinction or elimination due to extreme rarity (often 5 or fewer occurrences), very steep declines, or other factors.

G2 = Imperiled at a range-wide level - at high risk of extinction or elimination due to very restricted range, very few occurrences, steep declines, or other factors.

G3 = Vulnerable at a range-wide level - at moderate risk of extinction or elimination due to a restricted range, relatively few occurrences, recent and widespread declines, or other factors.

G4 = Apparently secure at a range-wide level - uncommon but not rare, some cause for long-term concern due to declines or other factors.

G5 = Secure at a range-wide level – common, widespread and abundant.

G#G# = A numeric range rank (e.g., G2G3, G1G3) is used to indicate a range of uncertainty about the exact status of a natural community type.

GNR = Unrankable, meaning that an evaluation has been attempted, but information was insufficient to make a determination.

G? = Unranked, meaning no evaluation has been attempted.

## NATURAL COMMUNITY DESCRIPTIONS

A description of each community type is included in this document. The descriptions provide an account of community nomenclature, classification information, environment, vegetation structure and composition, ranking information and other pertinent information. Specific fields included in the descriptions are as follows:

**STATE NAME** - The community name provided by the authors specifically for use in Nebraska is provide in bold at the beginning of each description.

**ELEMENT CODE** – A unique ten digit code given to each community type by NatureServe.

**GLOBAL NAME** – Global name given by NatureServe. The symbols “=”, “>” or “<” have been placed prior to the global names to show thier relationship to the state community type. A “=” indicates that the state community type and global community type are nearly equivalent in definition. A “>” indicates that the state community type is more broadly defined than the global type. A “<” indicates the state community type is more narrowly defined than the global type.

**OTHER NAMES** – Synonyms for the community type used in previous versions of this document or other publications. The “=”, “>” and “<” symbols placed prior to the community names indicate the same relationship to the state community type as defined for the global name field.

**SYSTEM PLACEMENT** – The ecological system(s) in which the natural community type occurs.

**RANGE** – Description of the communities’ Nebraska distribution.

**EPA ECOREGIONS** – Ecoregions, as defined by (Chapman et al. 2001), in which the community occurs or may possibly occur in Nebraska.

**ENVIRONMENTAL DESCRIPTION** – Summary of environmental conditions known to be associated with the natural community in Nebraska.

**COWARDWIN WETLAND SYSTEM** – If the community is a wetland, its “System” type from the USFWS Wetland Classification (Cowardin et al. 1979).

**MOST ABUNDANT SPECIES** – The consistently most abundant plant species (in terms of percentage cover) that occur in the community. The species are listed by strata.

**DIAGNOSTIC SPECIES** – Key plant species with high constancy that are used to classify the type. These may include dominant, differential, or characteristic species.

**VEGETATION DESCRIPTION** – A summary of the communities’ vegetation including physiognomic structure and species composition.

**OTHER NOTEWORTHY SPECIES** - The plant species of possible conservation concern (e.g. rare, endemic, or disjunct) that occur in the community.

**STATE RANK** – Rank of the communities’ relative rarity and endangerment in the state.

**RANK JUSTIFICATION** – Reasons for assigning the state rank.

**INVASIVE SPECIES OF CONCERN:** A listing of the key invasive species that occur or potentially could occur in the community.

**GLOBAL RANK** – Rank of the communities’ relative rarity and endangerment throughout its entire range.

**COMMENTS** – This field includes any other comments about the community, including seral state, prominent disturbances, similarity to other communities, and difficulties in classification.

**EXEMPLARY SITES** – Occurrences of the community type in the state in good ecological condition.

# CHAPTER 2: ECOLOGICAL SYSTEMS OF NEBRASKA

## UPLAND FOREST, WOODLAND, AND SHRUBLAND SYSTEMS

### EASTERN UPLAND OAK BLUFF FOREST

ELEMENT CODE: CES202.046, CES202.696

GLOBAL NAMES: <North-Central Interior Dry-Mesic Oak Forest and Woodland, =?North-Central Interior Maple-Basswood Forest

CONCEPT SUMMARY: This ecosystem represents the western fringe of the once vast eastern deciduous oak-hickory forest of North America. In Nebraska it occurs primarily on the steep loess bluffs of the Missouri and lower Platte river valleys and to a lesser extent in the loess-mantled glacial till hills of the Nemaha River drainage in the southeast. It includes our upland deciduous forest communities with a moderately dense to dense canopy of oaks with lesser amounts of hickory on upper slopes, and basswood co-dominant on lower slopes. Ironwood is the most abundant subcanopy tree in most situations. This system reaches the western edge of its geographic range in Nebraska and is rather species rich by Plains standards, containing many eastern species that reach the western edge of their ranges. Historic descriptions suggest many of these areas were predominately closed canopy forest prior to the 20<sup>th</sup> century, especially on the lower bluff slopes. Early quadrat studies (Pool *et al.* 1918) suggest that the forest in southeast Nebraska consisted of four intergrading successional stages: a mesic basswood (*Tilia americana*) – ironwood zone on the lowest slopes with a slightly less mesophytic red oak (*Quercus rubra*) zone along its upper margin; an intermediate black oak (*Q. velutina*) – hickory (*Carya cordiformis*, *C. ovata*) zone; and a dry-mesic bur oak (*Q. macrocarpa*) – chinkapin oak (*Q. muhlenbergii*) zone on the uppermost slopes. The more mesophytic basswood – ironwood and red oak stages appear to have expanded upslope at many sites, displacing black oaks and hickories following logging and fire suppression.

DISTRIBUTION: In Nebraska, this system occurs mostly on loess bluffs associated with the Missouri River from eastern Knox County downstream. It also extends westward along the south side of the Platte River to Saunders County and occurs sporadically westward in the Nemaha River drainage of Richardson and eastern Pawnee counties. Outside the state, it extends south into eastern Kansas, eastward to Illinois and Missouri, and northward to Minnesota and Wisconsin.

EPA ECOREGIONS: 47h, 47i, 47k

#### COMMUNITIES INCLUDED:

- Red Oak–Basswood–Ironwood Forest
- Oak–Hickory–Ironwood Forest
- Bur Oak–Basswood–Ironwood Forest

Although historical accounts detail a number of seemingly clearly separable deciduous forest communities occurring in the state, years of logging, fire suppression and other disturbances have tended to replace our native forests with more homogenous secondary growth forests in which communities are not so easily separated. The most mesic footslopes of bluffs are commonly now dominated by mesophytic deciduous trees such as hackberry (*Celtis occidentalis*) and black walnut (*Juglans nigra*), that were formerly included in the "Lowland Hackberry–Black Walnut Forest" community in the 3<sup>rd</sup> edition of this classification. These sites are currently considered a "degraded" state of the basswood-ironwood forest that presumably once existed there. A mesophytic black oak–shagbark hickory community was once known to occur as a transitional community between the more mesic red oak–basswood–ironwood forest and the drier bur oak–chinkapin oak–bitternut hickory upland forest. It has apparently been eliminated and has now occupied by the mesic forest types which have spread upslope in the absence of fire. Presently, both red oak and ironwood are often common in dry-mesic bluff forest, often making it difficult to delineate these two communities. If desired for mapping purposes, one may combine the two into a more broadly defined "southeastern upland forest" type, as was done in the second edition of this classification. Forests in the Niobrara River valley that were formerly included in a broad concept of "northeastern upland forest" are now treated in a different system.

**ENVIRONMENT:** This system occurs in glaciated areas on mesic to dry-mesic, well-drained to moderately well-drained, deep silt loams formed primarily in loess (less frequently on sandy loams and clay loams formed in glacial till or on weathered limestone). It occurs on gentle to relatively steep bluff and valley slopes, draws, and to a limited extent in bottoms and is best-developed on north and east-facing slopes.

**VEGETATION:** This system is dominated by oaks (*Quercus macrocarpa*, *Q. muhlenbergii*, *Q. rubra*, *Q. velutina*) sometimes sharing dominance with hickories (*Carya cordiformis*, *C. ovata*) in a moderate to dense canopy on upper slopes, or with basswood (*Tilia americana*) in a dense canopy on lower slopes. Ironwood (*Ostrya virginiana*) is the dominant subcanopy tree, and several understory layers of shade-tolerant shrubs, vines, ferns, and perennial herbs are usually present. The herbaceous understory is often fairly species rich, with numerous shade-tolerant sedges and grasses, ephemeral spring herbs, ferns, mosses, and fungi, including many that reach the western edge of their geographic range.

**DYNAMICS:** Windthrow and tree death may occasionally open gaps in this community. Fire is rare and has a limited impact at present. Prior to settlement low to moderate intensity ground fires were likely common in the dry-mesic communities within this system. These fires kept canopies somewhat open and limited the spread of fire-intolerant trees and shrubs. Fire suppression since settlement has allowed fire-sensitive trees and shrubs to increase their range and density in the system, which has impacted oak regeneration. Other impacts to this system are agricultural conversion, logging, prolonged heavy livestock grazing, deer overbrowsing, and spread of invasive species. The most serious invasive is garlic mustard (*Alliaria petiolata*), with Amur honeysuckle (*Lonicera maackii*), common buckthorn (*Rhamnus cathartica*) and multiflora rose (*Rosa multiflora*) becoming abundant in more disturbed sites. Other likely or potential invasives include tree-of-heaven (*Ailanthus altissima*), common burdock (*Arctium minus*), Japanese barberry (*Berberis thunbergii*), ground-ivy (*Glechoma hederacea*), dame's-rocket

(*Hesperis matronalis*), border privet (*Ligustrum obtusifolium*), Tatarian honeysuckle (*Lonicera xbella*), ivy-leaved speedwell (*Veronica hederifolia*), winged spindle tree (*Euonymus alatus*), wintercreeper (*Euonymus hederaceus*), Japanese honeysuckle (*Lonicera japonica*), highbush cranberry (*Viburnum opulus*) and Oriental bittersweet (*Celastrus orbiculatus*).

COMMENTS: We have defined this system to encompass areas that contained extensive pre-settlement upland deciduous forest that included a basswood-ironwood forest zone on mesic lower slopes and an oak (or oak-hickory) forest zone adjacent on dry-mesic middle and upper slopes. The National Vegetation Classification includes the basswood-ironwood and red oak zones in the North-Central Interior Maple-Basswood Forest system, in spite of the absence of sugar maple (*Acer saccharum*) from Nebraska. The remaining upland oak-hickory zones are included in the North-Central Interior Dry-Mesic Oak Forest and Woodland system. Many early studies by Nebraska botanists considered red oak to be a component of the upland dry-mesic oak-hickory forest communities. Pool *et al.* (1918) noted the basswood-ironwood community always occurring adjacent to either a red oak or red oak-shagbark hickory (*Carya ovata*) community upslope, and scarcely intergrading with it. Pound & Clements (1900) described a red oak – shagbark hickory forest community in great detail, but do not mention the presence of a basswood – ironwood stage, though they refer to ironwood as an 'infrequent invader' of the red oak – shagbark hickory forest, and fail to mention the presence of basswood in it at all. Given that the basswood – ironwood component of this community seems to occur independent of the upslope phases and extends upstream far beyond the range of red oak, it appears there is ample justification not to split the red oak-basswood-ironwood component into a separate system, and to suggest the most mesic components of the system at best represent an intermediate stage between the maple-basswood and oak-hickory systems.

Early quadrat studies (Pool *et al.* 1918) suggested that ironwood was originally restricted to the lowermost slopes in association with basswood, though at present it represents the dominant understory of most upland forest communities in this system as well. Black oak and hickories appear to have declined from historic levels.

## **EASTERN DRY-MESIC BUR OAK FOREST AND WOODLAND**

ELEMENT CODE: CES202.046

GLOBAL NAME: <North-Central Interior Dry-Mesic Oak Forest and Woodland

CONCEPT SUMMARY: This ecosystem and the Eastern Upland Oak Bluff Forest System represent the western flanks of the oak-hickory forest biome of eastern North America. In Nebraska, species diversity and the numbers of dominant trees decline gradually upstream along the Missouri River, and relatively quickly westward from the Missouri River valley. The Eastern Dry-Mesic Bur Oak Forest and Woodland System includes upland deciduous wooded communities that are dominated by bur oak (*Quercus macrocarpa*), occasionally sharing dominance with mesophytic trees such as basswood (*Tilia americana*), hackberry (*Celtis occidentalis*) and historically American elm (*Ulmus americana*) in more mesic sites. These areas tend to be more homogeneous and show less zonation than the bluff forest of the Missouri valley, possibly because they tend to occur in relatively shallow draws and valleys that



historically received less protection from fire. These sites were likely a mixture of open canopy oak woodland with embedded patches of closed canopy forest in the most protected ravines or at bases of steep bluffs or in areas protected from fire by stream meanders. Historical maps (Aikman 1929) suggest it was once rather extensive in eastern Nebraska and has probably declined due to clearing of bur oak from most of the mesic stream-bottoms in eastern Nebraska. Existing patches of upland oak woods may have expanded in extent somewhat due to fire suppression, but the vast majority has changed in structure and in abundance of dominant species as a result of succession. Extant stands tend to have denser canopies and more vertical complexity due to invasion by fire-sensitive mesophytic trees.

**DISTRIBUTION:** In Nebraska, this system occurs primarily in glaciated areas in the eastern fourth of the state, primarily along larger tributaries of the Missouri River, though it may also be associated with dissected topography along smaller streams in the loess and glacial drift hills in the southeast part of the state. It may occur on the bluffs of the Missouri River valley, primarily on south and west-facing bluff slopes. It occurs as isolated patches westward into loess-mantled areas in central and east-central Nebraska, primarily along the Big and Little Blue rivers, Platte and Loup river systems and the lower Republican River. The global system of which it is part was historically most widespread in the upper Midwest from Minnesota and Iowa eastward to Michigan and Indiana, with less extensive occurrences west to Nebraska and the eastern Dakotas, and east to Ohio.

**EPA ECOREGIONS:** 27, 42, 47

**COMMUNITIES INCLUDED:**

- Dry-Mesic Bur Oak Forest and Woodland
- Mesic Bur Oak Forest and Woodland

This system encompasses most of the bur oak-dominated forest in eastern Nebraska and is separated into two communities: upland oak forest on slopes of ravines, and lowland oak forest in bottomland along streams. The communities tend to be very similar, except that the lowland community has a more pronounced mesophytic tree component in the canopy and subcanopy, and often includes understory species typical of riparian forest in addition to upland forest species. In Nebraska, the upland community is far more common, and the two communities rarely, if ever co-occur. Westward, the upland community grades into the Dry Upland Bur Oak Woodland community of the Great Plains.

**ENVIRONMENT:** This system occurs primarily in glaciated areas and loess-mantled unglaciated plains on dry to mesic, moderately well-drained loams formed primarily in loess. It occurs on gentle to moderately valley slopes, draws, and to a limited extent in bottoms of varying aspect, though westward it is usually restricted to north or east-facing slopes and river bottoms.

**VEGETATION:** Fire-resistant drought-tolerant trees dominate the open to closed canopy, with bur oak (*Quercus macrocarpa*) found consistently in this system throughout, where it is often the sole canopy tree, especially westward along the eastern fringes of the unglaciated plains. In glaciated areas, bitternut hickory (*Carya cordiformis*) may also occur in the canopy south of the

Platte River, but is never common. Basswood (*Tilia americana*) may be a scattered to abundant canopy tree northward. Historically, most sites were probably open woodland with imbedded patches of closed canopy forest in protected draws and on lower slopes, with fire suppression allowing many sites to succeed to forested conditions. On moderate north and east-facing slopes and in bottoms, mesophytic trees, especially hackberry (*Celtis occidentalis*), may become important constituents of the subcanopy or even invade the canopy in the absence of fire. Woodland may persist on south and west-facing slopes, but is often invaded by scattered eastern red cedar (*Juniperus virginiana*) and saplings of mesophytic deciduous trees in the gaps between the canopy trees. Various shrubs are often important, including rough-leaf dogwood (*Cornus drummondii*), wolfberry (*Symphoricarpos occidentalis*), coralberry (*S. orbiculatus*), and prickly ash (*Zanthoxylum americanum*). Herbaceous understory varies from species poor to quite rich, with a ground layer of perennial sedges, grasses, herbaceous flowering plants and ferns in closed-canopy communities or of shade-tolerant grasses and shrubs in drier, more open situations.

**DYNAMICS:** Fire is a primary historical factor in this system, and likely maintained a more open canopy structure that could support oak regeneration. In the absence of fire, many open-canopy woodlands have become closed-canopy forests, in large part due to invasion by mesophytic trees. In addition, logging may allow fast-growing mesophytic trees to displace most or nearly all oaks in the canopy, particularly in mesic sites. Much of the original extent of this system has been fragmented by agricultural conversion. Heavy grazing and continued fire suppression limit oak regeneration. In mesic sites, deer overbrowsing may be a serious problem, along with the spread of invasive species, particularly garlic mustard (*Alliaria petiolata*) and Amur honeysuckle (*Lonicera maackii*), with common buckthorn (*Rhamnus cathartica*) and multiflora rose (*Rosa multiflora*) possible in disturbed mesic sites. Other likely or potential invasives include tree-of-heaven (*Ailanthus altissima*), common burdock (*Arctium minus*), Japanese barberry (*Berberis thunbergii*), ground-ivy (*Glechoma hederacea*), dame's-rocket (*Hesperis matronalis*), border privet (*Ligustrum obtusifolium*), Tatarian honeysuckle (*Lonicera xbella*), ivy-leaved speedwell (*Veronica hederifolia*), winged spindletree (*Euonymus alatus*), wintercreeper (*Euonymus hederaceus*), Japanese honeysuckle (*Lonicera japonica*), highbush cranberry (*Viburnum opulus*) and Oriental bittersweet (*Celastrus orbiculatus*).

**COMMENTS:** This system is defined to accommodate primarily bur oak dominated upland forest with understory dominated by plants typical of forest. Historic records suggest the majority of such communities were narrow bands of gallery forest occurring in moist draws and along stream courses, though some undoubtedly also occurred on slopes of larger draws within these watersheds. The two communities recognized here accommodate bur oak forests found in the floodplain of water courses (mesic bur oak forest) and on upland bluffs (dry-mesic bur oak forest). These communities are included in the North-Central Interior Dry-Mesic Forest and Woodland system of NatureServe along with the dry-mesic components of the Eastern Upland Oak Bluff Forest system.

Historical reports suggest that American elm may have been an important canopy constituent in the gallery forest, but has since been relegated to a minor subcanopy tree due to Dutch elm disease (Rolfmeier 2007). Many historical reports also comment on the abundance of plums, cherries and vines, suggesting that the gaps in the wooded canopy may have been

dominated by shrubland, rather than grassland vegetation, particularly along river courses where fires would have been of lower intensity and/or less frequent.

## **GREAT PLAINS DRY UPLAND BUR OAK WOODLAND**

ELEMENT CODE: CES303.667

GLOBAL NAME: >Western Great Plains Dry Bur Oak Forest and Woodland

CONCEPT SUMMARY: This ecosystem includes the bur oak (*Quercus macrocarpa*) dominated upland woods of bluffs and ravines, primarily in the mixed-grass prairie environment of central and northern Nebraska. These woodlands tend to occur on relatively well-drained upland sites and usually maintain an open canopy cover even in the absence of fire. In most sites, eastern red cedar (*Juniperus virginiana*) has filled in the gaps between and beneath the canopy trees and has replaced the native understory vegetation. These bur oak woodlands occur primarily on sandy to loamy soils formed in bedrock or rarely on eolian sands, though some may be present on silt loams in the central Nebraska Loess Hills. The historic extent of this system is poorly known as there are few descriptions of examples in the older literature. It is most extensive in the Niobrara River drainage from northeastern Cherry County to near the river's mouth. Smaller examples are known locally in the Smoky Hills of southeast Nebraska and along the Elkhorn River in northeast Nebraska, and others are likely in the canyons of central and southwest Nebraska.

DISTRIBUTION: In Nebraska, this system occurs primarily in unglaciated mixed-grass plains in central and north-central Nebraska from near the mouth of the Niobrara River in northwestern Knox County westward to northeastern Cherry County, with bur oak reported as far west on the Niobrara as the mouth of the Snake River. It likely also occurs on steep canyon slopes in the Loess Hills of Custer County southwestward to Hitchcock County. Smaller examples are known from the Little Blue River drainage in Jefferson County, along the Elkhorn River in Stanton County, and along Beaver Creek in Boone County, Nebraska.

EPA ECOREGIONS: 27, 42, 44, 47 (rarely).

COMMUNITIES INCLUDED:

- Sandstone Upland Bur Oak Woodland
- Dry Upland Bur Oak Woodland

This system includes areas of bur oak dominated woodland occurring on upland slopes on sandy or well-drained silty soils in which neither a deciduous subcanopy or forest understory is well-represented. These sites are typically in a mixed-grass prairie environment, or in very well-drained sandy or rocky areas in a tall-grass prairie environment. Historical reports suggest many of these sites contained scrubby scattered bur oak and shrubs near the turn of the 20<sup>th</sup> Century, and have since matured into woodlands of moderately large spreading crowned bur oaks, usually with eastern red cedar filling the gaps between trees as a moderate to dense

"subcanopy". In the lower Niobrara River valley, such sites may grade into Dry-Mesic Bur Oak Forest and Woodland.

At present two communities are recognized: one restricted to the Little Blue River drainage in southeast Nebraska and the other widespread in north-central Nebraska and elsewhere. Oak woodlands in central and south-central Nebraska are tentatively included with the northern woodlands in the Dry Upland Bur Oak Woodland community, as are the oak-wooded sand dunes of the Elkhorn River in northeast Nebraska. Where this community occurs in association with forest (such as in the canyons of the lower Niobrara), both may be recognized together as Dry-Mesic Bur Oak Forest and Woodland if desired. The Sandstone Upland Bur Oak Woodland of southeastern Nebraska is mostly confined to the Dakota Sandstone-derived soils of the Smoky Hills in the escarpments of the Rose Creek drainage.

**ENVIRONMENT:** This system occurs primarily in the unglaciated Great Plains on dry to dry-mesic moderately well-drained sandy loams and loams, formed either in Tertiary or Cretaceous sandstones, eolian sand, or loess. It occurs on moderate valley slopes, draws, and occasional lower slopes, primarily of northern or eastern aspect. It is usually associated with slopes of river bluffs or sides of ravines.

**VEGETATION:** Fire-resistant drought-tolerant trees dominate the open to somewhat closed canopy, with bur oak (*Quercus macrocarpa*) dominant in this system throughout. Little of the associated vegetation has been recorded, though most observed sites have an abundance of eastern red cedar (*Juniperus virginiana*), and probably some scattered green ash (*Fraxinus pennsylvanica*) forming a thin to dense subcanopy. Grassland and shade-tolerant plants are usually found in the understory, and a nearly pure woodland understory may be present on some protected sites in the Niobrara River valley. Where cedars are abundant, the understory may be sparse to nearly absent, though some ferns and a few grasses may persist under the cedars. Although it is likely that the presence of this system predates Euro-American settlement, little is known of its historical extent and structure in Nebraska. Pound & Clements (1900) and Pool (1914) indicate that west of the confluence of the Niobrara and Missouri rivers that bur oak becomes less abundant and more diminutive or scrubby and that some mesophytic trees associated with the eastern dry-mesic bur oak woodland and forest system are similarly dwarfed or drop out entirely (though some reappear in canyons westward). Pool describes the presence of scattered scrubby bur oak in open shrub thickets along the Niobrara, and it is possible some of these sites have succeeded to open woodland. However, Bates (1894) mentions the presence of (sometimes large) bur oaks on lower and upper slopes along the river west to the mouth of the Snake River, suggesting better-developed oak woodland was present on loamy soils of protected slopes.

**DYNAMICS:** Fire is a primary historical factor in this system, and frequent low-intensity ground fires likely maintained an open canopy structure that could support oak regeneration. In the absence of fire, many open-canopy woodlands have become infested with eastern red cedar, which probably was a significant part of presettlement woods, though not in the abundance which it presently occurs. Wind and ice storms, lightning, bison grazing and insect outbreaks likely affected community structure historically. In addition to fire suppression, excessive logging (which was probably extensive in this area in the late 19<sup>th</sup> Century) cattle grazing and invasive species have contributed to degradation of most sites. Invasive and likely invasive

plants in this system include smooth brome (*Bromus inermis*), leafy spurge (*Euphorbia esula*), Kentucky bluegrass (*Poa pratensis*), common burdock (*Arctium minus*), poison hemlock (*Conium maculatum*), dame's rocket (*Hesperis matronalis*), and Siberian elm (*Ulmus pumila*).

COMMENTS: Although it is very likely that parts of this system may have existed as bur oak openings ("savannah") prior to fire suppression, there is also historical evidence that shrubs were an important part of this community and that many sites may have consisted of large shrub patches with occasional small to large fire-resistant trees and patches of grassland. Eastern red cedar is described as common to co-dominant in many ravines in northern Nebraska in historical literature, and was probably limited to large trees with little regeneration due to frequent low-intensity fire. Anecdotal reports from the Smoky Hills in Kansas suggest that eastern red cedar was historically quite rare, probably due to higher fire intensity in tall-grass prairie, and it was probably limited to occasional small trees of rocky bluffs in southeast Nebraska. Sites associated with sand dunes on the south side of the Elkhorn River valley may have had a similarly low abundance of cedar, but no historical data are known at present.

The global system name is intended to encompass oak-dominated communities occurring within the range of ponderosa pine dominated forest and woodland, but we use it here to encompass open oak woodland of the Great Plains outside the native range of pine.

## **GREAT PLAINS WOODED DRAW, RAVINE AND CANYON**

ELEMENT CODE: CES303.680, CES303.658

GLOBAL NAME: >Western Great Plains Wooded Draw and Ravine, >Northwestern Great Plains Canyon

CONCEPT SUMMARY: This ecosystem is usually present as a linear or small patch occurrence on steep north-facing bluff slopes and in draws, ravines, and canyon slopes and bottoms associated with permanent or ephemeral streams. It is commonly associated with the Northwestern Great Plains Ponderosa Pine Woodland System, and less frequently with the Great Plains Dry Upland Bur Oak Woodland System. In Nebraska, this system contains forest, woodland and shrubland communities, and is distinguishable in that it contains most of the woody communities of uplands in the western two-thirds of Nebraska that are not included in the aforementioned systems. The two forested communities are limited to springbranch canyons of the central Niobrara River valley that are dominated by northern and eastern trees including paper birch (*Betula papyrifera*) or basswood (*Tilia americana*) with a subcanopy of ironwood (*Ostrya virginiana*). Bur oak (*Quercus macrocarpa*) is often present in these communities, but apparently did not share dominance with birch or basswood historically (and rarely at present). Woodland communities are found on slopes of ravines, where eastern red cedar (*Juniperus virginiana*) is usually common among a scattered to moderate canopy of deciduous trees, most commonly green ash (*Fraxinus pennsylvanica*). In canyon bottoms and protected pockets in uplands, mesophytic deciduous trees and shrubs including American elm (*Ulmus americana*), hackberry (*Celtis occidentalis*), green ash and box-elder (*Acer negundo*) may be common. In the Sandhills, small "pockets" of hackberry and other deciduous trees found in sheltered sites in uplands can be considered part of this system as well. In the Panhandle, Rocky Mountain juniper

(*Juniperus scopulorum*) may sometimes form small, linear woodland patches in upland draws and ravines.

The shrub communities of this system are small-patch types composed of species common in the Great Plains, with wolfberry (*Symphoricarpos occidentalis*) the most frequently encountered, while skunkbrush sumac (*Rhus aromatica* var. *trilobata*), buffaloberry (*Shepherdia argentea*), chokecherry (*Prunus virginiana*) and wild plum (*P. americana*) are locally common in some parts of the state. Mountain mahogany (*Cercocarpus montanus*) comprises a small-patch shrubland community typical of the Rocky Mountains and is found extensively in the Wildcat Hills and Cheyenne Hills, and to a limited extent on the Nebraska Pine Ridge.

Historical descriptions indicate these woody communities existed along river bluffs and in deep canyons in central and western Nebraska in the 19<sup>th</sup> Century, and their presence in the Sandhills led early botanists to assume they were formerly forested (Webber 1890b). These woody communities owe their survival to the protection accorded them from fire by topography and soil moisture. In most cases, these sites were logged intensively following settlement and have regenerated from seed and stump sprouts. With fire suppression, red cedars have moved into the uplands a considerable distance beyond their historic extent. The full extent of and distribution of many of the constituent communities (especially the shrublands) in this system is poorly known.

**DISTRIBUTION:** In Nebraska, this system occurs primarily in unglaciated mixed-grass plains in the northern reaches of central and western Nebraska, particularly along the Niobrara, Dismal and Middle Loup rivers in north-central Nebraska, and in the North Platte, White River, and Pumpkin Creek drainages in the Panhandle. Both global systems are mostly limited to the northern Great Plains, with the Northwestern Great Plains Canyon system of comparatively limited distribution from Nebraska north to the Black Hills.

**EPA ECOREGIONS:** 25, 27, 42?, 43h, 43r, 44, 47 (rarely)

**COMMUNITIES INCLUDED:**

- Paper Birch Springbranch Canyon Forest
- Basswood–Ironwood Springbranch Canyon Forest
- Green Ash–Elm–Hackberry Canyon Bottom Woodland
- Green Ash–Eastern Red Cedar Scarp Woodland
- Rocky Mountain Juniper Woodland
- Buckbrush Shrubland
- Buffaloberry Shrubland
- Skunkbrush Sumac Shrubland
- Chokecherry-Plum Shrub Thicket
- Mountain Mahogany Shrubland

The two forest communities are limited to the central Niobrara River valley and are often associated with pine or bur oak-dominated communities or other woodlands and shrublands in the system. Mountain mahogany is limited to the Pine Ridge, Wildcat Hills and Pumpkin Creek drainage in the Panhandle, usually in association with pines. Rocky Mountain Juniper Woodland is limited to the Panhandle, but eastward may grade into the Green Ash–Eastern Red Cedar

Scarp Woodland, as the two species of red-cedar intergrade from Sheridan to Keith counties. The remaining communities are apparently more widespread, though Skunkbrush Sumac Shrubland is thus far known only from the Pine Ridge. Since eastern red cedar has spread far beyond its preEuroAmerican settlement range, many areas dominated by *Juniperus virginiana* represent degraded prairie or shrubland communities. Red cedar is often particularly dense in the vicinity of areas known historically to have contained native stands, though it is not always possible to distinguish this community from degraded phases of other communities. Deciduous canyon-bottom woodland is usually fairly distinctive, but may grade into riparian woodland in places. The shrub communities included here are those for which there is evidence to suggest a natural origin (including historic descriptions).

**ENVIRONMENT:** This system occurs primarily in the unglaciated Great Plains on well-drained upland slopes in springbranch and dry, deep canyons, ravines, and draws on well-drained to somewhat poorly drained sandy loams and loams, formed primarily in Tertiary sandstones, eolian sand or loess. It occurs on steep valley slopes, draws, lower slopes and low terraces, primarily of northern aspect. It is usually associated ephemeral or permanent stream valleys.

**VEGETATION:** In cool, wet springbranch canyons on the central Niobrara River, paper birch may be found occasionally with quaking aspen (*Populus tremuloides*). Basswood and ironwood may also occur with these northern species, or may occupy lower canyon slopes in association with bur oak (*Quercus macrocarpa*), green ash (*Fraxinus pennsylvanica*), and eastern red cedar (*Juniperus virginiana*), with other scattered mesophytic deciduous trees. Paper birch and quaking aspen also occur to a very limited extent in the Pine Ridge, but never in association with basswood and ironwood, neither of which occurs there (despite persistent reports). The most common woodland phase of this system is dominated by a mix of deciduous trees and eastern red cedar, with green ash often the most abundant deciduous tree of most sites, frequently occurring with box-elder, American elm and sometimes hackberry. The canopy layer is usually somewhat open and a deciduous subcanopy is usually poorly developed or absent, with eastern red cedar filling the gaps, especially in degraded sites. A shrub layer is usually present and consists of scattered patches of wild plum (*Prunus americana*), chokecherry (*P. virginiana*), buffalo currant (*Ribes odoratum*), wolfberry (*Symphoricarpos occidentalis*) and western poison ivy (*Toxicodendron rydbergii*). In openings away from the woods, skunkbrush sumac (*Rhus aromatica* var. *trilobata*) and buffaloberry (*Shepherdia argentea*) may additionally be present. Several of these species may be part of isolated to extensive shrub patches which may occur as near monocultures or mixed shrub stands. A herbaceous layer of grassland and woodland plants occurs, with littleseed ricegrass (*Piptatherum micranthum*) often locally common under junipers on steep slopes, along with scattered ferns, shade-tolerant grasses and occasional woodland species such as wood strawberry (*Fragaria vesca*) and others. The mesic canyon bottom woodlands may be rich in woodland and even forest species, especially at the bases of protected canyon slopes where the deciduous trees come in contact with pine forest. For this reason, the canyon bottom types in the Pine Ridge have received much more attention from botanists, whereas the other types (especially upland phases) are poorly studied. Much of the description here is based on historic observations made along the Dismal River (Webber 1889, 1890a, b).

**DYNAMICS:** By and large this community likely owed its existence to the protection from fire on the steep slopes, though it is likely that low intensity ground fires were not uncommon. Wind

and ice storms, lightning, bison grazing and insect outbreaks likely affected community structure historically. At present in the absence of frequent fire, the red-cedars have moved from protected slopes onto uplands and open floodplains and are increasing in density in the draws themselves. Erosion due to cattle grazing and the presence of invasive species likely contributed to degradation of most sites. Invasive and likely invasive plants in this system include smooth brome (*Bromus inermis*), Japanese brome (*B. japonicus*), downy brome (*B. tectorum*), leafy spurge (*Euphorbia esula*), Kentucky bluegrass (*Poa pratensis*), common burdock (*Arctium minus*), poison hemlock (*Conium maculatum*), dame's rocket (*Hesperis matronalis*), and Siberian elm (*Ulmus pumila*).

COMMENTS: Although this system was likely dominated by deciduous trees and shrubs, there is evidence that large eastern red cedars were plentiful in some protected spots prior to their near disappearance due to cutting by settlers. Webber (1889) reported that cedar would occasionally occur above the rims of the canyons but usually only as charred stumps. The upland phases of this system have received little attention from grassland ecologists, as the presence of eastern red cedar is generally (and in most cases rightfully) considered a sign of degraded grassland. Nonetheless, eastern red cedar was an important component of native woodlands in the Niobrara River valley, Sandhills, and probably parts of the Loess Hills prior to EuroAmerican settlement. Students of Bessey believed that they were formerly more extensive, and it is likely that this may have been so before settlement of indigenous peoples in Nebraska (Webber 1890b).

We cannot justify maintaining the Northwestern Great Plains Canyon and Western Great Plains Wooded Draw and Ravine Systems of NatureServe as separate. Elements of both systems occur in the Panhandle and north-central Nebraska, and their placement into one system or the other seems somewhat arbitrary for our communities. Our proposed system includes both global systems but excludes the riparian/wetland and upland bur oak communities, which are included in other systems

## **NORTHWESTERN GREAT PLAINS PINE WOODLAND**

ELEMENT CODE: CES303.650

GLOBAL NAME: =Northwestern Great Plains – Black Hills ponderosa pine woodland and savanna

CONCEPT SUMMARY: This ecosystem represents remnants of Rocky Mountain forest flora stranded in the grassland environment of the northern Great Plains. It occurs primarily on gentle to steep slopes associated with escarpments and canyons, usually on fine sands and loams derived from sandstone, siltstone, loess, eolian sand, or rarely chalky shale. The majority of pine woodland in Nebraska is found in the Pine Ridge and middle Niobrara River valley, with isolated stands south of the North Platte River in the Panhandle, and along the northern edge of the central Nebraska Loess Hills. Ponderosa pine (*Pinus ponderosa* var. *scopulorum*) is the primary dominant, with red cedars (*Juniperus scopulorum* and hybrids with *J. virginiana*) often forming a sparse to fairly dense subcanopy. Deciduous trees are usually only a minor component within open upland pine woods, but may be common where the pines border deciduous wooded communities on lower slopes and in ravine bottoms. Somewhat open stands tend to have a



significant shrub component and an herbaceous layer containing many grassland species, while denser stands may contain patches of chokecherry (*Prunus virginiana*) and serviceberry (*Amelanchier alnifolia*). In shaded areas, herbaceous ground cover may be limited on dry upper slopes, but quite rich on protected mesic slopes where forest species common in deciduous-wooded canyon bottoms may be found. Historic records suggest the current range of ponderosa pine in Nebraska is practically the same as it was in the late 19<sup>th</sup> Century, except that stands have become denser and have spread to a limited extent away from the bluffs and canyons into adjacent uplands and bottoms due to fire suppression. The deciduous canyon-bottom elements associated with pine woodlands are included in the Western Great Plains Wooded Draw and Ravine system.

**DISTRIBUTION:** In Nebraska, the largest continuous examples of this system occur from the southern edge of the Hat Creek watershed in Sioux County southward to the upper reaches of the White River and northeastward along the Pine Ridge escarpment through Dawes County to northern Sheridan County. Along the Niobrara, pines are found nearly continuously from Valentine east to the Springview area, with isolated stands scattered west to northwestern Cherry County and east to the Long Pine area in Brown County. The Wildcat Hills, between the North Platte River and Pumpkin Creek in the Panhandle contains numerous scattered to nearly-continuous pine woods, and other isolated stands occur in the drainage of Pumpkin and Lodgepole creeks. Pine woods also occur in the Missouri Plateau north of the Pine Ridge in the drainage of Lime Kiln Creek in northeastern Dawes and northwestern Sheridan counties. Isolated stands are known from canyons in the Loup River drainage along the north side of the Loess Hills from western Custer to southwestern Garfield counties, some of which are known to have occurred there in the 19<sup>th</sup> Century. Historical reports of pine from the Republican River in Franklin County are considered unreliable. The overall range of this system extends from central Montana to the western Dakotas south to eastern Colorado.

**EPA ECOREGIONS:** 25, 27e, 43r, 44

**COMMUNITIES INCLUDED:**

- Ponderosa Pine Forest
- Dry-Mesic Ponderosa Pine Woodland
- Dry Ponderosa Pine Open Woodland and Savanna
- Pine-Juniper Scarp Woodland

Though this system is easily identified, the component communities vary significantly on the basis of slope and aspect, and pine canopy density is not always a reliable indicator of community, especially in areas affected by fire and logging. Areas with a significant (>25%) subcanopy of red cedar may be classified by the general term "mixed conifer woodland" keeping in mind that this designation includes both areas of naturally-occurring pine-juniper woods (Pine-Juniper Scarp Woods) on steeper slopes and degraded pine woodland. In areas where a juniper subcanopy is not abundant, most commonly on the Pine Ridge, the communities may be distinguished by herbaceous understory. Dry Ponderosa Pine Open Woodland and Savanna is dominated by short and mid-grasses of the surrounding mixed-grass prairie, as well as rock outcrops, with small more shaded inclusions dominated by Kentucky bluegrass and sun sedge. Dry-mesic Ponderosa Pine Woodland is usually limited to slopes of northerly or easterly aspect

and is distinguished by a conspicuous mid to tall-grass component mixed with shade-tolerant forest plants and straggling prairie plants. Ponderosa Pine Forest also favors north and east exposures that are fairly steep. The forests here often have a relatively sparse herbaceous layer of shade tolerant plants.

**ENVIRONMENT:** This system occurs in unglaciated portions of the Great Plains on dry-mesic to well-drained fine sands and loams formed primarily from Tertiary sandstones and siltstones, colluvial and eolian sands, or loess (less frequently from chalky shales or eolian sands). It currently occurs on gentle to relatively steep bluff and canyon slopes, ravines, and draws and to a limited extent in valley bottoms. Denser stands are generally developed on north and east-facing slopes.

**VEGETATION:** The canopy varies from sparse to relatively dense and is uniformly dominated by ponderosa pine, with the exception of a site along with Wyoming border in Kimball County at which limber pine (*P. flexilis*) is additionally present. Red cedar is sparse to abundant in the subcanopy, and is generally densest in areas of sparse pine canopy. Occasionally green ash (*Fraxinus pennsylvanica*) may appear as a small scattered subcanopy tree, but for the most part, deciduous trees are common only on protected lower slopes and bottoms. In stands of scattered pine, grassland herbs and shrubs are common understory, including blue grama (*Bouteloua gracilis*), threadleaf sedge (*Carex filifolia*), sun sedge (*C. heliophila*), skunkbrush sumac (*Rhus aromatica* var. *trilobata*), wolfberry (*Symphoricarpos occidentalis*) and the alien Kentucky bluegrass (*Poa pratensis*). In denser stands the herbaceous vegetation is usually much sparser, but the shrubs are still conspicuous, but shade-tolerant species such as chokecherry, serviceberry, poison ivy (*Toxicodendron rydbergii*), creeping juniper (*Juniperus communis*) and Oregon-grape (*Berberis repens*) (the latter two restricted to the Pine Ridge) replace shrubs typical of open pine stands.

**DYNAMICS:** By and large this community survived in the Great Plains because of the protection from fire afforded by steep slopes of bluffs and canyons, though it is likely that low intensity ground fires were not uncommon in open stands. Wind and ice storms, lightning, bison herds and insect outbreaks likely affected community structure historically. Logging, fire suppression, and livestock grazing have had serious impacts on pine woodlands and have resulted in an increase of dense, even-aged pine stands that are highly susceptible to catastrophic high-intensity canopy fires such as those that occurred on the Pine Ridge in 2006. Erosion due to cattle grazing, and the presence of invasive species have likely contributed to degradation of most sites. Invasive and likely invasive plants in this system include smooth brome (*Bromus inermis*), cheatgrasses (*Bromus japonicus*, *B. tectorum*), hound's-tongue (*Cynoglossum officinale*), dame's-rocket (*Hesperis matronalis*), Dalmatian toadflax (*Linaria dalmatica*), horehound (*Marrubium vulgare*), Kentucky bluegrass (*Poa pratensis*), and intermediate wheatgrass (*Thinopyrum intermedium*). Smooth brome appears to be rapidly spreading into sites affected by severe fire.

**COMMENTS:** Because of dominance by a single species (ponderosa pine), the limits of this system in Nebraska are relatively easily defined. The role of cedars in Nebraska pine woods, on the other hand, is poorly known. Historical reports of eastern red cedar as co-dominant in springbranch canyons of the Niobrara River (Pound & Clements 1900), suggest it is a naturally-

occurring part of these pine woods, even though its current abundance doubtlessly exceeds historic levels. Rydberg reported mixed pine and Rocky Mountain juniper woods in the Wildcat Hills (Kiener 1951) where pure ponderosa pine stands also occur. In both the Wildcat Hills and along the portion of the Pine Ridge that closely approaches badlands, Rocky Mountain juniper is abundant on steep, siltstone exposures that are generally unsuitable for all but a few scattered pines. Such sites likely would have afforded protection historically for cedars, though their subsequent spread into pine-dominated uplands is probably of relatively recent occurrence. Tolstead (1947) reported a dense stand of cedar in northeastern Dawes County, likely associated with the Chadron Dome area, where pines and cedars are still plentiful. The cedars in this area appear intermediate in morphology between the eastern and Rocky Mountain species. Chapman *et al.* (2001) included this area and the adjacent Lime Kiln Creek area as a part the Pine Ridge Escarpment of the Western High Plains ecoregion, though it clearly has affinities with the Missouri Plateau and shares little in common with the Pine Ridge other than the presence of pine.

## UPLAND HERBACEOUS SYSTEMS

### CENTRAL TALL-GRASS PRAIRIE

ELEMENT CODE: CES205.683

CONCEPT SUMMARY: This ecosystem includes the upland herbaceous communities of the glaciated and the loess-mantled unglaciated portions of eastern Nebraska. Soils are mostly formed in loess and glacial till and are usually deep and fertile. Grasses 1-2 m tall make up the dominant species, with big bluestem (*Andropogon gerardii*) almost always present, and Indian grass (*Sorghastrum nutans*) or switchgrass (*Panicum virgatum*) frequently co-dominant. In dry prairie on very steep slopes or in coarse soils, mid grasses such as little bluestem (*Schizachyrium scoparium*) and sideoats grama (*Bouteloua curtipendula*) may be abundant, sometimes with scattered short grasses including blue grama (*B. gracilis*) and hairy grama (*B. hirsuta*). Several short shrubs are associated with these communities, most commonly leadplant (*Amorpha canescens*), dwarf prairie rose (*Rosa arkansana*) and redroot New Jersey tea (*Ceanothus herbaceus*). Larger shrubs and trees will commonly encroach in all but the driest sites. A wide variety of herbaceous species occur in tall-grass prairie, with goldenrods (*Solidago* spp.) and asters (*Symphyotrichum* spp.) among the most conspicuous. Fire is perhaps the most important environmental factor in maintaining this system, and grazing is another important factor shaping these communities. The vast majority of this system has been converted to crop production, and a large portion of what remains is overgrazed or formerly plowed and abandoned and tends to be dominated by invasive smooth brome (*Bromus inermis*) and Kentucky bluegrass (*Poa pratensis*), and has much-reduced species diversity. Drought and insects (primarily grasshoppers) may also influence the species makeup of tall-grass prairie.

DISTRIBUTION: This system occurs primarily on the glaciated loess hills of eastern Nebraska in the eastern fifth of the state, and extends westward north of the Sandhills to Boyd County, and in the Smoky Hills and Rainwater Basin Plains south of the Platte River valley. The westward

extent of this system between the Platte Valley and Sandhills is poorly known. This system extends from eastern Nebraska south to northeastern Kansas and east to northwest Indiana.

EPA ECOREGIONS: 27a, 27e?, 27f, 42g?, 42h, 47

#### COMMUNITIES INCLUDED:

- Upland Tall-grass Prairie
- Dakota Sandstone Tall-grass Prairie
- Lowland Tall-grass Prairie
- Northern Loess/Shale Bluff Prairie
- Missouri River Valley Dune Grassland
- Missouri River Floodplain Terrace Grassland
- Southern Sand/Gravel Prairie

The majority of the tall-grass prairie that remains in the state will fit in the Upland Tall-grass Prairie community, which occurs on soils derived from loess and/or glacial till. This is a dry-mesic type dominated by tall grasses, but sometimes with mid grasses scattered within as well. In the driest of sites, mid grasses (especially little bluestem) may be common or even co-dominant. Prairies dominated by a mixture of tall and mid grasses that occur on loess or glacial till commonly are restricted to steep slopes and are most extensive on the bluffs that line the Missouri River valley (though they may occur as isolated patches elsewhere) and are classified as Northern Loess/Shale Bluff Prairie. Lowland Tall-grass Prairie is overwhelmingly dominated by tall grasses, particularly big bluestem, with prairie cordgrass often commonly occurring with it.

In the few instances in which tall-grass prairie occurs on soils derived from sandy alluvium or bedrock, mid grasses may be more conspicuous (though this is not always the case). Prairie on soils derived from Dakota Sandstone and shales in southern Jefferson and southwestern Gage counties are classified as Dakota Sandstone Mixed-grass Prairie, and commonly has little bluestem co-dominant with big bluestem in well-drained soils. Numerous seeps associated with sandstone outcrops are typical in this community. In northeast Nebraska, sandy prairie in the Missouri River valley, Missouri River Valley Dune Grassland on dunes and Missouri River Floodplain Terrace Grassland on level ground, are dominated by switchgrass and Canada wildrye (*Elymus canadensis*). The former community is known from Dixon and Thurston counties (as well as on the Iowa side of the river) and the latter is apparently somewhat more widespread, though its full range is unknown. Where deposits of Pleistocene sand and gravel are exposed along the lower Republican River and Little Blue River drainages in our southern tier counties, an open grassland community dominated by scattered mid grasses (little bluestem, sideoats grama) and numerous herbaceous species is found that can be classified as Southern Sand/Gravel Prairie. It and the Dakota Sandstone Tall-grass Prairie may co-occur in parts of Jefferson County, the former often found as a patch type in the latter, though occasionally large occurrences of the sand/gravel type are found.

ENVIRONMENT: This system occurs primarily on deposits of loess and/or glacial till, less frequently on Cretaceous Dakota Sandstone or Permian limestones, and infrequently on alluvial sands and gravels. Soils are usually silt loams in areas with a deep mantle of loess, silt loams

and silty clay loams in areas in which glacial till is present (mostly southward), and less frequently fine sands and sandy loams or clay loams (the latter derived from Pierre Shale). Soils are usually deep and fertile and are somewhat well-drained to somewhat poorly drained.

**VEGETATION:** On fine-textured soils, the communities of this system tend to be dominated solely by tall warm-season grasses 1-2 m tall, primarily big bluestem, or big bluestem and Indian grass. In some silty clay prairies prairie dropseed (*Sporobolus heterolepis*) may be sufficiently abundant to appear co-dominant, and the cool-season porcupine grass (*Hesperostipa spartea*) may be conspicuous in some sites. On steep slopes, the warm-season mid grasses little bluestem and sideoats grama may be conspicuous, with occasional patches of blue grama or hairy grama. On Pierre Shale in northeast Nebraska, western wheatgrass (*Pascopyrum smithii*) and green needlegrass (*Nassella viridula*) may be present westward in sites transitional to mixed-grass prairie. On coarse-textured soils, big bluestem frequently occurs with switchgrass, especially on level sites, and with little bluestem and sometimes sideoats grama on slopes. In the Missouri River valley, switchgrass and Canada wildrye (*Elymus canadensis*) may replace big bluestem in sandy soils. Very well-drained gravels may have somewhat open cover with an array of herbaceous plants that are nearly as abundant as the grasses. In the more mesic examples of tall-grass prairie, big bluestem (and sometimes switchgrass) dominates with prairie cordgrass (*Spartina pectinata*) conspicuous. Short shrubs may be scattered to somewhat common on uplands, with leadplant, dwarf prairie rose and redroot New Jersey tea prevalent in well-maintained sites. In the absence of fire or haying, these sites may become invaded by tall shrubs, with rough-leaf dogwood (*Cornus drummondii*) and smooth sumac (*Rhus glabra*) most common in the east (westward woody encroachment is less problematic). Trees often may invade as well, with eastern red-cedar (*Juniperus virginiana*) probably the most common in uplands, and with honey locust (*Gleditsia triacanthos*) problematic southward, along with several invasive alien trees. A diverse array of herbaceous perennials occur in better quality sites, which includes goldenrods and asters, particularly Missouri goldenrod (*Solidago missouriensis*), and heath aster (*Symphyotrichum erioides*), with purple cone-flower (*Echinacea angustifolia*) and compassplant (*Silphium laciniatum*) often common in the north, and many-flower scurfpea (*Psoraleidium floribundum*) common southward. Moderately grazed sites may contain an abundance of yarrow (*Achillea millefolium*), hoary vervain (*Verbena stricta*) and western ironweed (*Vernonia baldwinii*). Perennial sunflowers, especially sawtooth sunflower (*Helianthus grosesserratus*) may be common in lowland prairie, along with rosinweed (*Silphium integrifolium*).

**DYNAMICS:** Fire, and to a lesser degree grazing, are the determining ecological factors that maintain this system as grassland by preventing encroachment by aggressive shrubs and trees. Fires probably occurred naturally in this system in summer, due to lightning strikes during thunderstorms, and in the fall, when set by indigenous people to manage bison herds. Most prescribed burns are carried out in late spring, which promotes increased cover by warm-season grasses (especially big bluestem), often to the detriment of early-flowering species. Grazing (by bison) was historically likely periodic and high-intensity, and would have served to create openings allowing certain species to compete, thereby increasing species richness. Current grazing practices in the tall-grass region tend to be long duration and moderate to high intensity, and decrease species diversity. Drought and locust swarms would have also been important, periodic factors impacting the makeup of these communities. The two factors having the greatest negative impact on this system are agricultural conversion and invasion by alien cool-

season rhizomatous grasses, with smooth brome (*Bromus inermis*) being far and away the most problematic invader of tall-grass prairie. Other widespread invasives include Kentucky bluegrass (*Poa pratensis*), sweetclovers (*Melilotus* spp.) and cheatgrasses (*Bromus japonicus*, *B. tectorum*). Other species that are highly invasive in parts of this ecosystem include absinthe wormwood (*Artemisia absinthium*), Australian bluestem (*Bothriochloa bladhii*), plumeless thistle (*Carduus acanthoides*), musk thistle (*C. nutans*), leafy spurge (*Euphorbia esula*), common St.-John's-wort (*Hypericum perforatum*), sericea lespedeza (*Lespedeza cuneata*), and tall fescue (*Schedonorus arundinaceus*). Other locally problematic aliens include Canada thistle (*Cirsium arvense*), orchard grass (*Dactylis glomerata*), cutleaf teasel (*Dipsacus laciniatus*), sickleweed (*Falcaria vulgaris*), ox-eye daisy (*Leucanthemum vulgare*), and crown vetch (*Securigera varia*). The invasive trees white mulberry (*Morus alba*) and Siberian elm (*Ulmus pumila*) may encroach in unburned sites.

COMMENTS: This system is slightly expanded from the NatureServe definition to include a few sandy prairie communities (Missouri River Valley Dune Grassland, Southern Sand/Gravel Prairie) that are not listed as part of this system. The Southern Sand/Gravel Prairie community is included by NatureServe in the Western Great Plains Sand Prairie System, but we include it here since it commonly occurs as a patch type in a tall-grass prairie setting. The Missouri Valley Dune Grassland community is not recognized by NatureServe. Tall-grass prairie communities associated with sandy soils of the Sandhills and Platte River valley should be considered part of the Sandhills Mesic Prairie community in the Western Great Plains Sand Prairie System.

## **CENTRAL MIXED-GRASS PRAIRIE**

ELEMENT CODE: CES303.659

CONCEPT SUMMARY: This ecosystem occurs in the central Great Plains region from south-central South Dakota discontinuously south to Texas, the Nebraska Sandhills isolating the northernmost portions from the rest. In Nebraska, it is best developed on the rolling loess-mantled hills and plains of central and south-central Nebraska, and occurs to a limited extent to the north of the Sandhills on soils derived from loess and Pierre Shale. Upland herbaceous communities comprise this system, and among the dominant species are tall, mid, and short grasses. Big bluestem (*Andropogon gerardii*) is among the most common and visible species, and switchgrass (*Panicum virgatum*) is also sometimes common, especially on level areas. Little bluestem (*Schizachyrium scoparium*) and sideoats grama (*Bouteloua curtipendula*) are the primary mid grasses and tend to dominate slopes. Blue grama (*Bouteloua gracilis*) is frequently present and may be common and conspicuous on mowed and grazed sites, but on lightly grazed or spring-burned sites the tall grasses are frequently most conspicuous, creating the appearance of tall-grass prairie. The majority of this system has been converted to cropland, and most areas that remain are heavily grazed and extensively invaded by alien species. Encroachment by eastern red cedar (*Juniperus virginiana*) as a result of fire suppression is problematic in some portions of the state.

DISTRIBUTION: In Nebraska, the major portion of this system occurs from the Loess Hills of central Nebraska south to the Kansas border, west to Lincoln, Hayes and Hitchcock counties, and

with the eastern boundary indefinite. North of the Sandhills, this system is limited to the Loess and Pierre Shale plains of northwestern Knox, Boyd, and perhaps extreme eastern Keya Paha counties.

EPA ECOREGIONS: 27b, 27e, 42g, 42h

#### COMMUNITIES INCLUDED:

- Loess Mixed-grass Prairie
- Northern Loess/Shale Bluff Prairie

The majority of the prairie in this system occurs in central and south-central Nebraska and can be classified as Loess Mixed-grass Prairie. Westward, it may grade into the Western Mixed-grass Prairie System and the Western Sand Prairie System, and inclusions of sand prairie are associated with the Platte River valley and the Loup River system. North of the Niobrara River, this community may be associated with loess deposits in areas such as the Ponca Plains in Boyd County, though no intact prairie is currently known from this area. Most of the intact mixed-grass prairie north of the Niobrara River is confined to Pierre Shale bluffs associated with the Missouri, Niobrara, and Keya Paha rivers. These sites are now included with the loess bluff prairies of northeast Nebraska in an expanded Loess/Shale Bluff Prairie community. Many examples of the latter community may be difficult to distinguish from tall-grass prairie.

**ENVIRONMENT:** This system occurs on gentle to steep hills and plains mantled by loess, or less frequently in areas eroded from Pierre Shale bedrock. Soils are mostly silt loams or less commonly silty clay loams and clay loams and are well drained to somewhat poorly drained.

**VEGETATION:** This system is usually somewhat densely vegetated by warm-season grasses, with big bluestem being the most conspicuous tall grass species. It may be fairly common on level to gently sloping areas and may occasionally be dense, giving the appearance of tall-grass prairie. On slopes, and in mowed or grazed areas, mid and short grasses dominate, with little bluestem and sideoats grama often the most common mid grasses, and blue grama the most common short grass. Heavily grazed areas may be temporarily converted to a short-grass cover of blue grama and buffalo grass (*Buchloë dactyloides*) which tends to revert to a cover of taller grasses once the disturbance is removed. Most sites are extensively invaded by smooth brome (*Bromus inermis*) and/or Kentucky bluegrass (*Poa pratensis*), which may constitute the most abundant grasses. Shrub species are often those associated with tall-grass prairie to the east, and though westward some Great Plains shrubs and yucca (*Yucca glauca*) may be conspicuous. Overall species diversity is low to moderate, though generally higher than that of mixed-grass prairie of the High Plains. Among the most conspicuous herbaceous components are western ragweed (*Ambrosia psilostachya*), purple prairie coneflower (*Echinacea angustifolia*), skeletonplant (*Lygodesmia juncea*), prairie coneflower (*Ratibida columnifera*) and scarlet globe mallow (*Sphaeralcea coccinea*).

**DYNAMICS:** Species composition is strongly tied to soil moisture, with a higher percentage of tall grasses on moderate and north-facing slopes, and mid and short grasses on steep and south exposures. Fire and grazing are important ecological processes as well. Many sites appear to

have been overgrazed and are dominated by cool-season invasives such as smooth brome and Kentucky bluegrass. Areas occupying more level sites have largely been converted to crop fields. Fire suppression has allowed an increase in woody vegetation associated with uplands, particularly eastern red cedar, which has overtaken many sites in the central Nebraska Loess Hills. Among the most common invasive species are smooth brome (*Bromus inermis*), Japanese brome (*B. japonicus*), downy brome (*B. tectorum*), sweetclovers (*Melilotus albus*, *M. officinalis*), and Kentucky bluegrass (*Poa pratensis*). Musk thistle (*Carduus nutans*), leafy spurge (*Euphorbia esula*), and tall fescue (*Schedonorus arundinaceus*) are locally problematic.

COMMENTS: This system occurs between the cool-season dominated mixed-grass prairies to the west, and the tall-grass prairies of the east, and tends to blend into other systems around its borders. It can be separated from the western prairies by the conspicuous tall grass (namely big bluestem) elements, but in the east, the distinctions are problematic, and some communities (e.g. Loess/Shale Bluff Prairie) may be intermediate to tall-grass prairie. Sandy mixed-grass prairie communities in the Western Sand Prairie System may also intergrade with these communities, the difference between these two systems primarily being soil particle size.

## WESTERN GREAT PLAINS SAND PRAIRIE

ELEMENT CODE: CES303.670

CONCEPT SUMMARY: This ecosystem includes the upland grassland communities of the unglaciated Great Plains that occur primarily on coarse-textured soils (sandy prairie of the eastern ¼ is included in the Central Tall-grass Prairie System). These soils are often poorly developed and nutrient-poor, though in some valley bottoms they may contain significant amounts of organic matter. Rhizomatous tall and short graminoids are well-adapted to growing in these soils, and prairie sandreed (*Calamovilfa longifolia*) and sun sedge (*Carex heliophila*) are among the dominants in well-drained areas, while switchgrass (*Panicum virgatum*) and big bluestem (*Andropogon gerardii*) tend to be more common on finer soils that retain moisture. Other grasses commonly found in grassland of this system include sand bluestem (*Andropogon hallii*), blue grama (*Bouteloua gracilis*), hairy grama (*B. hirsuta*), and little bluestem (*Schiachyrium scoparium*). In western Nebraska, sandsage (*Artemisia filifolia*) is a conspicuous shrubby component of prairie, in places occurring in densities sufficient to be regarded as shrubland. Other shrubs and subshrubs, such as leadplant (*Amorpha canescens*), sand cherry (*Purnus pumila* var. *besseyi*) and yucca (*Yucca glauca*) are locally common. Herbaceous species include plants typical of both tall-grass prairie and other mixed-grass prairie communities of the Great Plains (including species adapted to loose soils), with all but the tall-grass communities tending to be somewhat open with the soil surface clearly visible. Most communities associated with uplands are relatively intact, moderately grazed, and in good condition. Some valley-bottom sites have been converted to cropland (usually unsuccessfully), but many more have been altered from warm-season prairie to a cool-season assemblage of invasive species due to regular early season haying and interseeding of alien forage species.

DISTRIBUTION: This system is centered on the Sandhills region but also extends beyond its periphery through Cherry and Keya Paha counties into South Dakota on the north, west to



southwestern Sioux County, south in the High Plains Region into southwestern Nebraska, and eastward to northwestern Knox and Stanton counties. Isolated stands occur in the mixed-grass and tall-grass areas of central Nebraska in the Loup, Platte, and Republican drainages, and in the tall-grass prairie region along the Elkhorn drainage.

EPA ECOREGIONS: 25, 27b, 27e, 27f, 42h, 42p, 44, 471

#### COMMUNITIES INCLUDED:

- Sandsage Prairie
- Sandhills Dune Prairie
- Sandhills Dry Valley Prairie
- Western Sand Prairie
- Eastern Sand Prairie
- Sandhills Mesic Tall-grass Prairie
- Threadleaf Sedge Western Mixed-grass Prairie
- Great Plains Gravel/Cobble Prairie

Sandsage Prairie may include any community in which sandsage represents a conspicuous part (>5% cover), though sandsage may occur in low densities in Sandhills Dune Prairie and is sometimes associated with open woodland in the central Niobrara River valley. Most sites within the Sandhills will fall under the broadly-defined Sandhills Dune Prairie community, which may include often dense shrubby inclusions, especially on steep north-facing slopes. Valley bottoms may be dominated either by a moderate cover of switchgrass in Sandhills Dry Valley Prairie, or big bluestem or Indian grass with switchgrass in Sandhills Mesic Tall-grass Prairie. Along the periphery of the Sandhills, needlegrasses (*Hesperostipa* spp.) may be dominant. In Western Sand Prairie, needle-and-thread (*H. comata*) is often dominant or co-dominant with prairie sandreed on slopes, occasionally with low densities of sand bluestem and/or sandsage. Threadleaf Sedge Western Mixed-grass Prairie may also occur on sand dunes in the western half of the Panhandle (and to a limited extent along the south side of the Niobrara River valley). Along the northern and southern perimeter of the Sandhills to the east of the Panhandle, Eastern Sand Prairie occurs commonly at the margins of the Sandhills, and tends to include needle-and-thread, porcupine grass (*Hesperostipa spartea*) and sometimes little bluestem among the dominants. Gravelly areas often occur as inclusions in sand prairie in the northern and southwestern part of the states. Larger areas may be identified as Great Plains Gravel/Cobble Prairie and often have species other than graminoids as the most conspicuous components.

ENVIRONMENT: This system occurs primarily on eolian sands (sometimes mixed with loess along the periphery of the Sandhills) and to a lesser extent on sands derived from weathered sandstone bedrock and alluvium. Soils vary from loams with organic material in subirrigated valley bottoms to fine sands and sandy loams on escarpments and in dry valleys (and in uplands along the eastern periphery of the Sandhills) to coarse well-drained sands and gravels (the latter associated with ancient river terraces). Soils vary from well-drained to somewhat poorly drained.

**VEGETATION:** Well-drained sites in this system are usually dominated by mixed-grass prairie with an open to moderate (sometimes dense) cover that includes tall grasses 1-2 m tall (most commonly prairie sandreed, with sand bluestem locally common), mid grasses 0.5-1 m tall (needle-and-thread commonly, with little bluestem especially common on slopes), and short graminoids <0.5 m tall (sun sedge, hairy grama and blue grama most common). Some heavily-grazed sites in dry valley bottoms may temporarily convert to short grass cover. Sandsage forms an open to locally dense shrub layer 0.5-1.5 m tall along the western periphery of this system, while the short shrub sand cherry and the subshrub yucca are common on uplands throughout. Other short shrubs that may be locally common eastward include leadplant, dwarf prairie rose (*Rosa arkansana*) and western poison ivy (*Toxicodendron rydbergii*). Taller shrubs such as wild plum (*Prunus americana*), chokecherry (*P. virginiana*), and wolfberry (*Symphoricarpos occidentalis*) are sometimes associated with steep, north-facing dune slopes. An array of annual and perennial herbs are commonly present, including prairie spurge (*Euphorbia missurica* var. *petaloidea*), stiff sunflower (*Helianthus pauciflorus*), bush morning-glory (*Ipomoea leptophylla*), hairy puccoon (*Lithospermum caroliniense*), and Missouri goldenrod (*Solidago missouriensis*), among many others.

Somewhat poorly-drained sites may contain tall-grass prairie in which big bluestem or Indian grass (*Sorghastrum nutans*) are usually dominant with switchgrass and an array of plants associated with tall-grass prairie and sand prairie of the eastern United States.

**DYNAMICS:** Slope, aspect and moisture retention of soils are major factors determining the dominant species within a given site. Erosion by wind and water is also an important factor in upland dune situations and has led to the creation of distinctive blowout and sand wash communities that have different species composition. Fire and overgrazing have been important historical factors, both of which can alter the species composition and sometimes promote wind erosion of large areas. Haying of valley bottoms can alter species composition, annual early-summer haying which can promote dominance by cool-season (often invasive) species at the expense of the native tall grasses. Many sites have been intentionally interseeded with Eurasian forage plants to increase hay production, and early haying promotes the spread of these species to the detriment of the native vegetation. Most of the problematic invasives are associated with hayed areas, with Kentucky bluegrass (*Poa pratensis*) probably the most abundant. Elsewhere smooth brome (*Bromus inermis*) and downy brome (*B. tectorum*) may be abundant, especially in areas peripheral to the Sandhills. Other locally problematic species include Japanese brome (*Bromus japonicus*), nodding cheat (*B. squarrosus*), diffuse knapweed (*Centaurea diffusa*), spotted knapweed (*C. stoebe* ssp. *micranthos*), Canada thistle (*Cirsium arvense*), leafy spurge (*Euphorbia esula*), common St. John's-wort (*Hypericum perforatum*), Dalmatian toadflax (*Linaria dalmatica*), narrow-leaf bird's-foot trefoil (*Lotus tenuis*), and sulphur cinquefoil (*Potentilla recta*). Black locust (*Robinia pseudoacacia*) is locally invasive on dunes in the Valentine National Wildlife Refuge.

**COMMENTS:** This system considerably overlaps the Western Great Plains and Central Mixed-grass Prairie Systems, and to a limited extent the Eastern Tall-grass Prairie System. Therefore numerous sites may be found that may include elements of two (or more) systems. Many of these sites in the High Plains are accommodated by the Western Sand Prairie community and those in the Central Great Plains and Eastern Prairies in the Eastern Sand Prairie community. Wetlands occurring in this system are primarily included in the Western Great Plains Open

Freshwater Depression System. Sandy tall-grass prairie associated with the Little Blue, lower Republican, and Missouri river drainages are treated in the Eastern Tall-grass Prairie System.

This system includes the Western Great Plains Sandhills Steppe System of NatureServe, which in our range includes only the Sandsage Prairie community.

## **NORTHWESTERN GREAT PLAINS MIXED-GRASS PRAIRIE**

ELEMENT CODE: CES303.674

**CONCEPT SUMMARY:** This ecosystem occurs in the unglaciated Missouri Plateau in extreme northwestern Nebraska and is defined by having fine-textured soils formed primarily in Pierre Shale (and to a lesser degree in chalky shales). Sandy soils are absent (except as rare deposits along permanent streams). This system is limited to two upland grassland communities, the most widespread (Northwestern Mixed-grass Prairie) is generally found on clay loams and silty clay loams derived from Pierre Shale, and is dominated by western wheatgrass (*Pascopyrum smithii*) and blue grama (*Bouteloua gracilis*), and the second, limited to areas of silt loam, is dominated by threadleaf sedge (*Carex filifolia*) and needle-and-thread (*Hesperostipa comata*). Badlands and grasslands occurring along stream terraces are found as inclusions within this community, but are placed in other systems. Closer to the Pine Ridge, communities in the Northwestern Great Plains Pine Forest and Woodland, Western Great Plains Mixed-grass Prairie and Northwestern Great Plains Wooded Draw, Ravine and Canyon systems may be found. The Threadleaf Sedge Western Mixed-grass Prairie community being the only one that extends northward as an inclusion in the Northwestern Mixed-grass Prairie matrix. By and large this system is heavily disturbed by extensive past overgrazing and drought, and species diversity is often low. Among the more common species associated with the dominant grasses are scattered shrubs such as sagebrushes (*Artemisia* spp.) and rubber rabbitbrush (*Ericameria nauseosa*), subshrubs, such as broom snakeweed (*Gutierrezia sarothrae*), and numerous annual and perennial herbaceous plants, among the more conspicuous being milkvetches (*Astragalus* spp.) and prickly-pears (*Opuntia* spp.).

**DISTRIBUTION:** In Nebraska, this system is restricted to the Missouri Plateau region north of the Pine Ridge escarpment. It extends northward to southern Canada and west to central Montana.

**EPA ECOREGIONS:** 25a, 43g 43h

**COMMUNITIES INCLUDED:**

- Northwestern Mixed-grass Prairie
- Threadleaf Sedge Western Mixed-grass Prairie

In general, most upland prairie in this system will fall under the Northwestern Mixed-grass Prairie community, unless it is dominated by threadleaf sedge, in which case it should be classified as Threadleaf Sedge Western Mixed-grass Prairie. Upland grasslands associated with drainages are found in the Northwestern Great Plains Riparian System. Some patches of blue

grama – buffalograss short-grass prairie associated with clay pans are included in the Northwestern Mixed-grass prairie community, as are some other assorted mixed-grass types that include sideoats grama (*Bouteloua curtipendula*).

**ENVIRONMENT:** This system occurs in clay loams, silty clay loams, and silt loams formed primarily in Cretaceous Pierre Shales, and to a lesser extent in Tertiary siltstones and chalky shales. Most sites are somewhat poorly-drained, though areas with silt loam soils and in the vicinity of outcrops are well-drained

**VEGETATION:** This system is usually moderately to somewhat densely vegetated by cool-season mid-height (0.5-1 m) grasses, most commonly western wheatgrass on clay soils and needle-and-thread (*Hesperostipa comata*) on silty soils. Other mid grasses that may be present include thickspike wheatgrass (*Elymus lanceolatus*) and green needlegrass (*Nassella viridula*). Blue grama is the most abundant short grass, and also the dominant warm-season grass in this system. Threadleaf sedge (*Carex filifolia*) may be dominant on silty soils in places. Shrub density is usually under 15% in most places, and silver sagebrush (*Artemisia cana*) and big sagebrush (*A. tridentata*) are the most abundant, usually with rubber rabbitbrush, and less frequently winterfat (*Kraschennikovia lanata*) and winged saltbush (*Atriplex canescens*). Broom snakeweed is the most common subshrub. Among the common herbaceous associates are wild onion (*Allium textile*), two-grooved milkvetch (*Astragalus bisulcatus*), and spine-fruit prickly-pear (*Opuntia polyacantha*).

**DYNAMICS:** Fire and grazing are the primary ecological processes in this system, and most examples in Nebraska have been very heavily grazed by livestock (particularly by sheep in the late 19<sup>th</sup> and early 20<sup>th</sup> centuries), which has impacted species composition, and allowed invasion by alien grasses. Such invasions have increased biomass (especially in formerly open areas now filled by cheatgrass and sweetclovers). The fire frequency is undoubtedly reduced from historic levels. Among the most common invasive species are smooth brome (*Bromus inermis*), Japanese brome (*Bromus japonicus*), downy brome (*B. tectorum*), sweetclovers (*Melilotus albus*, *M. officinalis*), and Kentucky bluegrass (*Poa pratensis*). Crested wheatgrass (*Agropyron cristatum*), plumeless thistle (*Carduus acanthoides*), and saltlover (*Halogeton glomeratus*) are locally problematic.

**COMMENTS:** This system is distinctive through most of its range. In Nebraska, it generally occurs north of the badlands that line the north edge of the Pine Ridge. Some areas in the transition between the Arikaree sediments associated with the Pine Ridge and the volcanoclastic claystones of badlands may be transitional to the Western Great Plains Mixed-grass Prairie System.

## **WESTERN GREAT PLAINS MIXED-GRASS PRAIRIE**

**ELEMENT CODE:** CES303.672

**GLOBAL NAME:** Western Great Plains Short-grass Prairie

**CONCEPT SUMMARY:** This ecosystem includes the upland grassland communities of the High Plains surface that occur on fine sands, fine sandy loams and silt loams derived primarily from Tertiary Arikaree Group and Ogallala Group sandstones, sometimes mixed with wind-borne silts and sands. Grasslands that occur on coarser eolian (and sometimes colluvial) sand are placed in the Western Sand Prairie System, and often intergrade with the communities of this system. Dominant species in this system include cool-season mid grasses 0.5-1 m tall, most commonly needle-and-thread (*Hesperostipa comata*) and western wheatgrass (*Pascopyrum smithii*) along with the short, cool-season threadleaf sedge (*Carex filifolia*), and warm-season blue grama (*Bouteloua gracilis*). Scattered shrubs and subshrubs are often present, including skunkbrush sumac (*Rhus aromatica* var. *trilobata*), sandsage (*Artemisia filifolia*), fringed sage (*A. frigida*), spreading wild buckwheat (*Eriogonum effusum*), and broom snakeweed (*Gutierrezia sarothrae*). Sites associated with rocky, shallow soils, which usually occur on steeper slopes, are generally in good condition. Most of this grassland type on level and gently-sloping terrain is moderately to heavily grazed, and portions have been converted to cereal grains.

**DISTRIBUTION:** This system occurs entirely in the High Plains region south from (and including) the Pine Ridge escarpment to the Colorado and Kansas borders, and east to the Sandhills, and the western portion of Hayes and Hitchcock counties (where it blends into the Central Mixed-grass Prairie System). NatureServe's short-grass prairie system in which this Nebraska system is included extends south to eastern New Mexico and the Oklahoma and Texas panhandles.

**EPA ECOREGION:** 25

**COMMUNITIES INCLUDED:**

- Threadleaf Sedge Western Mixed-grass Prairie
- Wheatgrass Western Mixed-grass Prairie
- Great Plains Gravel/Cobble Prairie

Threadleaf Sedge Western Mixed-grass Prairie is usually easy to distinguish from Wheatgrass Western Mixed-grass Prairie, though the two sometime occur as a patchy mosaic, and the former designation "Western Mixed-grass Prairie" may be used for such examples. The Great Plains Gravel/Cobble Prairie tends to occur as a patch type associated with Threadleaf Sedge Western Mixed-grass Prairie, but in some cases along the South Platte River it may be locally extensive. Generally it is somewhat sparsely vegetated and the gravel and cobbles of the substrate are readily visible.

**ENVIRONMENT:** This system occurs in areas in which the soils are derived primarily from Tertiary Arikaree and Ogallala Group sandstones and to a lesser extent from ancient river sediments deposited on these formations. Soils are fine sands, fine sandy loams and finer loams, sometimes mixed with bedrock, gravel, or cobbles, and are well-drained.

**VEGETATION:** This system is usually dominated by a moderate to locally dense cover of mid grasses 0.5 – 1 m high with an underlayer of short grasses. Cool-season grasses are the most

common, with needle-and-thread and western wheatgrass usually the most abundant mid grasses and threadleaf sedge frequently the dominant short graminoid, with blue grama often abundant or dominant in disturbed situations. Scattered shrubs and subshrubs are often present, including skunkbrush sumac, sandsage, fringed sage, and broom snakeweed. Overall species diversity is usually not very high and other common herbaceous species include fringed puccoon (*Lithospermum incisum*), skeletonplant (*Lygodesmia juncea*), and scarlet globe mallow (*Sphaeralcea coccinea*). When prairie occurs as a mosaic with the Rock Outcrop community (Western Great Plains Cliff and Outcrop System) species diversity is much higher.

**DYNAMICS:** Fire and grazing are the primary ecological processes of this system. Fire suppression has allowed encroachment of red-cedar (*Juniperus* spp.) and other woody plants in some areas, resulting in lower species diversity. Drought may also impact this community. Invasive grasses often fill in the gaps between natives, and cheatgrasses (*Bromus japonicus*, *B. tectorum*) are particularly problematic. Other invasive that are locally troublesome include crested wheatgrass (*Agropyron cristatum*), smooth brome (*Bromus inermis*), sweetclovers (*Melilotus albus*, *M. officinalis*), and Kentucky bluegrass (*Poa pratensis*).

**COMMENTS:** For many years, biogeographers and ecologists unfamiliar with the region have classified the High Plains of western Nebraska as a region of "short-grass prairie," as the global name for this ecosystem reflects. Short-grass prairie is defined as dominated by blue grama with other short and mid-height grasses playing a secondary role. In Nebraska, areas of short-grass prairie have been recorded, but always as a patches occurring within a mixed-grass prairie setting, apparently the result of localized heavy grazing. These sites tend to revert to mixed-grass prairie once grazing pressure is diminished. Prairie in the northern High Plains of Nebraska tends to be dominated by cool-season graminoids, with blue grama playing a supporting role (except where increasing under heavy grazing), so the inclusion of this area in a system dominated by warm-season grasses seems problematic. "Short-grass prairie" was recognized as an accepted community in previous editions of this classification, but its occurrence as a patch type within several other mixed-grass prairie communities (usually Threadleaf Sedge Mixed-grass Prairie but also Loess Mixed-grass Prairie, Sandhills Dry Valley Prairie, and Northwestern Mixed-grass Prairie) indicates that in Nebraska it exists only as a temporary condition caused by livestock or herbivore grazing (though in some cases grassland associated with dense clays in extreme northwest Nebraska may be a naturally-occurring short-grass type, albeit limited in distribution).

## **RIPARIAN SYSTEMS**

### **NORTHWESTERN GREAT PLAINS RIPARIAN**

ELEMENT CODE: CES303.677

**CONCEPT SUMMARY:** This system includes both upland and wetland herbaceous communities associated with small streams of the Missouri Plateau from the Pine Ridge northward. Some permanent spring-fed streams may have riparian woodland communities found in the Western Great Plains Floodplain System, but the communities most commonly associated

with these sites are dominated by mesophytic and upland herbs and shrubs. Hydrophytic graminoids such as sedges (*Carex* spp.) tend to dominate the margins and lower banks of permanent streams, where they may be associated with wetland trees and shrubs. Along ephemeral streams, prairie grasses including needle-and-thread (*Hesperostipa comata*), green needlegrass (*Nassella viridula*), and western wheatgrass (*Pascopyrum smithii*) may dominate, occasionally with conspicuous stands of silver sagebrush (*Artemisia cana*). Slightly more alkaline sites may be dominated by greasewood (*Sarcobatus vermiculatus*) and alkali-tolerant grasses such as inland saltgrass (*Distichlis spicata*). Sites are generally found on sandy loams, silt loams, and clay loams formed from sandstone, siltstone or shaly bedrock and alluvium. The streamside wetland community is seasonally flooded, but the remaining communities in this system are only briefly and infrequently inundated following heavy rains.

**DISTRIBUTION:** In Nebraska, this system is primarily found on the Pierre Shale Plains of the Missouri Plateau from the Pine Ridge northward, and may also be found along portions of the Niobrara River valley in the Panhandle. It extends north to Saskatchewan, and west to central Montana and eastern Wyoming.

**EPA ECOREGIONS:** 25a, 25g, 43g, 43h

**COMMUNITIES INCLUDED:**

- Western Sedge Wet Meadow
- Western Floodplain Terrace Grassland
- Silver Sagebrush Shrub Prairie
- Greasewood Shrub Prairie

The communities in this system are mostly found in areas in which woody vegetation is not well developed, with the exception of sites on or near the Pine Ridge. In cases in which woody vegetation is extensive, the communities included here may be treated as part of the Western Great Plains Floodplain System, while areas with limited woody plant development are best included here. Banks of permanent streams are often covered by sedges and other wetland species such as three-square bulrush, and may be included as part of the Western Sedge Wet Meadow community. In degraded examples, redtop, quackgrass and reed canarygrass may compete with or even replace the sedges. The remaining communities are usually restricted to floodplain terraces, and are dominated by upland species. Areas dominated by needle-and-thread and western wheatgrass are generally part of the Silver Sagebrush Shrub Prairie community—which may have silver sagebrush densities ranging from low to relatively high (though generally never dominant). Greasewood shrub prairie may often occur on higher terraces of permanent streams (or rarely on streambanks), and is generally defined by the presence of greasewood, and usually includes western wheatgrass and other alkaline tolerant grasses, such as saltgrass. Areas of western wheatgrass and saltgrass that lack greasewood belong in the Western Floodplain Terrace Grassland community, which may be quite weedy and dominated by aggressive herbs along with, or even in place of, the dominant grasses. Most examples will have western wheatgrass and green needlegrass as dominants. In some places, particularly on the Pierre Shale Plains, this system may have inclusions of alkaline communities from the Western Great Plains Saline Depression Wetland System, and clay pans from the Western Great Plains Closed

Depression Wetland System. Elsewhere (such as along the upper Niobrara River) it may grade into Western Subirrigated Alkaline Meadow (Western Great Plains Saline Depression Wetland System).

**ENVIRONMENT:** This system occurs in the northern High Plains and unglaciated Missouri Plateau in somewhat poorly to somewhat well drained silt loams, sandy loams and clay loams formed in alluvium, Cretaceous Pierre Shale and Tertiary sandstones and siltstones. The streamside communities may be temporarily or seasonally flooded, though most of the floodplain and terrace communities are often flooded only after infrequent very heavy rains.

**VEGETATION:** In northwestern Nebraska, wetlands tend to be associated with permanent, spring-fed streams, and are usually restricted to the stream margins and lower banks, though woody wetland vegetation may be present on the upper banks and floodplains. Sedges, especially Nebraska sedge (*Carex nebrascensis*), bottlebrush sedge (*C. hystericina*), and woolly sedge (*C. pellita*), dominate the wettest phases, while three-square bulrush (*Schoenoplectus pungens*) and bald spikerush (*Eleocharis erythropoda*) are often present in the vicinity of seeps. Along ephemeral streams, the banks and terraces may be dominated by upland grasses, such as western wheatgrass and green needlegrass on lower terraces, and needle-and-thread and other mixed-grass prairie species in others. Silver sagebrush is common and conspicuous in many drainages on the Pierre Shale Plains, and in somewhat alkaline soils, greasewood may be scattered to locally common, with other halophytic grasses such as inland saltgrass and alkali sacaton (*Sporobolus airoides*).

**DYNAMICS:** Overgrazing by livestock represents an important ongoing threat to natural diversity in this system. Invasion by aggressive alien species is also a threat. Fire probably once played an important role in controlling the shrubby/woody components of these communities. Redtop (*Agrostis gigantea*), quackgrass (*Elymus repens*) and Kentucky bluegrass (*Poa pratensis*) are well-established in some sites along permanent streams, and smooth brome (*Bromus inermis*) and cheatgrasses (*Bromus* spp.) are often common in upland communities. Reed canarygrass (*Phalaris arundinacea*) and Canada thistle (*Cirsium arvense*) are locally problematic, and Garrison creeping foxtail (*Alopecurus arundinaceus*) and saltcedar (*Tamarix ramosissima*) are likely to increase in the near future.

**COMMENTS:** Riparian woodland that is often associated with this system includes the Cottonwood – Peachleaf Willow Woodland and Cottonwood Woodland, which is commonly associated with streams in the vicinity of the Pine Ridge. Alkaline wet areas on the Pierre Shale Plains are tentatively included in the Western Great Plains Saline Depression Wetland System, and seasonally-flooded clay pans in the Western Great Plains Closed Depression Wetland System. The global definition of this system needs further refinement.

## WETLAND SYSTEMS

### EASTERN FLOODPLAIN WETLAND

ELEMENT CODE: CES202.694



GLOBAL NAME: North-Central Interior Floodplain

CONCEPT SUMMARY: This ecosystem includes wetland communities primarily associated with the channels and floodplains of the Missouri River and its larger tributaries in the glaciated portion of eastern Nebraska, though it does extend westward along the Platte River and Loup River systems to central Nebraska. It includes a range of herbaceous wetland communities, an assortment of wooded communities, and seral stages from sparsely-vegetated annual sandbars to mixed-deciduous riparian forest.

Soils vary from saturated to somewhat poorly drained sands, silts and unconsolidated sediments. The communities included range from semi-permanently flooded aquatic to temporarily-flooded floodplain forest, woodland, shrubland, herbaceous, and sparsely-vegetated types. Herbaceous aquatic communities of backwaters and oxbows may be dominated by submersed and floating-leaved aquatic species, and are often bordered by marshes with emergent vegetation such as cattails (*Typha* spp.) and bulrushes (*Schoenoplectus* spp., *Bolboschoenus fluviatilis*). Woody communities vary from mixed herbaceous – woody sandbar communities to willow (*Salix* spp.) dominated shrubland to cottonwood (*Populus deltoides*) and peachleaf willow (*Salix amygdaloides*) dominated woodlands. As the willows, and then the cottonwood species mature, they are replaced with various deciduous trees creating a cottonwood-mixed deciduous woodland and finally a mixed-deciduous forest lacking cottonwood. Flooding is an important process allowing for regeneration of pioneer woody species, and such actions as dam-building and stabilization of river channels threatens the long-term persistence of cottonwood and willow dominated communities.

DISTRIBUTION: In Nebraska, this system is most common in the floodplains of the Missouri River below Gavin's Point Dam, along the Platte River west to Hall County, along the Elkhorn River west to Antelope County, in the Loup River system in Howard, Sherman, and possibly Custer counties, as well as in scattered locations along the Big Blue River and Nemaha River systems. The system apparently extends from Nebraska east to Ohio, north to Minnesota, and south to Missouri.

EPA ECOREGIONS: 27e, 27f, 27g, 47

COMMUNITIES INCLUDED:

- Eastern Riparian Forest
- Cottonwood-Peachleaf Willow Riparian Woodland
- Eastern Cottonwood-Dogwood Riparian Woodland
- Cottonwood-Diamond Willow Woodland
- Sandbar Willow Shrubland
- Riparian Dogwood False-Indigobush Shrubland
- Eastern Pondweed Aquatic Wetland
- Water-lily Aquatic Wetland
- American Lotus Aquatic Wetland
- Eastern Bulrush Deep Marsh
- Reed Marsh

- Perennial Sandbar
- Sandbar/Mudflat

The communities in this system represent short to long-lived seral stages typical of floodplains in eastern Nebraska. In temporarily to seasonally-flooded areas, sandbars and mudflats represent the earliest successional stages, remaining unvegetated or sparsely vegetated by annuals and tree seedlings. Sandbars and riverbanks that are not scoured of vegetation each year may become dominated by perennial graminoids and young saplings of trees or shrubs (Perennial Sandbar community). Such sites may then develop into shrubland, or into young woodland dominated by cottonwoods, often growing with sandbar willow and/or peachleaf willow in earlier stages, which are replaced by other mesophytic deciduous trees as succession continues until a riparian forest stage is reached. In portions of the Missouri River north of Omaha, mixed-deciduous trees have been unsuccessful in creating a subcanopy and a dense, tall layer of rough-leaved dogwood simulates a short subcanopy. In the Elkhorn and Loup systems, a Cottonwood–Diamond Willow woodland appears intermediate between earlier cottonwood woodland stages and riparian forest.

Flooded wetlands range from pondweed dominated wetlands where water is deepest, to water-lily dominated wetland (nearly extirpated from eastern Nebraska) and American lotus dominated wetland (also nearly extirpated), the latter of which may merge with emergent bulrush-dominated communities. In the shallowest flooded wetlands, cattails may co-occur with bulrushes, especially river bulrush, and patches of common reed may occupy shallower sites still.

**ENVIRONMENT:** This system occurs primarily in glaciated areas in saturated to somewhat poorly-drained organic and mineral soils varying from sands to clays, formed mostly from alluvium. Most herbaceous communities remain inundated by up to 1 m of water through most of the year, with some marsh areas becoming dry in mid to late summer, or during prolonged drought. Woodlands may be only flooded temporarily, while sandbar areas are frequently seasonally inundated.

**VEGETATION:** The most prominent communities of this system are woodlands dominated by cottonwood and willows. Such communities rarely have a well-developed understory, though rough-leaved dogwood (*Cornus drummondii*) is sometimes dense beneath cottonwoods along the Missouri River. As mature trees are replaced, species including box-elder (*Acer negundo*), black walnut (*Juglans nigra*), American elm (*Ulmus americana*), hackberry (*Celtis occidentalis*), and green ash (*Fraxinus pennsylvanica*) may share dominance. Silver maple (*Acer saccharinum*) may dominate locally in particularly wet sites. Shrubs associated with maturing forest include coralberry (*Symphoricarpos orbiculatus*), wolfberry (*S. occidentalis*), and rough-leaved dogwood. Vines, including riverbank grape (*Vitis riparia*), eastern poison ivy (*Toxicodendron radicans* var. *negundo*), Virginia creeper (*Parthenocissus quinquefolia*) and greenbriar (*Smilax hispida*) are often dense. Aquatic communities may be dominated by pondweeds (*Potamogeton* spp.) and rarely American lotus (*Nelumbo lutea*). Marshes are typically dominated by cattails and bulrushes along with other plants such as arrowhead (*Sagittaria* spp.), bur-reed (*Sparganium eurycarpum*) and common reed (*Phragmites australis* ssp. *americanus*).

**DYNAMICS:** Past and present overgrazing by livestock and white-tail deer threaten diversity, as does land clearing for cropland and urban development, which results in excessive runoff and

sediment deposition. Channelization and dam building have both reduced the frequency of beneficial floods and exacerbated the impact of siltation. Historically fires were apparently of frequent occurrence in the Missouri River floodplain but because of land clearing for agriculture have since been all but eliminated. The most serious invasive species that threaten the communities in this system include garlic mustard (*Alliaria petiolata*), Amur honeysuckle (*Lonicera maackii*), purple loosestrife (*Lythrum salicaria*), white mulberry (*Morus alba*), common buckthorn (*Rhamnus cathartica*), multiflora rose (*Rosa multiflora*), and narrow-leaf cattail (*Typha angustifolia*). Other likely or potential invasives include Amur maple (*Acer ginnala*) tree-of-heaven (*Ailanthus altissima*), common burdock (*Arctium minus*), Japanese barberry (*Berberis thunbergii*), poison hemlock (*Conium maculatum*), autumn-olive (*Elaeagnus umbellata*), ground-ivy (*Glechoma hederacea*), dame's-rocket (*Hesperis matronalis*), Japanese hops (*Humulus japonicus*), yellow iris (*Iris pseudoacorus*), border privet (*Ligustrum obtusifolium*), Amur honeysuckle (*Lonicera maackii*), Tatarian honeysuckle (*Lonicera xbella*), moneywort (*Lysimachia nummularia*), Osage orange (*Maclura pomifera*), curly pondweed (*Potamogeton crispus*), Siberian elm (*Ulmus pumila*), ivy-leaved speedwell (*Veronica hederifolia*), winged spindletree (*Euonymus alatus*), wintercreeper (*Euonymus hederaceus*), Japanese honeysuckle (*Lonicera japonica*), highbush cranberry (*Viburnum opulus*) and Oriental bittersweet (*Celastrus orbiculata*).

COMMENTS: The wooded communities included in this system are riverfront woodlands. Bottomland oak forests are included in other systems. Pound & Clements (1900) indicate the presence of three types of riparian woodland in their "Wooded Island Formation", namely a cottonwood type along the Missouri River, a willow type from the 'Great Bend' (presumably northeast Nebraska) to the mouth of the Niobrara River, and a mixed cottonwood-willow type on the Niobrara itself. They do not mention the presence of mixed-deciduous woods other than to suggest the infrequent inclusion of wild plum (*Prunus americana*) and box-elder, but mention the presence of a shrub layer of rough-leaf dogwood and gooseberry (*Ribes missouriense*). It would appear the Eastern Cottonwood-Dogwood Woodland community represents mature stands of the cottonwood dominated woods. Weaver (1960) reported that cottonwood was the only large tree on the banks of the Missouri and Elkhorn rivers north of central Nebraska.

## **WESTERN GREAT PLAINS FLOODPLAIN**

ELEMENT CODE: CES303.678, CES303.676

GLOBAL NAME: Western Great Plains Floodplain, Northwestern Great Plains Floodplain

CONCEPT SUMMARY: This system includes woody and herbaceous communities associated with larger rivers and streams in the Great Plains region, primarily the Platte River and its tributaries, the Niobrara River and White River, portions of the Loup System, and the Republican River system in southern Nebraska. It includes communities that are subject to at least occasional seasonal inundation, usually following spring snowmelt but also rarely after very heavy rain events. Communities range from woodland to shrubland, marsh, wet meadow and sparsely vegetated sandbars and riverine gravel flats, with other herbaceous communities restricted to other systems (primarily the Great Plains Woody Draw, Ravine, and Canyon

System). Cottonwood (*Populus deltoides*) and willows (*Salix* spp.) make up the dominant woody vegetation, and may sometimes occur with an understory of tall prairie grasses such as switchgrass (*Panicum virgatum*) and scattered upland shrubs including snowberry (*Symphoricarpos occidentalis*) and buffaloberry (*Shepherdia argentea*). Rapidly-drained communities such as gravel flats may also be home to xerophytic species typically associated with uplands, but the bulk of the herbaceous vegetation is typical of Great Plains wetlands.

Soils vary from flooded mucks and sands to rapidly-drained gravels and cobbles, and the communities range from seasonally flooded to temporarily inundated following high water flows. Flooding is an important process allowing for regeneration of pioneer woody species, and such actions as dam-building and stabilization of river channels threatens the long-term persistence of cottonwood and willow dominated communities.

**DISTRIBUTION:** In Nebraska, this system is most common in the floodplains of the Platte, North Platte and South Platte rivers east to Buffalo County, and in portions of the Niobrara River valley. It occurs to a lesser extent along the White River and is scattered in the Loup River system in central Nebraska and associated with larger rivers in the Sandhills. It probably occurs along the Republican River, but the vegetation of the Republican River floodplain is poorly known. Nebraska is at the northern limit of the Western Great Plains Floodplain and the southern limit of the Northwestern Great Plains floodplain systems, which have an overall range extending from southern Canada to Texas and New Mexico.

**EPA ECOREGIONS:** 25, 27b, 27e, 27g, 42?, 43, 44

**COMMUNITIES INCLUDED:**

- Cottonwood-Peachleaf Willow Riparian Woodland
- Cottonwood Riparian Woodland
- Peachleaf Willow Woodland
- Sandbar Willow Shrubland
- Cattail Shallow Marsh
- Northern Cordgrass Wet Prairie
- Perennial Sandbar
- Riverine Gravel Flats
- Sandbar/Mudflat

The communities in this system represent mostly early seral stages typical of floodplains in central and western Nebraska, though it is possible more mature forest communities typical of eastern Nebraska may also be found in places. Most woodland is presumably dominated by cottonwood with a lesser amount of peachleaf willow and sometimes a shrub layer of sandbar willow, though areas of open cottonwood stands with little additional woody vegetation are known from along the Platte Rivers and elsewhere in the Panhandle. Of the shrub communities found in larger floodplains the Sandbar Willow Shrubland is the only common and extensive one subject to regular flooding. More study of the marsh and wet meadow communities is needed, but for now the Cattail Shallow Marsh will encompass most marsh communities while Northern Cordgrass Wet Prairie encompasses most of the wet grassland/meadow communities. Alkaline wetlands, common in the Panhandle, are included in a different system. Riverine gravel flats are

somewhat unique in Nebraska to the Platte River and are particularly common west of North Platte to the Wyoming and Colorado borders. Such sites are usually sparsely to moderately vegetated by an assortment of herbaceous annuals and perennials, though some sites may have an open canopy of cottonwood.

**ENVIRONMENT:** This system occurs in the unglaciated Great Plains in flooded to rapidly drained, mostly mineral soils varying from sands to silt, and formed mostly from alluvium. The herbaceous communities are seasonally flooded by up to 1 m of water or intermittently flooded following spring floods and heavy rains. Most woodlands are flooded only temporarily, while sandbar areas are frequently seasonally inundated.

**VEGETATION:** The most prominent feature of this system is woodland dominated by cottonwood and willows. Such communities rarely have a well-developed understory, though sandbar willow (*Salix interior*) is sometimes patchy beneath cottonwoods. In most places, peachleaf willow (*S. amygdaloides*) forms an open subcanopy layer, though in places assorted other deciduous trees may also be present including box-elder (*Acer negundo*), American elm (*Ulmus americana*), hackberry (*Celtis occidentalis*), and green ash (*Fraxinus pennsylvanica*). A few sites have a tall cottonwood canopy with little or no subcanopy or shrub layer, and it is suspected many such sites along the Platte owe their existence to elimination of regular flooding below Kingsley Dam. Patches of wolfberry (*Symphoricarpos occidentalis*), are occasionally present, that are rarely subject to flooding, and those large enough to consider as a separate community are included in the Great Plains Wooded Draw, Ravine, and Canyon System. Marshes typically dominated by cattails (*Typha* spp.) may be present along margins of channels and backwaters, and wet prairie dominated by prairie cordgrass (*Spartina pectinata*) may be found along the margins. Sandbars may vary from sparsely vegetated by annuals (Sandbar/Mudflat) to dominated by perennial graminoids and young shrub and tree saplings (Perennial Sandbar). Sometimes sparsely vegetated gravel flats dominated by annual and perennial herbs may occur on low terraces above the river banks, especially along the North and South Platte rivers upstream from their confluence.

**DYNAMICS:** Past and present overgrazing by livestock represent an important ongoing threat to natural diversity, as does land clearing and excavation of sand and gravel in places. The construction of Kingsley Dam has reduced the frequency of beneficial floods and increased the density of woody vegetation at the expense of herbaceous wetlands along the Platte River. Several invasive species represent a serious threat, the worst posed by Eurasian phragmites (*Phragmites australis* ssp. *australis*), purple loosestrife (*Lythrum salicaria*), Russian olive (*Elaeagnus angustifolia*), and narrow-leaf cattail (*Typha angustifolia*), all of which severely impact native communities. Other species such as redtop (*Agrostis gigantea*), Garrison creeping foxtail (*Alopecurus arundinaceus*), smooth brome (*Bromus inermis*), Canada thistle (*Cirsium arvense*), quackgrass (*Elymus repens*), leafy spurge (*Euphorbia esula*), white and yellow sweetclovers (*Melilotus albus*, *M. officinalis*), reed canary-grass (*Phalaris arundinacea*), and Kentucky bluegrass (*Poa pratensis*) are well-established in some communities. Other invasive species that show potential to become problematic include common burdock (*Arctium minus*), poison hemlock (*Conium maculatum*), white mulberry (*Morus alba*), common buckthorn (*Rhamnus cathartica*), multiflora rose (*Rosa multiflora*), yellow iris (*Iris pseudoacorus*), European privet (*Ligustrum vulgare*), Scotch thistle (*Onopordum acanthium*), salt-cedar

(*Tamarix ramosissima*), Siberian elm (*Ulmus pumila*), and broad-leaf pepperwort (*Lepidium latifolium*).

COMMENTS: Mixed-deciduous hardwood areas found in floodplains may be young versions of Eastern Riparian Forest (the western limits of which are poorly known) or examples of Green Ash–Elm–Hackberry Canyon Bottom Woodland, which may also be found in floodplains of larger rivers. Other woody communities such as Buckbrush Shrubland, Buffaloberry Shrubland and Chokecherry–Plum Shrub Thicket may also be occasionally present, but are rarely subject to flooding. This system is poorly studied, and future additions may be needed, particularly to the herbaceous wetland communities.

The Platte River drainage is considered the northern boundary of the Western Great Plains Floodplain System by NatureServe, whereas the Niobrara River is considered the south boundary of the Northwestern Great Plains Floodplain System. Due to considerable overlap in communities, these have been combined in the Nebraska classification. Wetland communities primarily associated with smaller streams in the northern Panhandle may be found in the Northwestern Great Plains Riparian System.

## **EASTERN GREAT PLAINS WET-MEADOW, PRAIRIE AND MARSH**

ELEMENT CODE: CES205.687

CONCEPT SUMMARY: This ecosystem includes herbaceous wetland communities associated primarily with creeks, streams and rivers (occasionally pond margins) in the glaciated eastern portion of the state. Its distribution coincides in part with the Eastern Floodplain Wetland System, and includes wet meadow and wet prairie communities associated with that system, in addition to wetland communities occurring in smaller drainages that are not part of that system. This system includes seep and fen communities found in eastern Nebraska, along with wet meadow, wet prairie, and marsh communities, including the saline wetland communities in the vicinity of Lincoln.

In most instances, this system is found in drainages within loess-mantled hills and soils are usually silt loams or silty clay loams formed in loess or glacial till and alluvium. The saline wetland and prairie fen communities are associated with outcrops of the Cretaceous Dakota Sandstone Formation, and in both cases the communities are supplied with groundwater by these strata. In the case of some saturated wetlands, soils may be formed mostly or entirely from organic matter. Communities in this system are generally dominated by hydrophytic graminoids including prairie cordgrass (*Spartina pectinata*), sedges (*Carex* spp.), leafy bulrushes (*Scirpus* spp.) and cattails (*Typha* spp.). Flooding and fire prevented these communities from being displaced by woody vegetation historically. Most examples have been impacted by drainage associated with agricultural conversion or urban development.

DISTRIBUTION: In Nebraska, this system is found mostly in the glaciated eastern fifth of the state, extending somewhat westward into central Nebraska along the Platte, Big Blue, Little Blue and possibly the Loup river systems. This system extends south into Kansas, east to western Illinois, and north to Minnesota.

EPA ECOREGIONS: 27, 47

COMMUNITIES INCLUDED:

- Freshwater Seep
- Prairie Fen
- Cattail Shallow Marsh
- Eastern Saline Marsh
- Eastern Cordgrass Wet Prairie
- Eastern Saline Meadow
- Eastern Sedge Wet Meadow

These communities are commonly associated with riparian woodland and other wetland communities, and a given site may contain elements from several systems. This system consists primarily of herbaceous wetlands found along small drainages in eastern Nebraska, and is often associated with the Eastern Floodplain Wetland System, especially along larger rivers. The seep and fen communities are saturated much of the year but only temporarily flooded. The Freshwater Seep may be associated with prairie or woodland settings, while the Prairie Fen, as the name suggests, is restricted to intact tall-grass prairie. Wetlands dominated by cattails and bulrushes can be regarded as belonging to the Cattail Shallow Marsh community, which is usually bordered by the Eastern Sedge Wet Meadow (which may be dominated by sedges, leafy bulrush, or coarse wetland perennial herbs), that is in turn bordered by the Eastern Cordgrass Wet Prairie community, which may grade into upland communities such as tall-grass prairie. Saline marsh and meadow communities are restricted to Lancaster and Saunders counties and are often identifiable by the associated salt crusts.

ENVIRONMENT: This system occurs in saturated to somewhat poorly-drained organic and mineral soils and includes mostly silt loam and silty clay loam formed in loess, glacial till, and alluvium. Most areas are flooded temporarily in the spring, though marshes may remain inundated by up to 1 m of water through most of the growing season, often drawing down in mid to late summer or during prolonged drought. Seep and fen communities remain saturated for much of the season, though water levels may lower similarly in late summer and during drought. Saline communities frequently dry out during the summer leaving conspicuous salt crusts at the surface.

VEGETATION: The communities in this system are currently limited in extent, though presumably the wet meadows and wet prairies were once fairly extensive. These communities are dominated by tall sod-forming grasses such as prairie cordgrass (*Spartina pectinata*), with switchgrass (*Panicum virgatum*) and other tall-grass prairie species including big bluestem (*Andropogon gerardii*) and Indiangrass (*Sorghastrum nutans*) occasionally present. Wetter areas may be dominated by sedges including woolly sedge (*Carex pellita*) and smoothcone sedge (*C. laeviconica*), leafy bulrushes (*Scirpus* spp.) and other perennial hydrophytic herbs such as blue vervain (*Verbena hastata*) and hemp dogbane (*Apocynum cannabinum*). Due to the salt content of the soils, saline meadows may include more drought-tolerant plants including inland saltgrass (*Distichlis spicata*) and western wheatgrass (*Pascopyrum smithii*). Marshes are dominated by

broad-leaf cattail (*Typha latifolia*) and arrowheads (*Sagittaria* spp.), both of which are also often present in seep and fen communities with a wide array of wetland graminoids and herbs.

**DYNAMICS:** Efforts to convert wet prairies and meadows to more efficient agricultural use (ditching, seeding of alien forage plants) has degraded the majority of communities. Many sites that have not been converted to cropland are severely overgrazed. Such sites are often subject to invasive weeds including plumeless thistle (*Carduus acanthoides*), Canada thistle (*Cirsium arvense*), purple loosestrife (*Lythrum salicaria*) and European phragmites (*Phragmites australis* ssp. *australis*). Other invaders that have become thoroughly established include redtop (*Agrostis gigantea*), reed canarygrass (*Phalaris arundinacea*), Kentucky bluegrass (*Poa pratensis*) and narrowleaf cattail (*Typha angustifolia*) that latter of which has hybridized extensively with the native cattail. Garrison creeping foxtal (*Alopecurus arundinaceus*) and field sow-thistle (*Sonchus arvensis* var. *glabrescens*) may become problematic, more so in the northern part of the state.

**COMMENTS:** The system is defined by NatureServe to include all the flooded and non-flooded wetland communities of eastern Nebraska (including those in the Eastern Floodplain Wetland System) with the exception of wooded communities. Since the western boundary of the system is poorly defined, it overlaps considerably with the Western Great Plains Open Freshwater Depression Wetland System, and areas along the central Platte and Loup river systems may contain wetland elements from both systems (as may areas along the Elkhorn River).

## **WESTERN GREAT PLAINS OPEN FRESHWATER DEPRESSION WETLAND**

**ELEMENT CODE:** CES303.675

**CONCEPT SUMMARY:** This ecosystem includes herbaceous wetland communities found primarily in grassland (rather than a floodplain) environments that are generally in contact with the water table through much of the season. It includes saturated seep and fen communities, submergent and emergent marshes, and subirrigated wet meadows and wet prairies. It is most abundant in the Nebraska Sandhills, but may be found anywhere in the unglaciated portion of the state, and may even be present within the glaciated region along the Platte and Elkhorn rivers.

In most instances, this system is found in depressions within prairie, though it may also be found along the margins of lakes and ponds as well. Soils vary from saturated to somewhat poorly-drained sands, sandy loams and loams and are formed in eolian sand, bedrock, or alluvium. A wide variety of aquatic and hydrophytic species may dominate including submersed pondweeds (*Potamogeton* spp.), cattails (*Typha* spp.), bulrushes (*Schoenoplectus* spp.), sedges (*Carex* spp.), prairie cordgrass (*Spartina pectinata*) and northern reedgrass (*Calamagrostis stricta*). Woody communities found in the floodplain systems may also be present as small patches and should be considered part of this system when they are present. Fire played a role in limiting the woody vegetation within these communities, though some (such as Sandhills fens) probably always contained a significant shrubby component. Many examples have been impacted by drainage and seeding to alien forage species for hay production.



**DISTRIBUTION:** In Nebraska, this system is found mostly in the unglaciated portions of central and western Nebraska, extending somewhat eastward into glaciated part of the state along the Elkhorn and Platte rivers. This system occurs throughout the mixed-grass prairie dominated portions of the Great Plains from Texas north to North Dakota and eastern Montana.

**EPA ECOREGIONS:** 25b, 27e, 27g, 42p, 43i, 44, 471

**COMMUNITIES INCLUDED:**

- Freshwater Seep
- Sandhills Fen
- Northern Pondweed Aquatic Wetland
- Water-lily Aquatic Wetland
- Sandhills Hardstem Bulrush Marsh
- Cattail Shallow Marsh
- Reed Marsh
- Northern Cordgrass Wet Prairie
- Sandhills Wet Meadow

High-quality submergent wetlands are recognizable in the Sandhills by their relative abundance of broad-leaved and narrow-leaved submersed pondweeds, and in some areas by the presence of spatterdock or water-shield (or introduced white water-lily). Wild rice may be associated with such communities as a scattered emergent in some instances. Sandhills marshes are commonly dominated by hardstem bulrush, though soft-stem bulrush is sometimes more abundant westward and southward, as well as in marshy seeps. Shallow marshes with cattails and species such as slender bulrush (*Schoenoplectus heterochaetus*) may be found scattered in the eastern Sandhills, and should be considered part of the Cattail Shallow Marsh community, as should semi-natural stands of cattails in shallow depressions. Most wet meadows and wet prairies are hayed and dominated by native and alien cool-season graminoids, and in these cases, the Sandhills Wet Meadow and Northern Cordgrass Wet Prairie communities are often not distinguishable from each other. Where they are unmowed, Sandhills Wet Meadow often occupies the borders of marshes or depressions within areas of wet prairie. The presence of bluejoint and northern reedgrass usually (though not always) may distinguish wet meadow communities within the Sandhills. Outside the Sandhills, northern reedgrass tends to occur mixed with prairie cordgrass, and most wet meadow habitats in such places are probably Northern Cordgrass Wet Prairie. Fens occur in Boone, Cherry, Garfield, Grant and Wheeler counties, and many small areas that appear to be fens should be classified as Freshwater Seep if their status is unclear. Alkaline wetlands in the Sandhills are included in the Western Great Plains Saline Depression Wetland System.

**ENVIRONMENT:** This system occurs in saturated to somewhat poorly-drained organic and mineral soils and includes mostly sands, sandy loams and loams formed in eolian sand, bedrock, and alluvium. Most areas are flooded at least temporarily in the spring, though marshes may remain inundated by up to 1 m of water through most of the growing season. Seep and fen communities remain saturated for much of the season, though water levels may lower similarly in late summer and during drought. Wet meadows and prairie are flooded temporarily in the

spring or following heavy rains, and the water table remains relatively close (<1 m) to the surface through most of the growing season.

**VEGETATION:** The most extensive communities in this system are the native hay meadows and wet prairies, which are dominated by tall sod-forming grasses such as prairie cordgrass (*Spartina pectinata*) and northern reedgrass (*Calamagrostis stricta*), with switchgrass (*Panicum virgatum*) and other tall-grass prairie species including big bluestem (*Andropogon gerardii*) and Indian grass (*Sorghastrum nutans*) are occasionally present. Wetter areas may be dominated by sedges including woolly sedge (*Carex pellita*), Sartwell's sedge (*C. sartwellii*), and pointed broom sedge (*C. scoparia*) with an assortment of rushes. Hardstem bulrush (*Schoenoplectus acutus*) is abundant in most marshes where it often occurs with cattails (*Typha* spp.), common arrowhead (*Sagittaria latifolia*), and an array of submersed pondweeds (*Potamogeton* spp.) and other aquatics. Shallower wetlands may be almost entirely dominated by common reed (*Phragmites australis* ssp. *americanus*).

**DYNAMICS:** Hydrology is the most important process effecting this ecosystem, and efforts to convert wet prairies and meadows to dry hay meadows (ditching, seeding of alien forage plants) has degraded the majority of communities. Regular early-summer haying has converted many sites from dominance by native warm-season grasses to an abundance of sedges, rushes, and invasive cool-season grasses and forage plants. Invasives commonly occurring in hayed sites include redtop (*Agrostis gigantea*), Garrison creeping foxtail (*Alopecurus arundinaceus*), smooth brome (*Bromus inermis*), reed canarygrass (*Phalaris arundinacea*), timothy (*Phleum pratense*) and Kentucky bluegrass (*Poa pratensis*). Invasive species that seriously threaten sites that are not regularly hayed include Canada thistle (*Cirsium arvense*), leafy spurge (*Euphorbia esula*), purple loosestrife (*Lythrum salicaria*), phragmites (*Phragmites australis* ssp. *australis*) and narrowleaf cattail (*Typha angustifolia*). Other potentially problematic invaders include yellow bedstraw (*Galium verum*), narrow-leaf bird's-foot trefoil (*Lotus tenuis*) and field sow-thistle (*Sonchus arvensis* var. *glabrescens*). Invasion by carp threatens submerged communities.

**COMMENTS:** The system is based primarily on natural wetlands associated with valleys and depressions in the Sandhills and its periphery (especially to the north), but may also extend into northeast Nebraska, especially along the Elkhorn River drainage. Such sites were also known in the sandhills dunes of southwestern Nebraska but have mostly been destroyed through groundwater pumping. Artificial impoundments in the mixed-grass prairie region may contain aquatic communities similar to naturally-occurring communities of the eastern part of the state, but should not be considered part of the Eastern Floodplain Wetland System.

## **WESTERN GREAT PLAINS CLOSED DEPRESSION WETLAND**

**ELEMENT CODE:** CES303.666

**CONCEPT SUMMARY:** This ecosystem includes herbaceous wetland communities found primarily in upland depression basins in a grassland environment. They are typified by having an impermeable clay pan layer and are recharged by rainwater and runoff. They are usually flooded by spring rains and tend to draw down or dry completely out later in the season. In the

largest examples, marsh vegetation may develop, including cattails (*Typha* spp.) and river bulrush (*Bolboschoenus fluviatilis*), but generally the impervious clay pan prevents establishment of deep-rooted aquatic macrophytes. Among the more common species in smaller basins are smartweeds (*Persicaria* spp.), spikerushes (especially *Eleocharis macrostachya*), Plains coreopsis (*Coreopsis tinctoria*) and numerous (mostly) annual herbs and grasses. Foxtail barley (*Hordeum jubatum*) is often common at the margin of these depressions, and western wheatgrass (*Pascopyrum smithii*) and buffalograss (*Buchloë dactyloides*) often occupy the temporarily-flooded zone along the margins of these basins. Examples of these communities may be found statewide, but are most common in the Rainwater Basin Plains, portions of southwest Nebraska, the Pierre Shale Plains of northwest Nebraska, and in certain areas within the tall-grass prairie region (e.g the Todd Valley). The basins tend to form in silt loams derived from loess (in the Rainwater Basin) or in clay (Pierre Shale Plains) derived from loess or bedrock. Agricultural conversion has resulted in destruction of most sites, and intact sites are generally impacted by siltation and reduction in water quality due to adjacent agricultural practices. On the Pierre Shale plains, the most extensive examples are associated with artificial impoundments, though some natural depressions are present.

**DISTRIBUTION:** In Nebraska, this system is found mostly in Rainwater Basin Plains in south-central Nebraska from Gosper County east to western Seward and south to northern Thayer and Nuckolls counties. It is also scattered in southwest Nebraska from eastern Deuel south and east into Keith, Perkins, Chase and Dundy counties. Concentrations of small wetland basins also occur on the Pierre Shale Plains north of the Pine Ridge in Sioux and Dawes counties, while isolated basins may be found in uplands nearly anywhere in the state. This system is most prevalent in the southern Great Plains from Oklahoma north to southern Nebraska, but is scattered northward and westward to eastern Wyoming and central Montana.

**EPA ECOREGIONS:** 25, 27e, 27f, 42h, 43g, 47 (rare)

**COMMUNITIES INCLUDED:**

- Cattail Shallow Marsh
- Playa Wetland
- Spikerush Vernal Pool
- Wheatgrass Playa Grassland

Larger basins may contain well-developed examples of the Cattail Shallow Marsh community populated mostly by cattails and river bulrush, with scattered patches of slender bulrush often also present. In shallower water, perennial species such as large-spike spikerush (*Eleocharis macrostachya*), rice cutgrass (*Leersia oryzoides*) and swamp smartweed (*Persicaria coccinea*) are often present with an array of annual plants including barnyardgrass (*Echinochloa* spp.) and smartweeds (*Persicaria* spp.) that make up the "outer marsh" portion of this community. The Cattail Shallow Marsh is often bordered by a zone of sedges (*Carex* spp.), Kentucky bluegrass, western wheatgrass and/or buffalograss that usually forms a band around the marsh, and constitutes the Wheatgrass Playa Wetland community. In smaller basins, the lowest portion generally dries out earlier in the year than in larger basins, and annual species including smartweeds, barnyardgrass, and sprangletop (*Leptochloa fusca*) often dominate with an

array of annuals and often a few scattered perennials, constituting the Playa Wetland community. This community may often occur in the center of some larger basins as well. Finally the Spikerush Vernal Pool is generally limited to small, deep, bowl-shaped depressions that may have submersed aquatic vegetation in the spring, but are replaced by a dense stand of hairgrass (*Eleocharis acicularis*) or large-spike spikerush as they dry out later in the season. Submersed aquatics are sometimes present in high quality examples of pond marsh, but the Spikerush Vernal Pool refers primarily to isolated, small wetland depressions with little zonation. In some larger basins, the Cattail Shallow Marsh may not be readily separable from the Playa Wetland community, in which case the term "Pond Marsh" can be used to describe the entire wetland complex.

**ENVIRONMENT:** This system occurs in poorly drained silt loams and clays derived from loess and shaly bedrock (such as Cretaceous Pierre Shale) and is characterized by an impermeable underlying clay pan. Sites are generally flooded by runoff from spring rains and snow melt but may also be flooded following heavy rains. Communities vary from temporarily to seasonally flooded. Sites generally do not have a direct connection to the water table.

**VEGETATION:** Some sites may have submerged ephemeral vegetation early in spring, including water-thread pondweed (*Potamogeton diversifolius*) and water starworts (*Callitriche spp.*) but most basins lack submerged vegetation. Larger basins may develop persistent marsh vegetation dominated by cattails, river bulrush, and slender bulrush (*Schoenoplectus heterochaetus*) with arrowheads (*Sagittaria brevirostra*, *S. cuneata*, *S. graminea*), and large-fruit burreed (*Sparganium eurycarpum*) sometimes also present. Smaller basins often lack persistent perennial hydrophytes and are dominated by annual/biennial plants including Plains coreopsis, smartweeds and numerous other annuals. Foxtail barley is often associated with the periphery of smaller basins, while larger ones may have rice cutgrass (*Leersia oryzoides*) and even occasional wet meadow species such as sedges (*Carex spp.*). The outermost, temporarily flooded areas tend to be occupied by perennial grassland species including western wheatgrass and buffalograss.

**DYNAMICS:** Hydrology is the primary process affecting this ecosystem, and species composition may vary year to year in response to moisture. Most sites in the Rainwater Basin Plains and southwest Nebraska have been drained and converted to cropland, and remaining sites have generally been degraded by runoff from adjacent agriculture and livestock grazing operations. Siltation of basins has impacted some species sensitive to water quality (*e.g. Isoetes melanopoda*) and several other species once recorded from these communities are now rare or extirpated from them. Siltation also promotes the spread of invasive species in these sites. Basins occurring on Pierre Shale have been subject less to agricultural conversion but have been impacted by grazing and degraded water quality. Late-season wildfires probably once served a role in removing standing vegetation from basins, especially eastward. Invasive species that threaten larger basins include reedtop (*Agrostis gigantea*), phragmites (*Phragmites australis* ssp. *australis*) and narrow-leaf cattail (*Typha angustifolia*). Reed canary-grass (*Phalaris arundinacea*) has overtaken many basins, and in places, the native river bulrush may be aggressive. In northwest Nebraska, halogeton (*Halogeton glomeratus*) could invade clay pans.

**COMMENTS:** The southern Nebraska wetlands appear to fit the definition of this system rather closely, but the clay pan areas on Pierre Shale tend toward alkalinity and have a different array of

species. It is possible they should be treated in the Northwestern Great Plains Riparian system instead.

## **WESTERN GREAT PLAINS SALINE DEPRESSION WETLAND**

ELEMENT CODE: CES303.669

**CONCEPT SUMMARY:** This ecosystem includes herbaceous wetland communities similar to those found in the Western Great Plains Open Freshwater Depression Wetland and the Western Great Plains Closed Depression Wetland, but occurring on alkaline soils. In many cases, salt encrustations are formed at the surface as water draws down, but in one community (Western Alkaline Subirrigated Meadow) they may not be readily visible. In some instances, communities may rely primarily on rainfall or runoff, while others are connected to groundwater. In the wettest examples, submersed vegetation may be conspicuous, with spiral ditchgrass (*Ruppia occidentalis*) and sago pondweed (*Stuckenia pectinata*) common in more brackish water. Emergent macrophytes are often not conspicuous in highly alkaline settings, but three-square bulrush (*Schoenoplectus pungens*), and less commonly Nevada bulrush (*Amphiscirpus nevadensis*), may predominate in some sites. Temporarily flooded areas within this system are often dominated by inland saltgrass (*Distichlis spicata*), foxtail barley (*Hordeum jubatum*) or alkali dropseed (*Sporobolus airoides*). Highly alkaline depressions associated with these sites often have conspicuous salt crusts and little vegetation, except for dwarfed alkali arrowgrass (*Triglochin maritima*) and seablite (*Suaeda calceoliformis*). In areas in which the water table remains close to the surface much of the year, a number of hydrophytic graminoids may dominate including alkali cordgrass (*Spartina gracilis*), clustered field sedge (*Carex praegracilis*), and Baltic rush (*Juncus arcticus* var. *balticus*), in addition to saltgrass and others. Most examples of these communities are found in the Panhandle, but they are also present locally in the northern and western Sandhills, along the Platte River to central Nebraska, and along the Republican River in the southwest part of the state. Most examples occur on silt loam or sandy loam soils formed in siltstone, calcareous alluvium, or eolian sand.

**DISTRIBUTION:** In Nebraska, this system is found mostly abundantly in the floodplain of the North Platte River from the city of North Platte west to the Wyoming border, and in the "Alkaline Lakes Area" or "Closed Basin" area of the western Sandhills. It is also extensively associated with drainages in the Pierre Shale Plains north of the Pine Ridge, and along the Niobrara River west of the Sandhills. Small, isolated inclusions are scattered in the northern Sandhills and along smaller permanent streams in the Panhandle. Degraded examples also occur sporadically eastward along the Platte River to Dawson County, and along the Republican River in Hitchcock and Red Willow counties. The system is most prevalent in the southern Great Plains, and extends south to Texas and New Mexico, north to North Dakota, and west to central Montana and eastern Wyoming.

EPA ECOREGIONS: 25d, 25g, 25h, 27b, 27g, 43g, 44a, 44b

## COMMUNITIES INCLUDED:

- Saline/Alkaline Aquatic Wetland
- Western Alkaline Marsh
- Western Alkaline Meadow
- Western Subirrigated Alkaline Meadow

Many alkaline lakes in the Sandhills have little in the way of submerged vascular plants, but some (*e.g.* Smith Lake at Crescent Lake Wildlife Refuge) have dense beds of ditchgrass and little emergent vegetation, and such sites may be classified as Saline/Alkaline Aquatic Wetland. In areas of lower alkalinity, sago pondweed may dominate, with lesser amounts of ditchgrass, and greater amounts of emergent vegetation, primarily bulrushes (*Schoenoplectus* spp.). Such sites may be classified either as Saline/Alkaline Aquatic Wetland or Western Alkaline Marsh depending on whether submerged or emergent vegetation is more prevalent. The alkali-grass/foxtail barley zone associated with the margins of alkaline marshes is now included in that community, whereas in previous classifications it was included with the Western Alkaline Meadow. The latter now consists primarily of the inland saltgrass dominated areas and associated salt flats which are usually dominated by annual halophytes such as sea blite or spearscales (*Atriplex* spp.), and dwarf forms of alkali arrowgrass. The description of the Subirrigated Alkaline Wet Meadow community is based on sites along the Niobrara River, but it may also be present in the western Sandhills and along smaller streams in the Panhandle. Unlike our other alkaline wetlands, the water table remains close to the surface throughout the year, and salt crusts are not conspicuous. Ephemeral stream channels on the Pierre Shale Plains may contain salt crusts, and these communities are tentatively placed in this system, though they may be better treated as a separate community within the Northwestern Great Plains Riparian System.

**ENVIRONMENT:** In most of its range, this system occurs in poorly drained silt loams and sandy loams, sometimes with an underlying clay pan, formed in alluvium or eolian sand. On the Pierre Shale Plains it may occur on clays derived from shaly bedrock. Most sites are temporarily to seasonally flooded by runoff from spring rains, snow melt, or heavy summer rains. Others may rarely flood, but remain wet due to a relatively high water table. Salts commonly accumulate as evaporites on shorelines, vegetation, and at times as a thin film on the water's surface. The most abundant salts are sodium and potassium carbonates, with calcium and magnesium carbonates common, but not abundant. Alkalinity is >5,000 mg/l in some Sandhill lakes, and salt crusts are most common in temporarily flooded sites, such as salt flats within the Western Alkaline Meadow community.

**VEGETATION:** Submerged vegetation may be present in some brackish Sandhills lakes and occasionally in basins in the North Platte River valley, where sago pondweed and widgeon-grass dominate. A few patches of softstem bulrush (*Schoenoplectus tabernaemontani*) may be present as an emergent with the submerged vegetation, but more commonly three-square bulrush and/or Nevada bulrush form a narrow band or locally extensive stand in shallow, seasonally flooded sites. Narrow-leaf cattail may invade sites that are less brackish. Salt-marsh bulrush (*Bolboschoenus maritimus* ssp. *paludosus*) is sometimes present at the border of such sites, and foxtail barley and Nuttall's alkali-grass (*Puccinellia nuttalliana*) commonly form a narrow band at the margin of the bulrush zone. This zone grades into temporarily flooded meadows often

dominated by inland saltgrass, meadow bluegrass (*Poa arida*) and alkali sacaton (*Sporobolus airoides*), and often include shallow depressions (salt flats) with little vegetation except for patches of dwarf alkali arrowgrass and annual halophytes such as seablite. In some wet sites particularly subirrigated meadows along permanent streams, alkaline wet meadows may be quite extensive, and generally lack salt flat inclusions. Among the dominant species in these sites are Baltic rush, alkali cordgrass, clustered field-sedge, scratchgrass (*Muhlenbergia asperifolia*) and, in higher areas, inland saltgrass and alkali sacaton.

**DYNAMICS:** Although hydrology is important, the presence of dissolved salts in the soil primarily defines this system. In cases of increased runoff caused by adjacent agricultural practices, salts may be leached from the soil, allowing invasive alien grasses to take hold. Most sites are unsuitable for crop production (though some alkaline meadows in the North Platte River valley have been converted to beet fields). Many intact sites, particularly along the North Platte River, are severely degraded from overgrazing. Late-season wildfires probably once served a role in removing standing vegetation from these sites. A few invasive species pose a threat, including narrow-leaf cattail (*Typha angustifolia*), which is well-established in some alkaline wetlands, and tall wheatgrass (*Thinopyrum ponticum*) which is locally abundant in some alkaline meadows. Other potential invasives include clasping pepperwort (*Lepidium latifolium*) and saltcedar (*Tamarix ramosissima*). Halogeton (*Halogeton glomeratus*) may become problematic in the vicinity of alkaline wetlands of the Pierre Shale Plains.

**COMMENTS:** Clay pan areas on Pierre Shale tend to be somewhat alkaline, but have a different array of species than the communities included here. It is possible they should be treated in the Northwestern Great Plains Riparian system instead.

## **UPLAND SPARSLEY VEGETATED SYSTEMS**

### **WESTERN GREAT PLAINS BADLANDS**

ELEMENT CODE: CES303.663

**CONCEPT SUMMARY:** This ecosystem occurs primarily in the unglaciated portion of the Missouri Plateau in the northwestern Great Plains and is defined by having extremely dry and easily eroded clay soils and very low (<25%) vegetative cover. Steeper slopes in badlands are generally unvegetated, though scattered annuals such as silver orache (*Atriplex argentea*) and povertyweed (*Monolepis nutalliana*) are sometimes found in small concentrations on lower slopes. Gentle slopes and fans at the base of badlands slopes may contain scattered shrubs and herbaceous plants, most commonly winged saltbush (*Atriplex canescens*), butte candle (*Cryptantha celosioides*), Hooker's sandwort (*Eremogone hookeri*), curly-top gumweed (*Grindelia squarrosa*), and broom snakeweed (*Gutierrezia sarothrae*). Soils are generally not developed, and plants grow on unconsolidated clays formed in Tertiary White River Group siltstones and claystones. Erosion is the primary natural process, and most sites are not heavily impacted by human-caused disturbance.

**DISTRIBUTION:** In Nebraska, this system occurs primarily in the Missouri Plateau on the north side of the Pine Ridge escarpment in Dawes and Sioux counties, but is also found in places below the Wildcat Hills escarpment in Scotts Bluff County. Its overall range extends north to southwestern North Dakota and eastern Montana.

**EPA ECOREGIONS:** 25f, 43g, 43h

**COMMUNITIES INCLUDED:**

- Badlands

Badlands formed in the Orella member of the Brule formation are generally recognizable by their tendency to form nearly unvegetated slopes as they erode, with much of the vegetation found in the outwash slopes at the base of these hills. Other strata within the White River group (e.g. Chadron fm., Rosebud fm.) are composed of siltstones and sandstones that form cliffs, and which may also be nearly unvegetated. Some sites in which ravines have channeled through these formations may be difficult to distinguish from communities in the Western Great Plains Cliff and Outcrop System and, when in doubt, should probably be included there.

**ENVIRONMENT:** This system occurs in the unglaciated Great Plains on extremely dry, rapidly drained siltstones and volcanoclastic claystones of the Tertiary White River Group sediments, and soils tend to be poorly developed or absent. Sites tend to occur within an upland grassland environment.

**VEGETATION:** This system is usually sparsely vegetated with a total cover under 10%, particularly on slopes, but up to 25% or higher in fans below badlands slopes. Shrubs and subshrubs are among the most common and conspicuous species, and include winged saltbush, broom snakeweed, few-flower false-buckwheat (*Eriogonum pauciflorum*), greasewood (*Sarcobatus vermiculatus*), and occasional patches of sagebrush, especially silver sagebrush (*Artemisia cana*), but often also big sagebrush (*A. tridentata*). Scattered annual and perennial herbs are often present, with annuals such as poverty weed and silver orache conspicuous on lower slopes, and thickspike wheatgrass (*Elymus lanceolatus*), butte candle, poison milkvetch (*Astragalus racemosus*) and pulse milkvetch (*A. multiflorus*) conspicuous in bottoms.

**DYNAMICS:** Erosion is the primary ecological process in this system, and sediments washed into drainages often store water that is utilized by annual plants. Given the sparse nature of the flora, grazing does little to degrade this community, and few invasive species can tolerate conditions there. Among the most common aliens are kochia (*Kochia scoparia*), and Russian thistles (*Kali* spp.), and the only invasive plants are cheatgrasses (e.g. *Bromus japonicus*, *B. tectorum*), which are well-established, and saltlover (*Halogeton glomeratus*), which is rapidly expanding its range.

**COMMENTS:** This system often occurs as an island within the Northwestern Great Plains Mixed-grass Prairie System, and may include elements of the Northwestern Great Plains Riparian System, and the Great Plains Wooded Draw, Ravine, and Canyon system. Patches of Buffaloberry Shrubland are present in places.



## WESTERN GREAT PLAINS CLIFF AND OUTCROP

ELEMENT CODE: CES303.665

**CONCEPT SUMMARY:** This ecosystem occurs where cliffs and outcrops are formed by erosion into bedrock, and is primarily composed of sandstone and chalk, often with interbedded shales. Very steep sites are often unvegetated, or have very sparse vegetation restricted to fractures and ledges, though sites that are moderately steep to nearly level often have small "islands" of shallow soil on which patches of vegetation may grow. On some nearly level outcrops of the Ogallala formation vegetation density may be well in excess of 10%, especially when they occur as a mosaic with mixed-grass prairie. Very few species occur on nearly vertical cliffs, with ten-petal blazing-star (*Mentzelia decapetala*) and smooth beardtongue (*Penstemon glaber*) among the most conspicuous examples. Grasses, short shrubs and perennial herbs, often with woody caudices, are commonly found in western outcrops, and among the most commonly seen are skunkbrush sumac (*Rhus aromatica* var. *trilobata*), milkvetches (*Astragalus* spp.), grama grasses (*Bouteloua* spp.), little bluestem (*Schizachyrium scoparium*), and broom snakeweed (*Gutierrezia sarothrae*). Outcrops in extreme east and southeast Nebraska tend to lack these species and often contain scattered grasses and tall-grass prairie species (when in the open), or ferns and mosses (when shaded). Soils are generally poorly developed or absent, and erosion and drought are important natural processes. Most sites are at little risk from human-created disturbance.

**DISTRIBUTION:** In Nebraska, this system occurs most commonly in the Nebraska Panhandle, but is also found in the southwest, north-central, northeast, and southeast parts of the state. Large concentrations of cliffs, rocky bluffs, and outcrops occur in the Pine Ridge, Wildcat Hills, Cheyenne Hills, along the North Platte River valley, the central Niobrara River valley, the Missouri River in northeastern Nebraska, and in the Smoky Hills in Jefferson County. The overall range of this system extends from northern Texas to southern Canada.

**EPA ECOREGIONS:** 25, 27a, 43r, 47h, 47i, 47k

**COMMUNITIES INCLUDED:**

- Western Sandstone Cliff
- Eastern Sandstone Bluff and Cliff
- Northern Chalk Bluff and Cliff
- Rock Outcrop

Limestone and sandstone cliffs are generally recognizable and are easily assigned to the proper community on the basis of substrate and location. Bluffs and footslopes of cliffs often contain talus fragments and unconsolidated sediments, which will usually serve to separate them from badlands. Whereas cliffs are often unvegetated, bluff slopes and foot slopes tend to have patches of vegetation exceeding 10% cover. The more extensive sandstone and siltstone communities of western Nebraska are divided into a cliff and a "Rock Outcrop" community, with the latter generally reserved for level, gently sloping or irregular rocky ledges in mixed-grass prairie or on level summits of buttes. These sites often tend to contain denser and more varied

vegetation than cliffs, and the density of vegetation may, in some cases, help to distinguish them from the relatively unvegetated cliff community. At present, all sparsely vegetated siltstone bluff and cliff communities are also included in the "Rock Outcrop" community, as well as steep sandstone exposures under 3 m high. When the two are impossible to separate, a "Cliff and Outcrop Complex" may be recognized. Small, isolated outcrops may be considered inclusions within a prairie community.

**ENVIRONMENT:** This system may occur nearly statewide wherever bedrock has been exposed by erosion, usually along river valleys. Substrates are most frequently sandstone (Tertiary Arikaree and Ogalalla Groups, or Cretaceous Dakota Sandstone Group), or less frequently chalk (Niobrara Chalk), often with interbedded shales. Soils tend to be poorly developed or absent. Sites tend to occur within a grassland environment, but in the east may also occur within forest or woodland.

**VEGETATION:** This system is usually sparsely vegetated with a vegetative cover under 10%, particularly on slopes, but up to 25% or higher on level ledges or butte tops. Shrubs and subshrubs are often present in the west with skunkbrush sumac probably the most common. Patches of grasses tend to occur on ledges and in fractures, and commonly occurring species include blue grama (*Bouteloua gracilis*), hairy grama (*B. hirsuta*), sideoats grama (*B. curtispindula*), little bluestem, Indian ricegrass (*Achnatherum hymenoides*), rock muhly (*Muhlenbergia cuspidata*), and in the Smoky Hills three-awns (*Aristida* spp.). Perennial herbs, often with branched, semi-woody caudices or spreading stems are often common on rocks in the west, and among the more commonly seen species are silky orophaca (*Astragalus sericoleucus*), mountain cat's-eye (*Cryptantha cana*), Hooker's sandwort (*Eremogone hookeri*), few-flower false buckwheat (*Eriogonum pauciflorum*), James' nailwort (*Paronychia jamesii* var. *depressa*), and stemless tetraeneuris (*Tetraeneuris acaulis*). Upright biennials and short-lived perennials, including ten-petal blazing-star, butte candle (*Cryptantha celosioides*) and smooth beardtongue may also occur singly in very sparsely vegetated areas, such as cliff faces. Annual species are often common where loose, unconsolidated sediments settle on rock faces. Shaded outcrops in the east may additionally be inhabited by fragile fern (*Cystopteris fragilis*) along with mosses and lichens.

**DYNAMICS:** Erosion and drought are the primary ecological process in this system. Fire suppression apparently has converted some open rocky bluffs in the Smoky Hills into wooded bluffs, which has likely served to shade out outcrop dwelling plants in areas. In some regions (especially in the Smoky Hills) seeps may be associated with rock outcrops, but usually most are rather xeric to somewhat mesic (in forested areas). Few alien species are capable of tolerating the conditions in these communities, though cheatgrasses (*Bromus japonicus*, *B. tectorum*) often establish where a shallow soil layer forms. Eastern red cedar (*Juniperus virginiana*), Rocky Mountain red cedar (*J. scopulorum*) or hybrids of the two may be increasing in the absence of fire, though it appears that in some places, these species were restricted to these habitats due to the protection accorded from wildfires.

**COMMENTS:** This system is very similar to the Western Great Plains Badlands System, which differs in its more readily eroded clay substrates. The chalky shale outcrops of northwest Nebraska, however, have many species in common with badlands. The eastern sandstone and

northern chalk communities are newly recognized for Nebraska and their placement in this system (as opposed to a system not yet recognized for the state) is done for convenience.

# CHAPTER 3: TERRESTRIAL NATURAL COMMUNITIES OF NEBRASKA

## WETLAND FOREST AND WOODLAND COMMUNITIES

### EASTERN RIPARIAN FOREST

ELEMENT CODE: C EGL002014

GLOBAL NAME: =*Fraxinus pennsylvanica* - *Ulmus* spp. - *Celtis occidentalis* Forest (Central Green Ash–Elm–Hackberry Forest)

OTHER NAMES: >Eastern Floodplain Woodland, >Eastern Lowland Forest (1<sup>st</sup>, 2<sup>nd</sup> ed.); =Mixed-hardwood shrub community (Currier 1982)

SYSTEM PLACEMENT: Eastern Floodplain Wetland

RANGE: This community is found primarily in the eastern fourth of the State and may extend slightly farther westward into central Nebraska along the Platte, and Loup River systems. It could be present along the Republican River as well, though its presence there has not been verified.

EPA ECOREGIONS: 27a, 27b? 27e, 27f, 27g, 47

ENVIRONMENTAL DESCRIPTION: This community occurs in floodplains and lower terraces of rivers and larger streams and on higher islands within the channels of large rivers which are occasionally to infrequently flooded. Soils are moderately well drained to poorly drained sands, sandy loams, loams, and silt loams formed in sand, silt, or clay alluvium.

COWARDIN WETLAND SYSTEM: Palustrine forested, temporarily flooded

MOST ABUNDANT SPECIES:

Tree canopy: Plains cottonwood (*Populus deltoides*) [sparse]

Subcanopy: silver maple (*Acer saccharinum*), box-elder (*A. negundo*), hackberry (*Celtis occidentalis*), green ash (*Fraxinus pennsylvanica*), honey-locust (*Gleditsia triacanthos*), white mulberry (*MORUS ALBA*), American elm (*Ulmus americana*)

Tall shrub: roughleaf dogwood (*Cornus drummondii*)

Short shrub: Missouri gooseberry (*Ribes missouriense*), coralberry (*Symphoricarpos orbiculatus*)

Vine: Virginia creeper (*Parthenocissus quinquefolia*), eastern poison ivy (*Toxicodendron radicans*), riverbank grape (*Vitis riparia*)

Herbaceous: white snakeroot (*Ageratina altissima*), sedges (*Carex* spp.), Virginia wildrye (*Elymus virginicus*), nodding fescue (*Festuca subverticillata*), annual bedstraw (*Galium aparine*), sweet-scented bedstraw (*G. triflorum*), white avens (*Geum canadense*), wood nettle (*Laportea canadensis*), whitegrass (*Leersia virginica*), starry false Solomon's seal (*Maianthemum stellatum*), muhlys (*Muhlenbergia* spp.), aniseroot (*Osmorhiza longistylis*), Virginia creeper (*Parthenocissus quinquefolia*), goldenglow (*Rudbeckia laciniata*), Canada sanicle (*Sanicula canadensis*), clustered sanicle (*S. odorata*), goldenrods (*Solidago* spp.), eastern poison ivy (*Toxicodendron radicans*), stinging nettle (*Urtica dioica*), violets (*Viola* spp.)

DIAGNOSTIC SPECIES: *Acer saccharinum*, *Cornus drummondii*, *Fraxinus pennsylvanica*, *Populus deltoides*, *Ulmus americana*

VEGETATION DESCRIPTION: This community typically has a sparse to moderately open, tall canopy of cottonwoods 10–30 m tall, though in some mature stands cottonwoods may be nearly absent. The subcanopy is generally dense and 5-15 m tall (or taller in mature stands) and contains several species, most commonly green ash and American elm. Other trees which may be common include silver maple, box-elder, hackberry, honey-locust, red mulberry (*Morus rubra*) and slippery elm (*Ulmus rubra*). The introduced white mulberry is frequently present and sometimes common in places. Eastern red cedar (*Juniperus virginiana*) is common in some sites in central Nebraska. The shrub layer is frequently well-developed though not as extensive as in some floodplain woodland communities. Roughleaf dogwood is usually the common tall shrub, and a short shrub layer of coralberry and Missouri gooseberry is frequently present. The herbaceous layer is usually lush with numerous woodland perennials including nodding fescue, wood nettle, sanicles, and white snakeroot. Species diversity varies from low to moderately high. Two phases can be recognized:

- a) American elm phase is the most common and widespread and typically occurs in sites that are infrequently flooded. American elm is usually the dominant subcanopy tree, frequently occurring with scattered green ash and hackberry, and often the introduced white mulberry. Farther east, silver maple, honey locust, and red mulberry (*Morus rubra*) may be present, while green ash may be more common westward. A tall shrub layer of scattered roughleaf dogwood is present, with false indigobush (*Amorpha fruticosa*) sometimes also present westward. Coralberry is frequently the most common short shrub, though it tends to drop out farther west. Woody vines (especially eastern poison ivy and Virginia creeper) are often common, and may climb into the tree canopy. The herbaceous layer is frequently lush with the woodland species described above. Species diversity is moderate to relatively high.
- b) Silver maple phase is known from the east fifth of the state and is especially common along the Missouri and lower Platte rivers. It tends to occur in lower ground that is frequently flooded in early spring. It is distinguishable by a fairly tall subcanopy predominately of silver maple, often with scattered green ash and elms. The shrub

layer is similar to the cottonwood-elm subtype, but the herbaceous layer is generally not as rich and often has a larger proportion of sedges. Species diversity is low to moderate, though it may be relatively high in some mature stands.

**OTHER NOTEWORTHY SPECIES:** Green dragon (*Arisaema dracontium*), hop sedge (*Carex lupulina*), eastern star sedge (*Carex radiata*), mullein foxglove (*Dasistoma macrophylla*) and bottle gentian (*Gentiana andrewsii*) are found sparingly in this community along the lower Platte River. Rough avens (*Geum laciniatum*) is frequent in this community along the Loup and Platte rivers, and sycamore (*Platanus occidentalis*) is sometimes present along the Missouri River south of Omaha. Northern green orchid (*Platanthera aquilonis*) was collected once from a site along the Middle Loup River.

**STATE RANK:** S3

**RANK JUSTIFICATION:** This community is fairly widespread in eastern Nebraska, and although it may be increasing due to less frequent flooding due to reduced stream flows, but is also subject to increased siltation due to agricultural activities, urban development, and channelization. Most sites that remain are degraded by heavy grazing and invasion by aggressive alien species, resulting in reduced species diversity.

**INVASIVE SPECIES OF CONCERN:** White mulberry infests numerous sites in eastern Nebraska, and other woody invaders include Japanese barberry (*Berberis thunbergii*), Amur honeysuckle (*Lonicera maackii*), Tatarian honeysuckle (*L. tatarica* and hybrids), and Siberian elm (*Ulmus pumila*). Problematic herbs include garlic mustard (*Alliaria petiolata*), common burdock (*Arctium minus*), poison hemlock (*Conium maculatum*), ground-ivy (*Glechoma hederacea*), dame's rocket (*Hesperis matronalis*) and moneywort (*Lysimachia nummularia*).

**GLOBAL RANK:** G3G5

**COMMENTS:** Phases of the Eastern Riparian Forest community with a moderately dense canopy of cottonwood have previously been segregated as Eastern Floodplain Woodland in earlier versions of this classification, but are here included in an expanded Eastern Riparian Forest community. It is likely that some such stands in northern and central Nebraska may eventually need to be split into a separate community, but more data are needed from these areas before such a split can be made. NatureServe attributes *Populus deltoides* / *Fraxinus pennsylvanica* Forest to Nebraska, a northern Great Plains forest community that may be similar to sites along the Platte or Niobrara rivers.

A couple of distinctive silver maple dominated phases of this community have been recorded in extreme eastern Nebraska. One seasonally-flooded forest along the Big Nemaha River in Richardson County is dominated by a fifty foot canopy of silver maple with a few taller cottonwoods on sandy ridges and a moderately dense herbaceous layer dominated by forest plants such as wood nettle, nodding fescue, Virginia wildrye and annual bedstraw. This type is strikingly similar to some silver maple dominated forests to the east of our area. A similar site occurs in lower channels within typical riparian forest along the Platte River in Douglas County. It has a canopy of silver maple and a tall subcanopy of green ash and few other trees. Dogwoods

are moderately dense, and the understory is primarily dominated by sedges (*C. grisea*, *C. lupulina*, *C. tenera*, *C. tribuloides*) and eastern poison ivy.

Two other mature phases of riparian forest types have been observed in extreme eastern Nebraska occurring as patches within more typical eastern riparian forest. Vaubel (1975) reported a sycamore (*Platanus occidentalis*)–elm dominated community from along the Missouri River in southeast Nebraska, and small occurrences have been observed at Fontenelle Forest in Sarpy County. A hackberry-basswood (*Tilia americana*) type has been observed in mature eastern riparian forest along the lower Platte at Two Rivers Wildlife Management Area.

EXEMPLARY SITES: Two Rivers State Recreation Area and Wildlife Management Area in Douglas County.

### **COTTONWOOD-PEACHLEAF WILLOW RIPARIAN WOODLAND**

ELEMENT CODE: CEG000659

GLOBAL NAME: =*Populus deltoides* - (*Salix amygdaloides*) / *Salix. exigua* Woodland (Cottonwood – Peachleaf Willow Floodplain Woodland)

OTHER NAMES: >Western Floodplain Woodland (1<sup>st</sup>, 2<sup>nd</sup> ed.), >Western Riparian Woodland (3<sup>rd</sup> ed.), >Eastern Cottonwood-Willow Riparian Woodland (3<sup>rd</sup> ed.)

SYSTEM PLACEMENT: Eastern Floodplain Wetland, Western Great Plains Floodplain

RANGE: This community is most commonly encountered in the central and western portions of the state, but may be found nearly statewide (except perhaps in the extreme southeast).

EPA ECOREGIONS: 25, 27, 42, 43, 44, 47

ENVIRONMENTAL DESCRIPTION: This community is found on banks, primary floodplains, low terraces and sandbars of streams and rivers. Soils are usually poorly developed, consisting predominately of sand, with lesser amounts of silt, clay or gravel formed in alluvium. Drainage varies with height of the community above the river level.

COWARDIN WETLAND SYSTEM: Palustrine forested, temporarily flooded

MOST ABUNDANT SPECIES:

Tree canopy: Plains cottonwood (*Populus deltoides*), peachleaf willow (*Salix amygdaloides*)

Tree subcanopy: box-elder (*Acer negundo*), Russian-olive (*ELAEAGNUS ANGUSTIFOLIA*), green ash (*Fraxinus pensylvanica*), white mulberry (*MORUS ALBA*)

Tall shrub: roughleaf dogwood (*Cornus drummondii*), wild plum (*Prunus americana*), chokecherry (*P. virginiana*), sandbar willow (*Salix interior*), buffaloberry (*Shepherdia argentea*)

Short shrub: wolfberry (*Symphoricarpos occidentalis*)

Vines: Virginia creeper (*Parthenocissus quinquefolia*), eastern poison ivy (*Toxicodendron radicans*)

Herbaceous: white snakeroot (*Ageratina altissima*), annual ragweed (*Ambrosia artemisiifolia*), smooth brome (*BROMUS INERMIS*), Emory's sedge (*Carex emoryi*), woolly sedge (*C. pellita*), Canada wildrye (*Elymus canadensis*), field horsetail (*Equisetum arvense*), common scouringrush (*E. hyemale*), sweet-scented bedstraw (*Galium triflorum*), wild licorice (*Glycyrrhiza lepidota*), green needlegrass (*Nassella viridula*), Virginia creeper (*Parthenocissus quinquefolia*), western wheatgrass (*Pascopyrum smithii*), Kentucky bluegrass (*POA PRATENSIS*), prairie cordgrass (*Spartina pectinata*), sand dropseed (*Sporobolus cryptandrus*), eastern poison ivy (*Toxicodendron radicans*), stinging nettle (*Urtica dioica*).

DIAGNOSTIC SPECIES: *Populus deltoides*, *Salix amygdaloides*, *S. interior*

VEGETATION DESCRIPTION: This community is dominated by a fairly tall (6-17 m), open canopy of cottonwoods and slightly shorter peachleaf willows. In broad stream valleys in the western half, the subcanopy is often poorly developed and contains scattered small trees of box-elder and green ash, with Russian-olive or junipers (*Juniperus scopulorum*, *J. virginiana*) often invading to a large extent. In canyons or at the bases of steep banks, the subcanopy may be denser with scattered American elm (*Ulmus americana*) and hackberry (*Celtis occidentalis*) in addition to ash and box-elder. In the east, the subcanopy is may contain widely scattered small trees of box-elder, silver maple (*Acer saccharinum*), hackberry, green ash, or American elm, or be nearly absent. Patches of shrubs are generally present and conspicuous under the open canopy of this community. A shrub layer 2-4 m tall is usually present, with sandbar willow most common in lower ground, while on higher terraces and adjacent banks, wild plum, chokecherry and buffaloberry may be conspicuous. Eastward, roughleaf dogwood and false indigobush (*Amorpha fruticosa*) comprise the bulk of the often somewhat sparser tall shrub layer. Patches of wolfberry form a short shrub stratum at many sites.

The herbaceous layer varies from sparse to dense depending on drainage and shade. In low ground it usually consists of hydrophytic and mesophytic graminoids < 1 m tall, which may sometimes include abundant field horsetail, but usually includes sedges and grasses such as Emory's sedge, woolly sedge, marsh muhly (*Muhlenbergia racemosa*), prairie cordgrass, and the introduced reedtop (*Agrostis gigantea*) or reed canarygrass (*Phalaris arundinacea*). Sites on higher terraces in the west tend to be dominated by grasses such as western wheatgrass and green needlegrass (*Nassella viridula*) with scattered native plants such as wild licorice. Eastward green needlegrass drops out and Canada wildrye is more common.

Flooding often creates open patches in the herbaceous layer, which are available for colonization by nearby species. Because of the high permeability of the sandy floodplain soil, species typical of upland prairie may be present in addition to annuals of upland sites. Among the more common ones are ragweeds (*Ambrosia artemisiifolia* and *A. psilostachya*), western sagewort (*Artemisia campestris* var. *caudata*), field sandbur (*Cenchrus longispinus*), spurges (*Euphorbia* spp.), curly-top gumweed (*Grindelia squarrosa*), plains sunflower (*Helianthus petiolaris*), hairy golden-aster (*Heterotheca villosa*), and sand dropseed. Species diversity is low to moderate.



OTHER NOTEWORTHY SPECIES: Information not available

STATE RANK: S3

RANK JUSTIFICATION: In western and central Nebraska, this community is now more extensive than it was prior to European settlement (particularly along the Platte and Republican rivers) due to reduced river flows and elimination of bison herds and fire which formerly limited its extent. Nonetheless, many sites are badly overgrazed and/or infested with invasive species. In eastern Nebraska, channelization has reduced the extent of this community, especially along the Missouri River, due to agricultural conversion and degradation of existing sites due to a lack of periodic flooding.

INVASIVE SPECIES OF CONCERN: Russian-olive and white mulberry are commonly the most problematic trees in the west and east, respectively. Wet sites are commonly infested with aggressive genotypes of reed canarygrass in addition to redtop and Kentucky bluegrass. In the east, such sites may additionally contain other aggressive invaders such as garlic mustard (*Alliaria petiolata*) and ground ivy (*Glechoma hederacea*). More open and better drained sites are often invaded by smooth brome, intermediate wheatgrass (*Thinopyrum intermedium*), Kentucky bluegrass, cheat (*Bromus* spp.), and noxious weeds such as leafy spurge (*Euphorbia esula*), musk thistle (*Carduus nutans*), and Canada thistle (*Cirsium arvense*). Common buckthorn (*Rhamnus cathartica*) is also problematic at some sites.

GLOBAL RANK: G3G4

COMMENTS: Though widespread, this community is very poorly studied in Nebraska, and it does not appear that enough data are available to maintain the separation of the eastern and western phases of cottonwood-willow woodland recognized in the third edition of the classification. Cottonwood-dominated riparian woodland, formerly included within the description of the community, is here separated as the Cottonwood Riparian Woodland community. NatureServe attributes a *Populus deltoides* / *Salix exigua* Woodland community to western Nebraska, which has not been documented from the state. Such sites probably represent variants of the *Populus deltoides* – (*Salix amygdaloides*) / *Salix exigua* Woodland rather than the former community, described from the Rio Grande drainage.

This community has not been documented from extreme southeast Nebraska, where different riparian woodlands have been recorded. A site in a wet meadow at Indian Cave State Park in Richardson County is dominated by a sparse canopy of sycamore (*Platanus occidentalis*) and honey locust (*Gleditsia triacanthos*), with a pronounced willow subcanopy. Black willow (*Salix nigra*) is locally common in the lower Missouri River valley but rarely occurs in stands that are dense enough to exert an effect on the surrounding vegetation. Still, it seems possible that *Populus deltoides* – *Salix nigra* Forest may be present in some places.

EXEMPLARY SITES: Most sites observed are moderately to seriously degraded, though some sites along the White River at Fort Robinson State Park appear typical.

## **EASTERN COTTONWOOD - DOGWOOD RIPARIAN WOODLAND**

ELEMENT CODE: none available

GLOBAL NAME: none available

OTHER NAMES: >*Populus-Cornus* community (Lawrey 1971), =Cottonwood –Dogwood Floodplain Woodland (2<sup>nd</sup> ed.)

SYSTEM PLACEMENT: Eastern Floodplain Wetland

RANGE: This community occurs along the Missouri River from Washington County northward to at least Cedar County, and may also be present downstream, and along the lower Platte River.

EPA ECOREGIONS: 47d, 47j?

ENVIRONMENTAL DESCRIPTION: This community occurs on nearly level ground in floodplains, low terraces, and old channels in broad river valleys. Soils are somewhat poorly to poorly drained sandy loams formed in alluvium. Historically, these sites were probably flooded occasionally to infrequently, though sites along the channelized portion of the Missouri are probably now rarely flooded.

COWARDIN WETLAND SYSTEM: Palustrine forested, temporarily flooded

MOST ABUNDANT SPECIES:

Tree canopy: Plains cottonwood (*Populus deltoides*)

Tall shrub: roughleaf dogwood (*Cornus drummondii*)

Vines: Virginia creeper (*Parthenocissus quinquefolia*), eastern poison ivy (*Toxicodendron radicans*)

Herbaceous: white snakeroot (*Ageratina altissima*), common scouringrush (*Equisetum hyemale*), sweet-scented bedstraw (*Galium triflorum*), Virginia creeper (*Parthenocissus quinquefolia*), eastern poison ivy (*Toxicodendron radicans*), stinging nettle (*Urtica dioica*).

DIAGNOSTIC SPECIES: *Cornus drummondii*, *Equisetum hyemale*, *Populus deltoides*

VEGETATION DESCRIPTION: This community is dominated by a tall (20-30 m) overstory of cottonwood. Occasionally subcanopy trees may be conspicuous along the margin of this community, especially the introduced white mulberry (*Morus alba*). A dense layer of roughleaf dogwood (2–4 m tall) is a consistent feature of this community, and is usually the only significant shrub present, though in some sites prickly ash (*Zanthoxylum americanum*) may also be scattered or a sparse short shrub layer of coralberry (*Symphoricarpos orbiculatus*) is present.

Vines are sometimes conspicuous, with Virginia creeper and eastern poison ivy most common. The herbaceous understory in this community is sparse to moderate and defines the two phases:

- a) Common scouringrush phase – in which the herbaceous stratum is a dense layer of common scouringrush with a few other species. This type generally occurs on lower, more poorly drained sites and has very low species diversity.
- b) Graminoid phase – in which the understory is dominated by scattered graminoids (grasses and sedges) and herbaceous plants typical of riparian forest under the dense dogwood canopy. Younger, more open examples may contain species typical of floodplain grasslands and floodplain woodlands. This type is usually found on slightly higher ground and has low to moderate species diversity.

OTHER NOTEWORTHY SPECIES: Information not available

STATE RANK: S2?

RANK JUSTIFICATION: Reduced water flows and channelization of rivers decreases the frequency of natural floods necessary for development and maintenance of this community. Agricultural development in floodplains further limits its extent.

INVASIVE SPECIES OF CONCERN: White mulberry (*Morus alba*) appears to be problematic in some instances of this community, as are multiflora rose (*Rosa multiflora*) and Kentucky bluegrass (*Poa pratensis*). Other invasives that may occur in this community include garlic mustard (*Alliaria petiolata*), dame's-rocket (*Hesperis matronalis*), Siberian elm (*Ulmus pumila*), and Oriental bittersweet (*Celastrus orbiculata*).

GLOBAL RANK: GNR

COMMENTS: Though this community is widespread and easily recognizable through its range, it has received little attention from ecologists. Pound & Clements (1900) mentioned cottonwood dominated communities associated with the Missouri River, but did not provide a description. The graminoid subtype, which is more common in the north part of the range, may be an early seral stage of the Eastern Riparian Forest community, and many of these sites will probably develop into this forest type with the elimination of frequent floods along the Missouri River. Tracts of young cottonwood woodland are present along the unchanneled portion of the Missouri River in Cedar and Dixon counties (and sporadically downstream). They are often open and contain many small to medium-sized trees, with switchgrass (*Panicum virgatum*) dominating the understory. The *Populus* savanna community of Lawrey (1971) probably refers to such stands, which appear to be an early phase of this subtype.

The common scouringrush subtype, which is best developed downstream, may be a mature "pioneer woodland" that develops in areas currently (or formerly) prone to frequent flooding. Some stands at DeSoto Bend National Wildlife Refuge contain cottonwoods that are reaching maturity but do not appear to be succeeding to Eastern Floodplain Woodland, perhaps the very sandy soils of this community at this site prevents establishment of a mixed-hardwood

subcanopy. Both subtypes mix in places (especially upstream), and it is not unusual to see relict grassland species even in densely shaded examples of either. This community intergrades with the Eastern Riparian Forest and other woodland communities, and sometimes with Missouri River Dune Grassland as well.

This very distinctive woodland was provisionally grouped into NatureServe's ill-defined *Populus deltoides* – *Fraxinus pennsylvanica* Forest in the 2000 classification, a northern forest type that may be present in northern Nebraska. That community is less similar to the Cottonwood-Dogwood Riparian Woodland than it is to many of our other riparian woodland communities.

EXEMPLARY SITES: DeSoto National Wildlife Refuge in Washington County.

### **COTTONWOOD - DIAMOND WILLOW WOODLAND**

ELEMENT CODE: none available

GLOBAL NAME: none available

OTHER NAMES: =Diamond Willow Woodland (2<sup>nd</sup>, 3<sup>rd</sup> ed.)

SYSTEM PLACEMENT: Eastern Floodplain Wetland

RANGE: This community is known from along the Missouri, Middle Loup and Elkhorn rivers and may also be present along the Platte and Niobrara rivers.

ECOREGIONS: 27e, 27g?, 42p?, 47l, 47d 47j?

ENVIRONMENTAL DESCRIPTION: This community is found in floodplains of rivers and streams and on islands in rivers. Soils are sandy loams and loams formed in alluvium and are moderately or poorly drained.

COWARDIN WETLAND SYSTEM: Palustrine forested, temporarily flooded.

MOST ABUNDANT SPECIES:

Tree canopy: Plains cottonwood (*Populus deltoides*), peachleaf willow (*Salix amygdaloides*), diamond willow (*Salix famelica*).

Tall shrub: roughleaf dogwood (*Cornus drummondii*), red osier (*Cornus sericea*), green ash (*Fraxinus pennsylvanica*) [saplings], wolfberry (*Symphoricarpos occidentalis*)

Vine: riverbank grape (*Vitis riparia*)

Herbaceous: hog peanut (*Amphicarpaea bracteata*), false nettle (*Boehmeria cylindrica*), sedges (*Carex emoryi* and others), field horsetail (*Equisetum arvense*), sweet-scented bedstraw (*Galium*

*triflorum*), Kentucky bluegrass (*POA PRATENSIS*), goldenglow (*Rudbeckia laciniata*), Canada sanicle (*Sanicula canadensis*)

DIAGNOSTIC SPECIES: *Amphicarpaea bracteata*, *Boehmeria cylindrica*, *Carex emoryi*, *Desmodium paniculatum*, *Equisetum arvense*, *Rudbeckia laciniata*, *Salix famelica*

VEGETATION DESCRIPTION: Mature diamond willows are the dominant tree in this community, forming a dense and at times nearly impenetrable canopy 4–6 m tall. Young peachleaf willows are scattered among the diamond willow, and occasionally a few young cottonwoods are present. A sparse shrub layer of roughleaf dogwood is usually present, with wolfberry also present at some sites. The herbaceous layer is dense and consists of mesophytic graminoids, chiefly sedges (*Carex emoryi*, most commonly), and sometimes also extensive stands of field horsetail. Numerous forbs are usually present and generally no single species dominates the understory. Species diversity is relatively high.

OTHER NOTEWORTHY SPECIES: *Geum laciniatum* is present in this community in Howard County.

STATE RANK: S2?

RANK JUSTIFICATION: Relatively few well-developed examples of this community have been located and further survey work is needed to determine its full extent in the state. Harvesting of diamond willow stems by crafts enthusiasts could impact this community. The best-developed known sites are in relatively inaccessible areas. Many stands along the channelized portion of the Missouri River are dying out and are succeeding to other woodland types, suggesting that flooding is necessary to maintain this community.

INVASIVE SPECIES OF CONCERN: Few invasive species have been recorded from this community, but species that invade riparian forests may pose a threat, such as garlic mustard (*Alliaria petiolata*) and dame's-rocket (*Hesperis matronalis*).

GLOBAL RANK: G?

COMMENTS: This community occurs as a band in floodplains, usually between Sandbar Willow Shrubland and other riparian woodland communities and may be a transitional phase, though sandbar willow is rarely present in this community, and cottonwoods, while occasionally present, never dominate. The high species diversity suggests that some stands may be fairly mature. All Nebraska sites sampled so far contain panicked tick-clover, including sites far west of the main range of this species in central Nebraska. This community might be a seral stage of the Cottonwood-Willow Riparian Woodland, and at least one site studied seems transitional to that type, and is grouped within it by NatureServe.

Currier (1982) mentions diamond willow as common in some woodland communities along the Platte River, but does not recognize it as a community. Morrison (1935) reported stands dominated by *Salix eriocephala* in the Platte River channel in eastern Nebraska, which may be synonymous with this community, though many open stands, especially westward, may be more similar to Sandbar Willow Shrubland in species composition. Shrublands containing

young diamond willows are known westward, but they do not tend to develop distinct canopy and shrub layers as is typical in eastern sites. It should not be assumed all patches of diamond willow necessarily represent this community.

EXEMPLARY SITES: Representative examples can be found at Loup Junction Wildlife Management Area in Howard County and Yellowbanks Wildlife Management Area in Madison County.

## **COTTONWOOD RIPARIAN WOODLAND**

ELEMENT CODE: CEGl001454

GLOBAL NAME: =*Populus deltoides* / *Panicum virgatum* – *Schizachyrium scoparium*  
Woodland (Cottonwood – Switchgrass Floodplain Woodland)

OTHER NAMES: =?*Populus* open meadow (Currier 1982)

SYSTEM PLACEMENT: Western Great Plains Floodplain

RANGE: This community is found primarily in the western 2/3 of the state, but may extend eastward along large rivers.

EPA ECOREGIONS: 25, 27b, 27e, 27g, , 42?, 43?, 44?

ENVIRONMENTAL DESCRIPTION: This community is found in floodplains and on low terraces of streams and rivers. Soils are usually poorly developed, consisting predominately of sand, with lesser amounts of silt, clay or gravel formed in alluvium. Drainage varies with height of the community above the river level.

COWARDIN WETLAND SYSTEM: Palustrine forested, temporarily flooded.

MOST ABUNDANT SPECIES:

Tree canopy: Plains cottonwood (*Populus deltoides*)

Tree subcanopy: Russian olive (*ELAEAGNUS ANGUSTIFOLIA*), green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus americana*)

Tall shrub: buffaloberry (*Shepherdia argentea*)

Short shrub: wolfberry (*Symphoricarpos occidentalis*)

Herbaceous: switchgrass (*Panicum virgatum*), Kentucky bluegrass (*POA PRATENSIS*), little bluestem (*Schizachyrium scoparium*)

DIAGNOSTIC SPECIES: *Populus deltoides*

VEGETATION DESCRIPTION: This community is dominated by a tall (20+ m), very open canopy of cottonwoods with at most a few scattered short subcanopy trees. Shrubs are generally absent or confined to streambanks. Herbaceous understory is quite variable in response to moisture and management regime, but is generally dominated by mid-height to tall warm season grasses. Species diversity is relatively low.

OTHER NOTEWORTHY SPECIES: Information not available

STATE RANK: S2?

RANK JUSTIFICATION: Open cottonwood dominated woodlands could, in many cases have resulted from reduced water flows and scouring in areas that would otherwise be dominated by herbaceous vegetation, and it is uncertain whether these sites are homologous to native communities that existed prior to EuroAmerican settlement. These sites are highly prone to invasion by alien species.

INVASIVE SPECIES OF CONCERN: Russian olive and (along the Platte River) eastern red-cedar (*Juniperus virginiana*) tend to commonly invade and alter the structure of this community. Invasive grasses such as Kentucky bluegrass, redtop (*Agrostis gigantea*) and reed canarygrass (*Phalaris arundinacea*) may be common, as may noxious weeds such as leafy spurge (*Euphorbia esula*), musk thistle (*Carduus nutans*), and Canada thistle (*Cirsium arvense*).

GLOBAL RANK: G2

COMMENTS: There is little mention of open cottonwood dominated communities in the Nebraska vegetation literature, and those that have (cf. Pound & Clements 1900) refer to communities along the Missouri River. Anecdotal reports suggest that many sites along the Platte River did not exist prior to closure of Kingsley Dam and that reduced stream flows may be responsible for their existence. However, sites are also known along smaller streams in the Panhandle. It is possible that the structure of this community is maintained through winter grazing and that it may be considered as a phase of the cottonwood-peachleaf willow woodland, as was done in previous classifications. We have included it as a separate community because of its visually distinctive character and call attention to such sites for further study. The conservation value of this community at the global level probably also deserves further scrutiny.

The herbaceous understory of Nebraska examples of this community is poorly known. Several similar communities that have been attributed to Nebraska include NatureServe's *Populus deltoides* / *Carex pellita* Woodland, *Populus deltoides* / *Distichlis spicata* Woodland and *Populus deltoides* / *Pascopyrum smithii* Woodland, though none of these types has been verified in the state and the assignment of the NatureServe community name is provisional.

EXEMPLARY SITES: Sites are preserved along the Platte River at the Kelly Ranch in Lincoln County.

## PEACHLEAF WILLOW WOODLAND

ELEMENT CODE: C EGL000947

GLOBAL NAME: =*Salix amygdaloides* Woodland (Peachleaf Willow Woodland)

SYSTEM PLACEMENT: Western Great Plains Floodplain

RANGE: This community is known from a single site in the Pine Ridge in Dawes County.

EPA ECOREGION: 25a

ENVIRONMENTAL DESCRIPTION: This community occurs in the primary floodplain of rivers in areas where the water table is relatively close to the surface. Soils are sandy loams derived from alluvium. Sites are generally poorly drained.

COWARDIN WETLAND SYSTEM: Palustrine forested, temporarily flooded.

MOST ABUNDANT SPECIES:

Tree canopy: peachleaf willow (*Salix amygdaloides*)

Tree subcanopy: diamond willow (*Salix famelica*)

Tall shrub: red-osier dogwood (*Cornus sericea*)

Short shrub: buffalo currant (*Ribes odoratum*)

Vine: woodbine (*Parthenocissus vitacea*)

Herbaceous: reed canarygrass (*PHALARIS ARUNDINACEA*), late goldenrod (*Solidago gigantea*), common cat-tail (*Typha latifolia*)

DIAGNOSTIC SPECIES: *Salix amygdaloides*, *S. famelica*, *Cornus sericea*

VEGETATION DESCRIPTION: This community is dominated by a canopy of peachleaf willow 12-20 m tall with a subcanopy of diamond willow 5 m tall and a tall shrub layer of red osier and American currant to 2 and 1.5 m, respectively. The understory is very disturbed and nearly consists of a near monoculture of reed canarygrass with late goldenrod (*Solidago gigantea*), woodbine (*Parthenocissus vitacea*) and scattered cattails (*Typha latifolia*), bordering a degraded wetland bottom. Species diversity is fairly low.

OTHER NOTEWORTHY SPECIES: Information not available

STATE RANK: S1



**RANK JUSTIFICATION:** This community represents one of very few wet woodlands of the High Plains, and may be threatened by drought and grazing pressure. The only known site in the state is not grazed by cattle.

**INVASIVE SPECIES OF CONCERN:** Reed canarygrass is present in the known site, and other potential invaders include Garrison creeping foxtail (*Alopecurus arundinaceus*) and Canada thistle (*Cirsium arvense*).

**GLOBAL RANK:** G3

**COMMENTS:** This wet woodland type is nearly identical to NatureServe's descriptions of the *Salix amygdaloides* Woodland community that is most common in the Rocky Mountains, with isolated stands attributed to the western Great Plains. It has been recorded from the Black Hills, and hence its presence in the Pine Ridge is not entirely surprising. Willow-dominated communities were reported by Pound & Clements (1900) on sandbars of the Niobrara River but details of their composition are not known.

**EXEMPLARY SITES:** The known site occurs along the White River at Fort Robinson State Park.

## **UPLAND FOREST AND WOODLAND COMMUNITIES**

### **RED OAK – BASSWOOD – IRONWOOD FOREST**

**ELEMENT CODE:** CEG002061

**GLOBAL NAME:** <*Acer saccharum* – *Acer nigrum* – *Tilia americana* – *Quercus rubra* / *Ostrya virginiana* Forest (Central Maple-Basswood Forest)

**OTHER NAMES:** =*Quercus maxima*-*Tilia americana* association (Aikman 1929), >Linden-Ironwood Association (Costello 1931), =Mesic Upland Forest (1<sup>st</sup> ed.), <Southeastern Upland Forest (2<sup>nd</sup> ed.)

**SYSTEM PLACEMENT:** Eastern Upland Oak Bluff Forest

**RANGE:** This community is best developed along the Missouri River from southern Washington County southward. It is sporadically present north to Dakota County and westward along the lower Platte River.

**EPA ECOREGION:** 47h

**ENVIRONMENTAL DESCRIPTION:** This community occurs on gentle to moderately steep middle and lower slopes of bluffs, and is usually best developed on north and east-facing exposures. Soils are moderately deep to deep silt loams formed in loess overlying glacial till and are moderately well drained.

## COWARDIN WETLAND SYSTEM: Upland

### MOST ABUNDANT SPECIES:

Tree canopy: bitternut hickory (*Carya cordiformis*), hackberry (*Celtis occidentalis*), green ash (*Fraxinus pennsylvanica*), black walnut (*Juglans nigra*), red oak (*Quercus rubra*), basswood (*Tilia americana*)

Subcanopy: pawpaw (*Asimina triloba*), red mulberry (*Morus rubra*), ironwood (*Ostrya virginiana*), slippery elm (*Ulmus rubra*)

Tall shrub: rough-leaf dogwood (*Cornus drummondii*), bladdernut (*Staphylea trifolia*)

Short shrub: coralberry (*Symphoricarpos orbiculatus*)

Vine: Virginia creeper (*Parthenocissus quinquefolia*), eastern poison ivy (*Toxicodendron radicans*), greenbriar (*Smilax hispida*)

Herbaceous: common wood sedge (*Carex blanda*), Davis' sedge (*C. davisii*), James' sedge (*C. jamesii*), bur-reed sedge (*C. sparganioides*), enchanter's nightshade (*Circaea canadensis*), lowland bladder fern (*Cystopteris protrusa*), dutchman's breeches (*Dicentra cucullaria*), white trout-lily (*Erythronium albidum*), wood nettle (*Laportea canadensis*), moonseed (*Menispermum canadense*), aniseroot (*Osmorhiza longistylis*), Virginia creeper (*Parthenocissus quinquefolia*), clustered sanicle (*Sanicula odorata*), downy yellow violet (*Viola pubescens*)

DIAGNOSTIC SPECIES: *Adiantum pedatum*, *Asimina triloba*, *Carex jamesii*, *C. hitchcockiana*, *Galium concinnum*, *Ostrya virginiana*, *Podophyllum peltatum*, *Quercus rubra*, *Staphylea trifolia*

VEGETATION DESCRIPTION: This community consists of a closed canopy of tall trees 15-30 m tall, most commonly red oak and basswood, with black walnut also frequent. Other trees that may be common in the canopy include bitternut hickory, hackberry, green ash, and Kentucky coffee-tree (*Gymnocladus dioica*). The sub-canopy is 3-10 m tall and is usually dominated by hop hornbeam, with red mulberry and red elm also common. North of Washington County, rock elm (*Ulmus thomasii*) may also be conspicuous. In the far southeastern part of the state, a short subcanopy of pawpaw is generally also present. A tall shrub layer 1-2 m tall is present and usually sparse, with bladdernut and American hazelnut common in the far southeast, and scattered roughleaf dogwood present elsewhere. A conspicuous short (<1 m) shrub layer of coralberry is a common feature of this community, especially southward, with Missouri gooseberry (*Ribes missouriense*) and black raspberry (*Rubus occidentalis*) scattered. The herbaceous layer is relatively lush, and contains numerous shade-tolerant sedges such as common wood sedge, Davis' sedge, few-fruited sedge (*C. oligocarpa*) and James' sedge. Ferns and perennial herbs are often common, with white trout-lily and dutchman's breeches conspicuous in early spring, and Virginia creeper, clustered sanicle, lowland bladder fern, maidenhair fern (*Adiantum pedatum*), wood nettle, honewort (*Cryptotaenia canadensis*), blue wood phlox (*Phlox divaricata*), late figwort (*Scrophularia marilandica*) and enchanter's

nightshade later in the season. Virginia waterleaf (*Hydrophyllum virginianum*) is an increasingly common component northward. Mosses and fungi are often common. Species diversity is high.

**OTHER NOTEWORTHY SPECIES:** Uncommon species in this community include *Actaea pachypoda*, *Aesculus glabra*, *Agastache scrophulariifolia*, *Allium tricoccum*, *Aralia racemosa*, *Arisaema dracontium*, *Asimina triloba*, *Brachyelytrum erectum*, *Cardamine concatenata*, *Carex albursina*, *C. hirtifolia*, *Caulophyllum thalictroides*, *Cerastium nutans*, *Claytonia virginica*, *Corydalis flavula*, *Cypripedium parviflorum*, *Cystopteris bulbifera*, *Galearis spectabilis*, *Hydrophyllum appendiculatum*, *Lobelia inflata*, *Matteucia sthruthiopteris*, *Panax quinquefolius*, *Podophyllum peltatum*, *Ranunculus recurvatus*, *Ruellia strepens*, *Solidago flexicaulis*, *Triphora trianthophora*, and *Ulmus thomasii*.

**STATE RANK:** S2

**RANK JUSTIFICATION:** This community is mostly restricted to richly forested bluffs in the southeast part of the state, and many remaining tracts are in fairly good condition, as these sites are generally in deep ravines less accessible to logging than other upland forests. However, many sites have been degraded by overgrazing or deer browsing. In addition, garlic mustard is spreading rapidly in this community type and is a serious threat.

**INVASIVE SPECIES OF CONCERN:** Garlic mustard (*Alliaria petiolata*) and ground-ivy (*Glechoma hederacea*) are often problematic in this community, and Amur honeysuckle poses a potentially serious threat.

**GLOBAL RANK:** G3G4

**COMMENTS:** This community is closest to NatureServe's Central Maple-Basswood Forest, which is primarily east of our range. The hard maple component is not present in Nebraska. Although this community was previously combined with the Oak-Hickory-Ironwood Forest and Woodland community in the second edition of this classification, it seems to be more distinct from our remaining upland oak forest communities than most of those communities are from each other. North of Washington County and west of the Missouri River this community becomes more patchy and discontinuous, and may be difficult to distinguish from the Bur Oak-Basswood-Ironwood Forest community, save for the presence of red oak. Many sites have either red oak or basswood as the dominant canopy tree and often contain other trees typical of both upper slope and ravine bottom woods. The subcanopy and herbaceous understory are usually fairly consistent, but tend to vary along a north-south gradient.

Pool *et al.* (1918) recognized a red oak and a linden-basswood phase, the latter of which they considered a climax stage of forest succession. They also mention a red oak–shagbark hickory (*Carya ovata*) community that is described in detail by Pound & Clements (1900). Other red oak dominated communities might be present in southeast Nebraska.

The Lowland Hackberry–Black Walnut Forest community of the third edition of this classification appears to be a transition between mesic upland forest and floodplain communities. Since hackberry and black walnut are also common canopy constituents in this community, it is included here for convenience, though it may also occur on level, mesic sites away from the bluffs.

EXEMPLARY SITES: Representative examples are common at Indian Cave State Park in Nemaha and Richardson counties. Other extensive stands are preserved at Rulo Bluffs Preserve in Richardson County, Fontenelle Forest in Sarpy County, and Neale Woods in Washington County.

## OAK – HICKORY – IRONWOOD FOREST

ELEMENT CODE: CEG002011

GLOBAL NAME: =*Quercus alba* (*Quercus velutina*) - *Carya ovata* / *Ostrya virginiana* Forest (white oak – hickory forest)

OTHER NAMES: >*Quercus velutina*-*Hicoria ovata* associes (Aikman 1929), =Bur oak-Black oak-Hickory association (Costello 1931), =Southeastern Upland Forest (1<sup>st</sup> ed.), <Southeastern Upland Forest (2<sup>nd</sup> ed.)

SYSTEM PLACEMENT: Eastern Upland Oak Bluff Forest

RANGE: This community is best developed along the Missouri River south of Omaha, and small patches may be scattered northward to Dakota County and westward along some major tributaries.

EPA ECOREGION: 47h

ENVIRONMENTAL DESCRIPTION: This community occurs on gentle to moderately steep upland slopes, usually on the upper slopes of bluffs, though it is often present on middle slopes of south and west-facing exposures. Soils are moderately deep to deep silt loams formed in loess (and less frequently glacial till) and are usually well drained.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Tree canopy: shagbark hickory (*Carya ovata*), hackberry (*Celtis occidentalis*), green ash (*Fraxinus pennsylvanica*), black walnut (*Juglans nigra*), bur oak (*Quercus macrocarpa*), chinkapin oak (*Q. muehlenbergii*), red oak (*Q. rubra*)

Subcanopy: redbud (*Cercis canadensis*), ironwood (*Ostrya virginiana*), basswood (*Tilia americana*), slippery elm (*Ulmus rubra*)

Tall shrub: roughleaf dogwood (*Cornus drummondii*), prickly-ash (*Zanthoxylum americanum*)

Short shrub: coralberry (*Symphoricarpos orbiculatus*)

Vine: Virginia creeper (*Parthenocissus quinquefolia*), greenbriar (*Smilax hispida*), eastern poison ivy (*Toxicodendron radicans*)

Herbaceous: white snakeroot (*Ageratina altissima*), Canada brome (*Bromus pubescens*), blunt-scale oak sedge (*Carex albicans*), stellate sedge (*C. rosea*), large-flower tick-clover (*Desmodium glutinosum*), dutchman's breeches (*Dicentra cucullaria*), hairy wildrye (*Elymus villosus*), white trout-lily (*Erythronium albidum*), nodding fescue (*Festuca subverticillata*), wood bedstraw (*Galium circaezans*), hairy sunflower (*Helianthus hirsutus*), Virginia creeper (*Parthenocissus quinquefolia*), Canada sanicle (*Sanicula canadensis*) clustered sanicle (*S. odorata*), downy wood violet (*Viola sororia*)

DIAGNOSTIC SPECIES: *Amelanchier arborea*, *Carya ovata*, *Helianthus hirsutus*, *Ostrya virginiana*, *Quercus macrocarpa*, *Q. muehlenbergii*, *Q. rubra*, *Q. velutina*

VEGETATION DESCRIPTION: This community consists of relatively dense cover of tall trees, most commonly red oak and bur oak, with chinkapin oak additionally common in the extreme southeast. Other canopy species that may be locally common are shagbark hickory, hackberry, and green ash. The sub-canopy is usually dominated by ironwood, with slippery elm frequently also common and redbud sometimes common southward. Sometimes shagbark hickory or bitternut hickory (*Carya cordiformis*) is common in the subcanopy. A shrub layer is present and usually sparse with roughleaf dogwood and prickly ash the common tall shrubs and coralberry often present though usually not as common as on lower slopes. The herbaceous layer is often sparse and consists of scattered graminoids and perennial herbs. Some early-flowering perennials, such as white trout-lily and dutchman's breeches, may cover extensive areas in early spring. Other common species include Virginia creeper, large-flower tick-clover, clustered sanicle, hairy sunflower, blunt-scale oak sedge, hairy wildrye and white snakeroot. Species diversity is moderate to relatively high.

OTHER NOTEWORTHY SPECIES: Uncommon species in this community include *Asclepias purpurascens*, *Asplenium platyneuron*, *Carex texensis*, *Caulophyllum thalictroides*, *Coeloglossum viride*, *Corallorhiza odontorhiza*, *C. wisteriana*, *Desmodium cuspidatum*, *Dioscorea villosa*, *Galearis spectabilis*, *Geum vernum*, *Lilium michiganense*, *Malus ioensis*, *Monotropa hypopithys*, *M. uniflora*, *Panax quinquefolius*, *Piptatherum racemosum*, *Viola viarum*, and *Vitis aestivalis*.

STATE RANK: S2

RANK JUSTIFICATION: This community is mostly restricted to moderate slopes above the Missouri River in southeast Nebraska. Many sites were cut extensively around the turn of the century. Presently, many sites are degraded by overgrazing. Fire suppression has allowed tree and shrub densities to increase and this increased shading is limiting oak regeneration. Garlic mustard is spreading rapidly in this community type and is a threat.

INVASIVE SPECIES OF CONCERN: Garlic mustard (*Alliaria petiolata*) is problematic in some examples of this community and appears to be spreading rapidly. Other species that may

become problematic include common buckthorn (*Rhamnus cathartica*), multiflora rose (*Rosa multiflora*), tree-of-heaven (*Ailanthus altissima*) and oriental bittersweet (*Celastrus orbiculata*).

GLOBAL RANK: G3

COMMENTS: Despite the community name, hickories are often not a major part of this community. North of Omaha, shagbark hickory quickly drops out and bitternut hickory becomes increasingly restricted to lower slope communities. In general, this community is distinguishable in that it is not overwhelmingly dominated by bur oak, unlike most other upland forest types. North of Omaha, this community probably exists as small patches associated with Red Oak–Basswood–Ironwood Forest.

This community seems roughly equivalent to the *Quercus alba* - *Carya ovata* / *Ostrya virginiana* Forest community of Iowa and Missouri, except that *Quercus macrocarpa*, *Q. muehlenbergii*, and *Q. rubra* take the place of *Q. alba* in Nebraska.

EXEMPLARY SITES: Extensive examples are preserved at Fontenelle Forest in Sarpy County, Indian Cave State Park in Nemaha and Richardson counties, and Rulo Bluffs Preserve in Richardson County.

### **BUR OAK – BASSWOOD – IRONWOOD FOREST**

ELEMENT CODE: CEG002012

GLOBAL NAME: <*Tilia americana* – (*Quercus macrocarpa*) / *Ostrya virginiana* Forest (Basswood-Bur oak Forest)

OTHER NAMES: >*Tilia americana* consociation (Aikman 1929), <Northeastern Upland Forest (1<sup>st</sup>, 2<sup>nd</sup> ed.)

SYSTEM PLACEMENT: Eastern Upland Oak Bluff Forest

RANGE: This community is best-developed on bluffs along the south side of the Missouri River from Dakota County westward to northeastern Knox County, and may be present as sporadic occurrences southward to the Omaha area.

EPA ECOREGIONS: 47h?, 47k

ENVIRONMENTAL DESCRIPTION: This community occurs on gentle to steep slopes of bluffs and adjacent uplands along the margins of river valleys, mostly on north and east-facing slopes. Soils are well drained to moderately well drained silt loams formed in loess or to a lesser extent in glacial till.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Tree canopy: hackberry (*Celtis occidentalis*), green ash (*Fraxinus pennsylvanica*), bur oak (*Quercus macrocarpa*), basswood (*Tilia americana*)

Subcanopy: eastern red cedar (*Juniperus virginiana*), ironwood (*Ostrya virginiana*), slippery elm (*Ulmus rubra*), rock elm (*Ulmus thomasi*)

Tall shrub: chokecherry (*Prunus virginiana*)

Short shrub: Missouri gooseberry (*Ribes missouriense*)

Vine: Virginia creeper (*Parthenocissus quinquefolia*), eastern poison ivy (*Toxicodendron radicans*), riverbank grape (*Vitis riparia*)

Herbaceous: common wood sedge (*Carex blanda*), long-beak sedge (*C. sprengelii*), dutchman's breeches (*Dicentra cucullaria*), annual bedstraw (*Galium aparine*), Virginia waterleaf (*Hydrophyllum virginianum*), aniseroot (*Osmorhiza longistylis*), bloodroot (*Sanguinaria canadensis*), Canada sanicle (*Sanicula canadensis*), Canada violet (*Viola canadensis*)

DIAGNOSTIC SPECIES: *Carex sprengelii*, *Ostrya virginiana*, *Quercus macrocarpa*, *Sanguinaria canadensis*, *Tilia americana*, *Viola canadensis*

VEGETATION DESCRIPTION: The overstory of this community is generally dominated by bur oak, with basswood frequent to common in places. Other common canopy trees include green ash and hackberry. Hop hornbeam is common in the subcanopy, with scattered red mulberry (*Morus rubra*) and rock elm in more protected sites, and eastern red cedar often common on drier slopes. Shrubs and vines are scattered and uncommon, with chokecherry and Missouri gooseberry the most frequently encountered. The herbaceous layer varies from sparsely to moderately vegetated, with long-beak sedge often abundant and with numerous other herbaceous plants variously common, including Virginia waterleaf, annual bedstraw, Canada sanicle and aniseroot. Species diversity is moderate to relatively high.

OTHER NOTEWORTHY SPECIES: Species uncommon in Nebraska which are known from this community include *Allium tricoccum*, *Aralia nudicaulis*, *A. racemosa*, *Boechnera shortii*, *Caulophyllum thalictroides*, *Dryopteris carthusiana*, *Panax quinquefolius*, *Piptatherum racemosum*, *Ulmus thomasi*, and *Viburnum lentago*.

STATE RANK: S2S3

RANK JUSTIFICATION: This community is fairly common in parts of northeast Nebraska, but most sites have been impacted by past timber cutting and are frequently heavily grazed and disturbed. Fire suppression has allowed tree and shrub densities to increase and this denser canopy is limiting oak regeneration. Garlic mustard is spreading rapidly in this community and is a threat.

INVASIVE SPECIES OF CONCERN: Garlic mustard (*Alliaria petiolata*) is rapidly becoming problematic in this community, and Amur honeysuckle (*Lonicera maackii*), common buckthorn (*Rhamnus cathartica*), and multiflora rose (*Rosa multiflora*) pose potential threats.

GLOBAL RANK: G3

COMMENTS: The distinction of this community from the Red Oak–Basswood–Ironwood community is rather difficult north of the Omaha area, with the presence of red oak perhaps the only visible distinction. South of the Sioux City area this community grades into Oak–Hickory–Ironwood Forest and Red Oak–Basswood–Ironwood Forest. Sites formerly included within this community in the Niobrara River valley are now included in the newly defined Basswood – Ironwood Springbranch Canyon Forest.

EXEMPLARY SITES: Ponca State Park in Dixon County

### **MESIC BUR OAK FOREST AND WOODLAND**

ELEMENT CODE: CEG002072, CEG002052

GLOBAL NAME: >*Quercus macrocarpa* / (*Amelanchier alnifolia*, *Cornus drummondii*) / *Aralia nudicaulis* Forest (Northern Bur Oak Mesic Forest), >*Quercus macrocarpa* / *Andropogon gerardii* – *Panicum virgatum* Woodland (Western Tall-grass Bur Oak Mesic Woodland)

OTHER NAMES: <Bur Oak Forest (1<sup>st</sup> ed.), =Mesic Bur Oak Forest (2<sup>nd</sup> ed.), =Lowland Bur Oak Forest (3<sup>rd</sup> ed.)

SYSTEM PLACEMENT: Eastern Dry-Mesic Bur Oak Forest and Woodland

RANGE: This community occurs in the glaciated portions of eastern Nebraska, and extant examples are known from the floodplain of the Platte River and the drainages of Salt Creek and the lower Big Blue and Big Nemaha rivers.

EPA ECOREGIONS: 27g, 47i, 47j

ENVIRONMENTAL DESCRIPTION: This community occurs on nearly level terraces of relatively small, permanent streams. Soils are well-developed silt loams and silty clay loams formed in loess and alluvium. The sites are moderately well drained.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Tree canopy: hackberry (*Celtis occidentalis*), bur oak (*Quercus macrocarpa*)

Tree subcanopy: hackberry, American elm (*Ulmus americana*), slippery elm (*Ulmus rubra*)



Short shrub: Missouri gooseberry (*Ribes missouriense*), coralberry (*Symphoricarpos orbiculatus*)

Herbaceous: smooth clustered sedge (*Carex aggregata*), common wood sedge (*C. blanda*), inflated narrowleaf sedge (*C. grisea*), wild chervil (*Chaerophyllum procumbens*), waterpod (*Ellisia nyctelea*), McGregor's wildrye (*Elymus macgregorii*), Virginia wildrye (*E. virginicus*), nodding fescue (*Festuca subverticillata*), annual bedstraw (*Galium aparine*), wood nettle (*Laportea canadensis*), whitegrass (*Leersia virginica*), Virginia creeper (*Parthenocissus quinquefolia*), wingstem (*Verbesina alternifolia*)

DIAGNOSTIC SPECIES: *Arabis shortii*, *Celtis occidentalis*, *Chaerophyllum procumbens*, *Diarrhena obovata*, *Elymus macgregorii*, *Laportea canadensis*, *Quercus macrocarpa*, *Verbesina alternifolia*

VEGETATION DESCRIPTION: The canopy of sites is commonly dominated by hackberry and bur oak in nearly equal proportion, or by a canopy of bur oak with a conspicuous tall subcanopy of hackberry. Scattered large honey locust (*Gleditsia triacanthos*), black walnut (*Juglans nigra*), or Plains cottonwood (*Populus deltoides*) are sometimes also present. The subcanopy is variable and is either overwhelmingly dominated by tall hackberry or more frequently a shorter layer of American elm and slippery elm. Bitternut hickory (*Carya cordiformis*), red mulberry (*Morus rubra*) or basswood (*Tilia americana*) may be present in richer sites. Other trees sometimes present include silver maple (*Acer saccharinum*) and Ohio buckeye (*Aesculus glabra*). The shrub layer is often sparse or nearly absent, usually represented by scattered coralberry and lesser amounts of Missouri gooseberry. The herb layer is fairly dense and consists of forest graminoids such as sedges, nodding fescue, and Virginia wildrye with annuals in disturbed openings, such as annual bedstraw, waterpod and wild chervil. White trout-lily (*Erythronium albidum*) and Dutchman's breeches (*Dicentra cucullaria*) are sometimes present, but are never as common as in Dry-Mesic Bur Oak Forest and Woodland. Virginia creeper often covers the forest floor early in the season, but is overtaken by tall coarse perennials including wood nettle, wingstem, jumpseed (*Persicaria virginiana*) and stinging nettle (*Urtica gracilis*) as the season progresses. Species diversity is moderate to high.

OTHER NOTEWORTHY SPECIES: Ohio buckeye (*Aesculus glabra*), Short's rockcress (*Arabis shortii*), and sycamore (*Platanus occidentalis*) are known from this community.

STATE RANK: S1?

RANK JUSTIFICATION: This community is currently known from only a few intact tracts in southeast Nebraska. Historic literature suggests it was once widespread, but it appears most tracts were cleared for timber and conversion to cropfields. Remnants sites are often overgrazed.

INVASIVE SPECIES OF CONCERN: Invasive species known or likely in this community include garlic mustard (*Alliaria petiolata*), common burdock (*Arctium minus*), Japanese barberry

(*Berberis thunbergii*), ground-ivy (*Glechoma hederacea*), dame's-rocket (*Hesperis matronalis*), Amur honeysuckle (*Lonicera maackii*), Tartarian honeysuckle (*L. tatarica* and hybrids), common buckthorn (*Rhamnus cathartica*), multiflora rose (*Rosa multiflora*), and highbush cranberry (*Viburnum opulus*).

GLOBAL RANK: G?

COMMENTS: The affinities and geographic range of this community are poorly known. We are treating the forested portions of this community and the Dry-Mesic Bur Oak Forest and Woodland as part of the same global community, as both have similar species composition. It is possible this community might be related to a similar lowland oak forest type reported for northeastern Kansas (Lauver, *et al.* 1999), which is included by them in the *Quercus macrocarpa* – *Quercus shumardii* – *Carya cordiformis* / *Chasmanthium latifolium* Forest community that NatureServe regards as occurring no farther north than southeast Kansas. In previous editions, this community was grouped with NatureServe's *Quercus macrocarpa* / *Andropogon gerardii* – *Panicum virgatum* Woodland community, and regarded as a closed-canopy, forested version of it. Historical data suggest that portions of this community were forested before the arrival of Euro-American settlers, with American elm possibly occupying the canopy or subcanopy much the way hackberry does in extant examples (Rolfmeier 2007). Examples of this community from which the bur oak canopy has been removed may resemble mature versions of the Eastern Riparian Forest community.

EXEMPLARY SITES: Perhaps the best-preserved example of this community is at Homestead National Monument in Gage County. Other representative occurrences are known from Lancaster, Pawnee, and Richardson counties.

## **DRY-MESIC BUR OAK FOREST AND WOODLAND**

ELEMENT CODE: CEG002072, CEG002053

GLOBAL NAME: >*Quercus macrocarpa* / (*Amelanchier alnifolia*, *Cornus drummondii*) / *Aralia nudicaulis* Forest (Northern Bur Oak Mesic Forest), >*Quercus macrocarpa* / *Andropogon gerardii* - *Hesperostipa spartea* Woodland (Western Tall-grass Bur Oak Woodland)

OTHER NAMES: =Eastern Deciduous Forest Community (Rolfmeier 1988), >Bur Oak-Bitternut Hickory Community (Weaver 1965), >Bur Oak Forest (1<sup>st</sup>, 2<sup>nd</sup> ed.), >Upland Bur Oak Forest (3<sup>rd</sup> ed.), >Oak Woodland (1<sup>st</sup> - 3<sup>rd</sup> ed.)

SYSTEM PLACEMENT: Eastern Dry-Mesic Bur Oak Forest and Woodland

RANGE: This community is found in the eastern fourth of the state, and is most common in the drainages of the lower Niobrara, Big Blue, Elkhorn, Platte (especially Salt Creek), Big and Little Nemaha rivers and could be present along the lower Loup River system.

EPA ECOREGIONS: 27f, 27e?, 42p, 47

ENVIRONMENTAL DESCRIPTION: This community occurs primarily in the glaciated portion of eastern Nebraska on gentle to steep slopes of draws and bluffs usually with a north or east aspect, and are often associated with streams and rivers. Soils are usually well-developed silt loams or sandy loams formed primarily in loess and glacial till and are well-drained.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Tree canopy: hackberry (*Celtis occidentalis*), green ash (*Fraxinus pennsylvanica*), bur oak (*Quercus macrocarpa*)

Tree subcanopy: hackberry (*Celtis occidentalis*), eastern red cedar (*Juniperus virginiana*), American elm (*Ulmus americana*), slippery elm (*U. rubra*)

Tall shrub: roughleaf dogwood (*Cornus drummondii*), chokecherry (*Prunus virginiana*), prickly-ash (*Zanthoxylum americanum*)

Short shrub: Missouri gooseberry (*Ribes missouriense*), wolfberry (*Symphoricarpos occidentalis*), coralberry (*S. orbiculatus*)

Vine: bittersweet (*Celastrus scandens*), Virginia creeper (*Parthenocissus quinquefolia*), greenbriar (*Smilax hispida*), eastern poison ivy (*Toxicodendron radicans*)

Herbaceous: white snakeroot (*Ageratina altissima*), common wood sedge (*Carex blanda*), longbeak sedge (*C. sprengei*), large-flower tick-clover (*Desmodium glutinosum*), hairy wildrye (*Elymus villosus*), nodding fescue (*Festuca subverticillata*), annual bedstraw (*Galium aparine*), common stickseed (*Hackelia virginiana*), moonseed (*Menispermum canadense*), aniseroot (*Osmorhiza longistylis*), Virginia creeper (*Parthenocissus quinquefolia*), Canada sanicle (*Sanicula canadensis*), clustered sanicle (*Sanicula odorata*), downy wood violet (*Viola sororia*)

DIAGNOSTIC SPECIES: *Quercus macrocarpa*, *Ulmus rubra*

VEGETATION DESCRIPTION: These sites are primarily dominated by bur oak, though in some sites green ash may also be conspicuous on upper slopes, while hackberry, black walnut (*Juglans nigra*) or basswood (*Tilia americana*) may be common on lower slopes. Slippery elm and hackberry are the most common subcanopy trees, with lesser amounts of green ash and American elm (*Ulmus americana*). In the extreme southeast, bitternut hickory (*Carya cordiformis*), redbud (*Cercis canadensis*), or red mulberry (*Morus rubra*) may be locally common in the subcanopy. Degraded sites may be invaded by eastern red cedar (*Juniperus*

*virginiana*), the introduced Siberian elm (*Ulmus pumila*), or white mulberry (*Morus alba*). Eastern red cedar is especially prominent in the lower Niobrara and upper Missouri drainages, where it may outcompete nearly all other understory species. The shrub layer varies from somewhat dense to sparse or nearly absent. The tall shrub layer is sparse to moderate and usually contains roughleaf dogwood in the south or chokecherry in the north. Prickly-ash is locally common throughout. Short shrubs are often more prominent, especially Missouri gooseberry and coralberry, with scattered wolfberry in some sites northward. The herbaceous layer is usually fairly sparse on upper slopes and quite dense below. Among the common species are several shade tolerant graminoids such as common wood sedge, narrowleaf inflated sedge (*Carex grisea*), nodding fescue, and hairy wildrye. Virginia creeper commonly dominates the forest floor of most sites, with clustered sanicle or aniseroot often equally abundant on lower slopes. Longbeak sedge may overwhelmingly dominate the forest floor in the far north. Other frequent herbs include white snakeroot, annual bedstraw, downy wood violet, large-flower tick-clover, Jack-in-the-pulpit (*Arisaema triphyllum*), and honewort (*Cryptotaenia canadensis*). White trout-lily (*Erythronium albidum*) and dutchman's breeches (*Dicentra cucullaria*) often blanket the forest floor of some higher quality sites in early spring. Species diversity is moderate to relatively high.

**OTHER NOTEWORTHY SPECIES:** Rock elm (*Ulmus thomasi*) may be present in this community in northeast Nebraska. Green dragon (*Arisaema dracontium*), pale Indian plantain (*Arnoglossum atriplicifolium*), mullein foxglove (*Dasistoma macrophylla*), and violet bush-clover (*Lespedeza violacea*) have been found in this community in southeast Nebraska.

**STATE RANK:** S2S3

**RANK JUSTIFICATION:** This community is fairly widespread in portions of eastern Nebraska, but many sites are degraded by overgrazing. Many, if not most have been heavily logged in the past.

**INVASIVE SPECIES OF CONCERN:** Kentucky bluegrass (*Poa pratensis*) is common in many sites, and smooth brome (*Bromus inermis*) may be problematic in more open sites. Garlic mustard is becoming widespread in this community. Common buckthorn and multiflora rose are sometimes present.

**GLOBAL RANK:** G4

**COMMENTS:** This community encompasses the majority of the extant bur oak-dominated areas in eastern Nebraska, most of which exist as a combination of forest and woodland that are scarcely separable. For the most part, the canopy is predominately to wholly dominated by bur oak. In some sites north of the Platte River, basswood may be common in the canopy or subcanopy of lower slopes. These sites and the Bur oak–Basswood–Ironwood Forest were combined as the Northeastern Upland Forest community in the 2<sup>nd</sup> edition of this classification. In extreme southeast Nebraska and along the lower Platte River, red oak (*Quercus rubra*) may be co-dominant with bur oak, or even dominant on lower slopes.

On the lower Niobrara River, this community exists in deep protected canyons west to the vicinity of Mariaville in Rock County. Upper slopes tend to be dominated by dry oak

woodland more typical of mixed-grass regions of the Great Plains, and given sites may include elements of both the Eastern Dry-Mesic Bur Oak Forest and Woodland System and the Great Plains Dry Upland Bur Oak System.

EXEMPLARY SITES: Burr Oak and Oak Glen Wildlife Management Areas in Seward County, Hickory Ridge Wildlife Management Area in Johnson County, Oak Valley Wildlife Management Area in Madison County.

## **SANDSTONE UPLAND BUR OAK WOODLAND**

ELEMENT CODE: none available

GLOBAL NAME: none available

OTHER NAMES: <Bur Oak Woodland (3<sup>rd</sup> ed.)

SYSTEM PLACEMENT: Great Plains Dry Upland Bur Oak Woodland

RANGE: This community is limited to the escarpments and draws in the drainage of Rose Creek in Jefferson County.

EPA ECOREGION: 27a

ENVIRONMENTAL DESCRIPTION: This community occurs on moderate to steep slopes of various aspect associated with stream valleys. Soils are somewhat poorly-developed sandy-loams formed in Cretaceous Dakota Sandstone, and often include outcrops of sandstone bedrock.

### **MOST ABUNDANT SPECIES:**

Tree Canopy: bur oak (*Quercus macrocarpa*)

Sub-canopy: eastern red cedar (*Juniperus virginiana*), American elm (*Ulmus americana*), slippery elm (*U. rubra*)

Shrub: roughleaf dogwood (*Cornus drummondii*), Missouri gooseberry (*Ribes missouriense*), coralberry (*Symphoricarpos orbiculatus*)

Vine: Virginia creeper (*Parthenocissus quinquefolia*), eastern poison ivy (*Toxicodendron radicans*), riverbank grape (*Vitis riparia*)

Herbaceous: white snakeroot (*Ageratina altissima*), common wood sedge (*Carex blanda*), sweet-scented bedstraw (*Galium triflorum*), nodding fescue (*Festuca subverticillata*), Canada sanicle (*Sanicula canadensis*), bluntleaf cliff fern (*Woodsia obtusa*).

DIAGNOSTIC SPECIES: *Quercus macrocarpa*

**VEGETATION DESCRIPTION:** The canopy of this community consists of moderate cover of bur oak, though scattered trees of green ash (*Fraxinus pennsylvanica*) and elms (*Ulmus* spp.) are frequently present. Honey locust (*Gleditsia triacanthos*) may be a constituent of this community in some places. Openings among the oak are frequently filled by eastern red cedar, and shrubs may be common where cedars are not as dense, with, coralberry, Missouri gooseberry, and roughleaf dogwood the common species. Remnant patches of wild plum (*Prunus americana*) and smooth sumac (*Rhus glabra*) are sometimes present where the canopy is more open. The herbaceous understory is often sparse where the subcanopy or shrub layers are dense with bluntleaf wood fern often conspicuous. In sites where the woody understory is occasionally removed by fire or grazing, the herbaceous understory is composed of woodland species such as Virginia creeper (*Parthenocissus quinquefolia*), eastern poison ivy (*Toxicodendron radicans*), white snakeroot (*Ageratina altissima*), nodding fescue (*Festuca subverticillata*), and sweet-scented bedstraw (*Galium triflorum*). Shade-tolerant grassland species are characteristically present, including wild strawberry (*Fragaria virginiana*), western ironweed (*Vernonia baldwinii*), wingstem (*Verbesina alternifolia*), and tall thistle (*Cirsium altissimum*), along with woodland species. Smooth brome (*Bromus inermis*) and Kentucky bluegrass (*Poa pratensis*) commonly invade more open sites to the exclusion of the natives.

Also included in these woodlands are small outcrops of bedrock that are often covered with shallow, sandy soil and are home to remnant grassland species including fork-tip three-awn (*Aristida basiramea*), church-mouse three-awn (*A. curtissii*), hairy grama (*Bouteloua hirsuta*), whorled milkwort (*Polygala verticillata*), slender knotweed (*Polygonum tenue*), and showy goldenrod (*Solidago speciosa*). Species diversity is moderate in open sites and low where infested by eastern red cedar.

**OTHER NOTEWORTHY SPECIES:** Uncommon species present in this community include *Asplenium platyneuron* and *Cystopteris tenuis* in shaded sites, and *Aristida purpurascens* and *Crocantemum bicknellii* in sandstone openings.

**STATE RANK:** S2?

**RANK JUSTIFICATION:** Most remaining sites have become extensively invaded by eastern red cedar or shrubs as a result of fire suppression.

**INVASIVE SPECIES OF CONCERN:** Smooth brome and Kentucky bluegrass are problematic in open areas within this community. Multiflora rose and common buckthorn are also potential threats.

**GLOBAL RANK:** GNR

**COMMENTS:** This community represents the most extensive example of an upland wooded community that occurs primarily on bedrock, and is separable from other oak woodland communities in the state because of their relatively acidic soils (often augmented by the presence of eastern red cedar) and floristic differences due to remnant sandstone glades within the community. Oak woodland associated with Permian and Pennsylvanian limestones are known from Cass, Pawnee and Richardson counties and sometimes contain unique species such as *Quercus marilandica* and *Q. prinoides* and probably deserved similar status, but have not been

studied sufficiently to recognize as distinct, and are here regarded as part of the Eastern Dry-Mesic Bur Oak Forest and Woodland System. Similarly woodlands associated with Cretaceous Greenhorn Limestone in southeast Thayer County may constitute a community similar to those of the Smoky Hills, but for now are included in the Dry Upland Bur Oak Woodland community.

EXEMPLARY SITES: Representative occurrences are present at Rock Glen Wildlife Management Area in Jefferson County.

## **DRY UPLAND BUR OAK WOODLAND**

ELEMENT CODE: none assigned

GLOBAL NAME: none assigned

OTHER NAMES: <Bur Oak Woodland (3<sup>rd</sup> ed.)

SYSTEM PLACEMENT: Great Plains Dry Upland Bur Oak Woodland

RANGE: This community occurs mainly in the central and north-central parts of the state, especially along the Niobrara River from Cherry County east to Knox County and along the Keya Paha River in Boyd County. Stands in the Elkhorn River drainage and in the Loup River drainage in the loess hills of central Nebraska are placed here as well. Oak woods of the Republican River valley have been placed here, including isolated stands in Hitchcock County, though little is known about these woodlands.

EPA ECOREGIONS: 27, 42, 43i, 43r, 47 (rare)

ENVIRONMENTAL DESCRIPTION: This community occurs on gentle to steep slopes of various aspects and is usually associated with stream valleys. Soils are well-developed and well-drained silt loams and sandy loams formed mostly in loess and glacial till, sometimes in eolian sand, limestone or sandstone.

MOST ABUNDANT SPECIES:

Tree Canopy: bur oak (*Quercus macrocarpa*)

Sub-canopy: green ash (*Fraxinus pennsylvanica*), eastern red cedar (*Juniperus virginiana*)

Shrub: wild plum (*Prunus americana*), chokecherry (*Prunus virginiana*), smooth sumac (*Rhus glabra*), wolfberry (*Symphoricarpos occidentalis*), prickly-ash (*Zanthoxylum americanum*)

Vine: bittersweet (*Celastrus scandens*), Virginia creeper (*Parthenocissus quinquefolia*), woodbine (*P. vitacea*), riverbank grape (*Vitis riparia*)

Herbaceous: common wood sedge (*Carex blanda*), longbeak sedge (*C. sprengelii*), hairy wildrye (*Elymus villosus*), Virginia wildrye (*E. virginicus*), starry false Solomon's-seal (*Maianthemum stellatum*), Canada sanicle (*Sanicula canadensis*)

DIAGNOSTIC SPECIES: *Quercus macrocarpa*, *Juniperus virginiana*

VEGETATION DESCRIPTION: The canopy of this community consists of moderate cover of bur oak, though scattered trees of green ash, box-elder (*Acer negundo*) and elms (*Ulmus* spp.) are frequently present. Openings among the oak are frequently filled by eastern red cedar, and shrubs may be common where cedars are not as dense, with wolfberry, chokecherry, and roughleaf dogwood the common species. Remnant patches of wild plum (*Prunus americana*) and smooth sumac (*Rhus glabra*) are sometimes present where the canopy is more open. The herbaceous understory is often sparse where the subcanopy or shrub layers are dense. However, in sites where the woody understory is occasionally removed by fire or grazing herbaceous woodland plants dominate, along with shade-tolerant plants of prairie and woodland edges such as ox-eye sunflower (*Heliopsis helianthoides*). Species diversity is low to moderate.

OTHER NOTEWORTHY SPECIES: none recorded

STATE RANK: S3?

RANK JUSTIFICATION: Most remaining sites have become extensively invaded by eastern red cedar or shrubs, and alien grasses such as Kentucky bluegrass (*Poa pratensis*) or smooth brome (*Bromus inermis*)

INVASIVE SPECIES OF CONCERN: Kentucky bluegrass is sometimes common, and smooth brome may dominate along the periphery. Dame's rocket (*Hesperis matronalis*) is known from some sites and garlic-mustard (*Alliaria petiolata*), which is recorded from along the Republican River, is possible. Common buckthorn (*Rhamnus cathartica*) and multiflora rose (*Rosa multiflora*) may also pose a threat.

GLOBAL RANK: GNR

COMMENTS: Although bur oak stands with a dense red cedar subcanopy are fairly widespread in north and northeast Nebraska, few high quality sites are known. The description included here is largely based on a well-preserved remnant on the Niobrara Valley Preserve in Cherry County, where burn management has been used to maintain the herbaceous understory. Formerly, all areas of open canopy upland woodlands dominated by some species of oak were included in a very broadly defined "Bur Oak Woodland" community that encompassed a wide range of edaphic conditions and species diversity. The community currently defined is still rather broadly defined, but is separable from other oak woodlands by its mixed-grass prairie setting. Oak woods associated with the loess-mantled exposures of Greenhorn Limestone in Thayer County are tentatively included here.

EXEMPLARY SITES: Representative occurrences are present on the Niobrara Valley Preserve in Cherry County. A different, more forest-like example is present at Hannibal Woods in Howard County.



## PAPER BIRCH SPRINGBRANCH CANYON FOREST

ELEMENT CODE: C EGL002013

GLOBAL NAME: =*Betula papyrifera* – (*Tilia americana*, *Quercus macrocarpa*) Canyon Forest (Paper Birch Canyon Forest)

OTHER NAMES: =Paper Birch Canyon Forest, =Boreal Relict Community (Kantak 1995), =Paper Birch association (Pool 1914), =Northern Springbranch Canyon Forest (1<sup>st</sup>, 2<sup>nd</sup> ed.)

SYSTEM PLACEMENT: Great Plains Wooded Draw, Ravine and Canyon

RANGE: This community occurs along a 50 km stretch of the Niobrara River from Valentine in eastern Cherry County to the mouth of Plum Creek in western Brown County. A historic collection of paper birch from Merriman indicates that it may also occur in northwest Cherry County.

EPA ECOREGIONS: 43r, 44?

ENVIRONMENTAL DESCRIPTION: This community occurs primarily in spring-fed tributary canyons (springbranch canyons) and along lower slopes of bluffs on the south side of the Niobrara River. Soils are deep loams and sandy loams formed in eolian sand, colluvium, alluvium, and Rosebud siltstone. Soils near seeps and on lower slopes of springbranch canyons remain moist to saturated throughout the year and often have a dense layer of organic matter; those on middle and upper slopes tend to be moderately well-drained.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Tree canopy: paper birch (*Betula papyrifera*), green ash (*Fraxinus pennsylvanica*), basswood (*Tilia americana*)

Subcanopy: eastern red cedar (*Juniperus virginiana*), ironwood (*Ostrya virginiana*)

Shrub: chokecherry (*Prunus virginiana*), wolfberry (*Symphoricarpos occidentalis*)

Short shrub: western poison ivy (*Toxicodendron rydbergii*)

Vine: Virginia creeper (*Parthenocissus quinquefolia*), riverbank grape (*Vitis riparia*)

Herbaceous: wild sarsaparilla (*Aralia nudicaulis*), grove sandwort (*Arenaria lateriflora*), common wood sedge (*Carex blanda*), bristle-leaf sedge (*C. eburnea*), Peck's sedge (*C. peckii*), Rocky Mountain sedge (*C. saximontana*), longbeak sedge (*C. sprengelii*), enchanter's nightshade (*Circaea canadensis*), brittle bladder fern (*Cystopteris fragilis*), hairy wildrye (*Elymus villosus*), common scouringrush (*Equisetum hyemale*), nodding fescue (*Festuca subverticillata*), annual

bedstraw (*Galium aparine*), sweet-scented bedstraw (*G. triflorum*), wood nettle (*Laportea canadensis*), starry false Solomon's-seal (*Maianthemum stellatum*), littleseed ricegrass (*Piptatherum micranthum*), Solomon's-seal (*Polygonatum biflorum*), smooth blue aster (*Symphyotrichum laeve*)

DIAGNOSTIC SPECIES: *Aralia nudicaulis*, *Arenaria lateriflora*, *Betula papyrifera*, *Ostrya virginiana*

VEGETATION DESCRIPTION: The dominant overstory trees in this community are paper birch, which occurs in areas where its roots are continuously in contact with the water table, and basswood, which occurs on adjacent low slopes. Ironwood is the dominant understory tree, with green ash and juniper present, but less common. Shrubs are sparse, though a short shrub layer of western poison ivy may be abundant. The herbaceous understory is likewise often sparse, with the slopes dominated by woodland sedges and grasses typical of the surrounding forest communities. Mesophytic forbs are often common on the lower slopes, including wood nettle and cow parsnip (*Heracleum montanum*). Two species diagnostic of this community are wild sarsaparilla and grove sandwort, both of which may be abundant. In the canyon bottoms, mosses, liverworts, and herbaceous perennials typical of the spring seep/stream community are common. Species diversity is relatively high.

OTHER NOTEWORTHY SPECIES: Uncommon species found in this community include *Aralia nudicaulis*, *Arenaria lateriflora*, *Carex peckii*, *Dryopteris carthusiana*, *Maianthemum canadense*, and *Platanthera aquilonis*.

STATE RANK: S1

RANK JUSTIFICATION: This community is extremely limited in its overall range. Paper birch trees seem not to be reproducing, and the historic structure of this community is being altered by deciduous trees filling gaps in the canopies as the birches die out.

INVASIVE SPECIES OF CONCERN: Few alien species are known from this community, though Kentucky bluegrass (*Poa pratensis*) is sometimes present, and dame's rocket (*Hesperis matronalis*) is established locally in moist woods along the Niobrara River near some known sites of this community.

GLOBAL RANK: G2?

COMMENTS: This community usually occurs as patches associated with the Basswood – Ironwood Springbranch Canyon Forest community and may be replaced by it as birches die out. The two may be combined as "springbranch canyon forest" for delineation purposes. In their upper reaches these communities many grade into Bur Oak Woodland and Dry Ponderosa Pine Open Woodland and Savanna (or a combination of the two).

Historically, this community showed very little vertical complexity, with paper birch often towering above its very sparse subcanopy (Pound & Clements 1900, Pool 1914). It appears that currently the encroachment of other deciduous trees may contribute to the apparent lack of birch reproduction in existing stands. In time, this community may be replaced by

Basswood-Ironwood Springbranch Canyon Forest in all but a few places, if not entirely. This community is known only from Nebraska, but may be similar to some birch dominated communities in the Black Hills.

EXEMPLARY SITES: Fort Niobrara National Wildlife Refuge and Smith Falls State Park in Cherry County, the Niobrara Valley Preserve in Brown and Cherry counties

## **BASSWOOD - IRONWOOD SPRINGBRANCH CANYON FOREST**

ELEMENT CODE: CEG002012

GLOBAL NAME: <*Tilia americana* – (*Quercus macrocarpa*) / *Ostrya virginiana* Forest (Basswood – Bur Oak Forest)

OTHER NAMES: <*Tilia americana* consociation (Aikman 1929); <Linden-Cedar-Ironwood-Ash association (Pool 1914); <Northeastern Upland Forest (1<sup>st</sup>, 2<sup>nd</sup> ed.)

SYSTEM PLACEMENT: Great Plains Wooded Draw, Ravine and Canyon

RANGE: This community is apparently restricted to the central Niobrara River valley breaks in northeastern Cherry, Brown, Keya Paha and Rock counties.

EPA ECOREGIONS: 43r

ENVIRONMENTAL DESCRIPTION: This community occurs on gentle to steep slopes of bluffs, canyons, and ravines, including springbranch canyons, mostly on north and east-facing slopes. Soils are well drained to moderately well drained loams and sandy loams formed in eolian sand, colluvium, alluvium, and Rosebud siltstone.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Tree canopy: hackberry (*Celtis occidentalis*), green ash (*Fraxinus pennsylvanica*), bur oak (*Quercus macrocarpa*), basswood (*Tilia americana*)

Subcanopy: eastern red cedar (*Juniperus virginiana*), ironwood (*Ostrya virginiana*), slippery elm (*Ulmus rubra*)

Shrub: chokecherry (*Prunus virginiana*), wolfberry (*Symphoricarpos occidentalis*)

Short shrub: western poison ivy (*Toxicodendron rydbergii*)

Vine: Virginia creeper (*Parthenocissus quinquefolia*), riverbank grape (*Vitis riparia*)

Herbaceous: wild sarsaparilla (*Aralia nudicaulis*), common wood sedge (*Carex blanda*), bristle-leaf sedge (*C. eburnea*), Peck's sedge (*C. peckii*), Rocky Mountain sedge (*C. saximontana*), longbeak sedge (*C. sprengelii*), enchanter's nightshade (*Circaea canadensis*), brittle bladder fern (*Cystopteris fragilis*), hairy wildrye (*Elymus villosus*), northern strawberry (*Fragaria vesca*), annual bedstraw (*Galium aparine*), starry false Solomon's-seal (*Maianthemum stellatum*), littleseed ricegrass (*Piptatherum micranthum*), smooth blue aster (*Symphotrichum laeve*)

DIAGNOSTIC SPECIES: *Campanula rotundifolia*, *Carex sprengelii*, *Ostrya virginiana*, *Tilia americana*, *Viola canadensis*

VEGETATION DESCRIPTION: The overstory of this community is generally dominated by basswood, with hackberry and bur oak often also present, but never dominant. Hop hornbeam and eastern red cedar form a sparse to dense subcanopy, and shrubs are often sparingly present. The herbaceous layer varies from sparsely to moderately vegetated, with longbeak sedge often abundant in moderately-vegetated sites with few red cedar, and littleseed ricegrass prevailing in sparsely vegetated areas with moderate to high density of red cedar. Species diversity is moderate to relatively high.

OTHER NOTEWORTHY SPECIES: Species uncommon in Nebraska which are known from this community include *Aralia nudicaulis*, *Botrychium campestre*, *Carex peckii*, *Dryopteris carthusiana*, and *Physocarpus intermedius*.

STATE RANK: S2

RANK JUSTIFICATION: In portions of the central Niobrara this community is common and well-developed, but most sites have been impacted by past timber cutting and are frequently heavily grazed and disturbed. Abundance of eastern red cedar likely exceeds historic levels in many sites.

INVASIVE SPECIES OF CONCERN: Alien species are infrequently recorded in this community, though species that may pose a threat include Kentucky bluegrass (*Poa pratensis*), garlic mustard (*Alliaria petiolata*), and dame's rocket (*Hesperis matronalis*).

GLOBAL RANK: G3

COMMENTS: Previous editions have considered this community equivalent to the northeastern upland forest types prevalent along the Missouri River, which have similar dominant species. However, the accounts of both Pound & Clements (1900) and Pool (1914) indicate that bur oak was at best a minor component in these forests and that green ash and eastern red-cedar shared dominance with basswood and ironwood in canyons neither wet nor cool enough to support paper birch. Since green ash and eastern red cedar are components of the scarp woodlands of central Nebraska, it would appear that these sites were a combination of dry green ash – red-cedar woodland with mesic basswood-ironwood forest. Since the mesic basswood-ironwood forest elements may be associated with either the green ash – eastern red cedar or bur oak upland woodlands, it appears logical to follow tradition in segregating these sites from the bur oak – basswood – ironwood forests of the Missouri River valley in northeast Nebraska, from which

they are fairly well isolated. Unlike its Missouri Valley counterparts, basswood tends to dominate where it occurs in association with bur oak along the Niobrara. However, this community shows some similarities to the bur oak dominated bluff forests of northeast Nebraska, which may also contain an eastern red cedar–littleseed ricegrass component in places, and rarely also wild spikenard. Both this and the Bur Oak–Basswood–Ironwood Forest of northeast Nebraska are here treated within the same global community designation.

EXEMPLARY SITES: The Niobrara Valley Preserve in Brown and Cherry counties, and Smith Falls State Park in Cherry County.

## **GREEN ASH – ELM – HACKBERRY CANYON BOTTOM WOODLAND**

ELEMENT CODE: CEGLO00643

GLOBAL NAME: =*Fraxinus pennsylvanica* - *Ulmus americana* / *Prunus virginiana* Woodland (Green Ash – Elm Woody Draw)

OTHER NAMES: =Deciduous woods (Tolstead 1947), =Northwestern Canyon Bottom Deciduous Woodland (1<sup>st</sup>, 2<sup>nd</sup> ed.), =Mesic Forest (Rolfsmeier & Stewart-Phelps 2007)

SYSTEM PLACEMENT: Great Plains Wooded Draw, Ravine and Canyon

RANGE: This community is known from northwest and north-central Nebraska, and is most extensive in the Pine Ridge, Niobrara River valley and the Nebraska Sandhills. It is probably scattered southward in the Panhandle and perhaps the Loess Hills of central Nebraska.

EPA ECOREGIONS: 25, 27e?, 43r, 44

ENVIRONMENTAL DESCRIPTION: This community occurs on low slopes and in bottoms of ravines and narrow canyons, as well as on terraces along streams and rivers. It is less frequently associated with low dune slopes in the Sandhills. Soils are deep and moderately well drained sandy loams formed in weathered Tertiary sandstone, colluvium, alluvium, or eolian sand.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Tree canopy: box-elder (*Acer negundo*), hackberry (*Celtis occidentalis*), green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus americana*)

Shrub: wild plum (*Prunus americana*), chokecherry (*P. virginiana*), buffalo currant (*Ribes odoratum*), western wild rose (*Rosa woodsii*), wolfberry (*Symphoricarpos occidentalis*)

Short shrub: western poison ivy (*Toxicodendron rydbergii*)

Vine: bittersweet (*Celastrus scandens*), woodbine (*Parthenocissus vitacea*), riverbank grape (*Vitis riparia*)

Herbaceous: common wood sedge (*Carex blanda*), longbeak sedge (*C. sprengelii*), hairy wildrye (*Elymus villosus*), sweet-scented bedstraw (*G. triflorum*), Kentucky bluegrass (*POA PRATENSIS*)

DIAGNOSTIC SPECIES: *Acer negundo*, *Carex sprengelii*, *Celtis occidentalis*, *Fraxinus pennsylvanica*

VEGETATION DESCRIPTION: The dominant trees of this community include green ash and American elm, with box-elder present in more mesic sites. Hackberry is common locally, sometimes occurring as a dominant or sharing dominance with green ash. The subcanopy, when present, consists of the same species, though rarely mountain birch (*Betula occidentalis*) or quaking aspen (*Populus tremuloides*) may be present in the Pine Ridge. Shrubs include wild plum and northern gooseberry (*Ribes oxycanthoides*) (in the Pine Ridge), in addition to chokecherry and buffalo currant, and less commonly red osier (*Cornus sericea*), smooth sumac (*Rhus glabra*), and black raspberry (*Rubus occidentalis*). A short shrub layer of western poison ivy is often present, and in the Pine Ridge dwarf juniper (*Juniperus communis* var. *depressa*) and Oregon grape (*Berberis repens*) are present as well. Riverbank grape is the most common vine. The herbaceous layer is rich in species and is often dominated by woodland graminoids such as longbeak sedge and hairy wildrye in undisturbed sites. Kentucky bluegrass is a common invader that dominates most grazed sites. In the Pine Ridge, other herbaceous understory plants include an array of eastern deciduous forest species of the northeastern United States, including wild columbine (*Aquilegia canadensis*), northern bedstraw (*Galium boreale*), black snakeroot (*Sanicula marilandica*) and purple meadow rue (*Thalictrum dasycarpum*). Some species typical of the Rocky Mountains are may be present there as well, but are often not as common, including many-flower stickseed (*Hackelia floribunda*) and veiny meadow rue (*Thalictrum venulosum*). Species diversity is low to moderate in most sites, though it may be relatively high in ungrazed sites in the Pine Ridge.

OTHER NOTEWORTHY SPECIES: Species in this community uncommon in Nebraska include *Allium cernuum*, *Betula occidentalis*, *Bromus marginatus*, *B. porteri*, *Chamerion angustifolium*, *Coeloglossum viride*, *Corallorhiza maculata*, *Delphinium nuttallianum*, *Epilobium brachycarpum*, *Erigeron subtrinervis*, *Hackelia floribunda*, *Lathyrus ochroleucus*, *Platanthera aquilonis*, *Populus tremuloides*, *Prenanthes racemosa*, *Rubus strigosus*, *Schizachne purpurascens*, *Symphoricarpos albus*, *Thalictrum venulosum*, and *Turritis glabra*.

STATE RANK: S2

RANK JUSTIFICATION: Though fairly extensive in the Pine Ridge, this community type is heavily impacted by cattle grazing and well-preserved sites are increasingly uncommon.

INVASIVE SPECIES OF CONCERN: Leafy spurge (*Euphorbia esula*) is sometimes present in more open phases of this community, along with common burdock (*Arctium minus*). Hound's-tongue (*Cynoglossum officinale*) is becoming increasingly common in the Pine Ridge, where

dame's-rocket (*Hesperis matronalis*) and Dalmatian toadflax (*Linaria dalmatica*) are long-established and locally problematic.

GLOBAL RANK: G2G3

COMMENTS: In previous editions of this classification, this community was considered to only be associated with sizable pine-forested escarpments, primarily in the Pine Ridge. Deciduous woodland fitting the description of this community has also been found in the Niobrara River valley (Tolstead 1942), along the Dismal River (Pool 1914) and associated with dunes in the Sandhills (Steinauer 2006). It often occurs in association with pine-wooded communities but may also occur with red-cedar wooded escarpments or may occur as wooded islands in a grassland setting. Tolstead (1942) and Steinauer (2006) described "hackberry pockets" that are associated with moist, protected lower dune slopes in the Sandhills of Cherry County, and that are dominated primarily by hackberry (or hackberry and green ash). These may be recognized as a separate subtype if desired but do not seem sufficiently distinct from this community type to accord it special status.

This community is probably most extensive and species-rich in the Nebraska Pine Ridge, especially in areas where it forms a transition between deciduous and coniferous woods (Rolfsmeier & Stewart-Phelps 2007), and the majority of the "noteworthy species" listed are from such sites.

EXEMPLARY SITES: Gilbert-Baker Wildlife Management Area in Sioux County, Chadron State Park and scattered areas in the Pine Ridge Unit of the Nebraska National Forest in Dawes County.

### **GREEN ASH – EASTERN RED CEDAR SCARP WOODLAND**

ELEMENT CODE: none assigned

GLOBAL NAME: none assigned

OTHER NAMES: <Juniper Woodland (1<sup>st</sup>-3<sup>rd</sup> ed.)

SYSTEM PLACEMENT: Great Plains Wooded Draw, Ravine and Canyon

RANGE: In Nebraska, this system occurs primarily in unglaciated mixed-grass plains in central and north-central Nebraska, particularly along the Niobrara, Dismal and Middle Loup rivers, but may also be present in the Loess Hills of central Nebraska.

EPA ECOREGIONS: 27e?, 42?, 43r, 44

ENVIRONMENTAL DESCRIPTION: This community occurs on relatively steep north-facing bluff slopes associated with permanent or ephemeral streams. Soils are shallow, rapidly drained, poorly developed loamy sands and loams formed in Tertiary sandstones, colluvium, and probably also loess.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Tree canopy: green ash (*Fraxinus pennsylvanica*), eastern red-cedar (*Juniperus virginiana*)

Shrub: skunkbrush sumac (*Rhus aromatica* var. *trilobata*), buffalo currant (*Ribes odoratum*), wolfberry (*Symphoricarpos occidentalis*), western poison ivy (*Toxicodendron rydbergii*).

Herbaceous: littleseed ricegrass (*Piptatherum micranthum*) and other shade-tolerant grasses and herbs not yet recorded

DIAGNOSTIC SPECIES: *Fraxinus pennsylvanica*, *Juniperus virginiana*

VEGETATION DESCRIPTION: This system is dominated by a mix of deciduous trees and eastern red cedar, with green ash often the most abundant deciduous tree at most sites, sometimes co-occurring with box-elder (*Acer negundo*), American elm (*Ulmus americana*) and hackberry (*Celtis occidentalis*). The canopy layer is usually somewhat open and a deciduous subcanopy is usually poorly developed or absent, with eastern red cedar filling the gaps, and becoming dense in degraded sites. A shrub layer may be present, and consists of scattered patches of wild plum (*Prunus americana*), chokecherry (*P. virginiana*), buffalo currant, wolfberry and western poison ivy. In openings away from the woods, skunkbrush sumac and buffaloberry may additionally be present. An herbaceous layer of grassland and woodland plants is usually present, with littleseed ricegrass (*Piptatherum micranthum*) locally common under junipers on steep slopes with scattered ferns, and shade-tolerant grasses and occasional woodland herbs such as wood strawberry (*Fragaria vesca*) and others in areas with less red-cedar cover. Species diversity is low to moderate.

OTHER NOTEWORTHY SPECIES: none recorded.

STATE RANK: S3?

RANK JUSTIFICATION: It is likely that the extent of this community is expanding from its native range due to fire suppression, and at least the eastern red-cedars associated with this community appear to have spread far beyond protected north-slopes in many areas.

INVASIVE SPECIES OF CONCERN: Invasive and likely invasive plants in this community include smooth brome (*Bromus inermis*), leafy spurge (*Euphorbia esula*), Kentucky bluegrass (*Poa pratensis*), and Siberian elm (*Ulmus pumila*).

GLOBAL RANK: GNR

COMMENTS: Historical accounts briefly discuss the presence of this community along river bluffs and in deep canyons in central Nebraska in the 19<sup>th</sup> century, and their presence in part led early botanists to assume the Sandhills were formerly forested (Webber 1890b). These woody communities owe their survival to the protection accorded them from fire by topography and soil



moisture. In most cases, these sites were logged intensively following settlement and have regenerated from seed and stump sprouts. With fire suppression, eastern red cedar has moved into the uplands a considerable distance beyond its historic extent. The full extent of this community is poorly known, but appears most commonly in the Niobrara River valley and the valleys of other east-west trending rivers in the Sandhills and Loess Hills. Historical descriptions are given by Webber (1889, 1890a).

Given the tendency for eastern red-cedar to invade grassland in the absence of fires, little attention has been paid to our native eastern red-cedar communities. Historic evidence suggests communities dominated by *Juniperus virginiana* were present and locally extensive in parts of northern Nebraska, and served as an important source of timber for EuroAmerican settlers in some parts of the state.

EXEMPLARY SITES: Relatively undisturbed sites are still present along the Dismal River in Hooker and Thomas counties.

## **PONDEROSA PINE FOREST**

ELEMENT CODE: C EGL000192

GLOBAL NAME: =*Pinus ponderosa* / *Prunus virginiana* Forest (Ponderosa pine/chokecherry forest)

OTHER NAMES: =?Upland pine forest community (Kantak 1995); =Western Coniferous Forest (2<sup>nd</sup> ed.)

SYSTEM PLACEMENT: Northwestern Great Plains Pine Woodland

RANGE: This community occurs most extensively on the Pine Ridge escarpment in Dawes, Sheridan and Sioux counties in northwest Nebraska, and locally in the Wildcat Hills in Scotts Bluff County. It is known historically from Pine Canyon in Custer County and Plum Creek Canyon in Brown County, and may be present elsewhere along the Niobrara River breaks.

EPA ECOREGIONS: 25a, 25f, 27e?, 43r?

ENVIRONMENTAL DESCRIPTION: This community occurs on gentle to steep (5-40%) side slopes of canyons and escarpments, mostly on north and east-facing exposures. Soils are usually well-drained fine sandy loams formed from weathered Tertiary sandstones, though in the Custer County locality they are formed in loess.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Tree canopy: Ponderosa pine (*Pinus ponderosa*)

Tree subcanopy: green ash (*Fraxinus pennsylvanica*)

Tall shrub: Saskatoon serviceberry (*Amelanchier alnifolia*), chokecherry (*Prunus virginiana*)

Short shrub: Oregon grape (*Berberis repens*), dwarf juniper (*Juniperus communis* var. *depressa*), wolfberry (*Symphoricarpos occidentalis*), western poison ivy (*Toxicodendron rydbergii*)

Herbaceous: spreading dogbane (*Apocynum androsaemifolium*), common wood sedge (*Carex blanda*), Ross' sedge (*Carex rossii*), Rocky Mountain sedge (*C. saximontana*), brittle bladder fern (*Cystopteris fragilis*), slender wildrye (*Elymus trachycaulus*), hairy wildrye (*E. villosus*), starry false Solomon's-seal (*Maianthemum stellatum*), littleseed ricegrass (*Piptatherum micranthum*), Kentucky bluegrass (*POA PRATENSIS*), smooth blue aster (*Symphyotrichum laeve*)

DIAGNOSTIC SPECIES: *Amelanchier alnifolia*, *Berberis repens*, *Juniperus communis*, *Pinus ponderosa*, *Poa fendleriana* var. *longiligula*, *Prunus virginiana*

VEGETATION DESCRIPTION: This community is dominated by a dense canopy of ponderosa pine with occasional small trees of green ash, box elder (*Acer negundo* var. *interius*), Rocky Mountain juniper (*Juniperus scopulorum*) and American elm (*Ulmus americana*) widely scattered in the understory. Two shrub layers are usually present. In the tall shrub layer (1-2 m tall), chokecherry is often present and sometimes common, often with Saskatoon serviceberry and green ash saplings and occasionally with vines such as bittersweet (*Celastrus scandens*) and riverbank grape (*Vitis riparia*). A short shrub layer of wolfberry is often present, with scattered sparse skunkbrush sumac and occasionally western wild rose (*Rosa woodsii*) on upper slopes and dwarf juniper and scattered northern gooseberry (*Ribes oxycanthoides*) present below. An even shorter shrub underlayer (<0.5 m tall) of Oregon grape and western poison ivy is usually present, at least on lower slopes. Herbaceous cover is often sparse due to shading and accumulation of pine litter on upper and middle slopes. In slightly open areas, sedges are abundant, though Kentucky bluegrass is often the dominant species, with scattered patches of slender wheatgrass, nodding brome (*Bromus porteri*), marsh muhly (*Muhlenbergia racemosa*), and false melic (*Schizachne purpurascens*). On steep, shaded slopes, littleseed ricegrass and ferns may be predominant in the understory. Other plants commonly found in this community include spreading dogbane, smooth blue aster, starry false Solomon's-seal and fragile fern. Species diversity varies from low in areas with a dense layer of pine needle duff, to moderate or high in some mesic sites.

OTHER NOTEWORTHY SPECIES: Species uncommon in Nebraska which are found in this community include *Acer glabrum*, *Allium cernuum*, *Carex rossii*, *Chaemerion angustifolium*, *Corallorhiza maculata*, *C. wisteriana*, *Goodyera oblongifolia*, *Poa fendleriana* var. *longiligula*, *P. interior*, *Pterospora andromedea*, *Schizachne purpurascens*, and *Symphoricarpos albus*

STATE RANK: S2

RANK JUSTIFICATION: Many historical examples have been degraded through excessive logging in the past, and most existing stands, especially in the Pine Ridge, are even-aged and

highly susceptible to catastrophic fire, such as those that occurred in 2006. Excessive grazing of intact sites decreases species diversity and eliminates fine fuels, allowing "dog-hair" stands of pine to proliferate. Due to fire suppression, many sites have a very dense duff layer that smothers much of the herbaceous understory.

**INVASIVE SPECIES OF CONCERN:** Kentucky bluegrass is probably the most abundant invasive species in pine forest, though dame's-rocket (*Hesperis matronalis*) is locally common.

**GLOBAL RANK:** G3G4

**COMMENTS:** This community has very little vertical complexity, and in many cases appears to represent areas of historic open woodland that have become densely wooded as a result of fire suppression. However, historical forest is recorded from the Pine Ridge, from the mouth of Plum Creek in the Niobrara River valley, and from Pine Canyon in Custer County (Pound & Clements 1900). The latter two sites have probably since been altered by logging, and it is also likely that pine forest existed in Carter Canyon in the Wildcat Hills as well, though it was not included by Steinauer (2007) in his assessment of natural communities of this area. Pine forest is often difficult to delineate and is usually associated with pine and/or juniper woodland. Percent canopy cover does not always seem to be as important as environmental factors such as aspect, slope, soils and past management in separating pine forest from woodland, and some sites that have sufficient pine coverage to qualify as forest may have an understory more typical of woodlands. Occurrences outside the Pine Ridge often lack some of the diagnostic shrubs (e.g. *Berberis repens*, *Juniperus communis*) and other understory herbs mentioned here, but are similar in structure and dominant species composition. At least in Nebraska, this community occurs on protected, often steep slopes within pine woodland, and has a considerably more open canopy than deciduous forest communities. In some cases, deciduous woodland understory appears to have spread into upland pine forest, blurring the distinction between these communities.

**EXEMPLARY SITES:** Metcalf Wildlife Management Area in Sheridan County, Gilbert-Baker Wildlife Management Areas in Sioux County, and numerous canyons in the Pine Ridge Unit of the Nebraska National Forest in Dawes County.

## **DRY-MESIC PONDEROSA PINE WOODLAND**

**ELEMENT CODE:** not yet assigned

**GLOBAL NAME:** not yet assigned

**SYSTEM PLACEMENT:** Northwestern Great Plains Pine Woodland

**RANGE:** This community is presently known only from the Pine Ridge escarpment in northwestern Nebraska but may be extant or known historically from the Wildcat Hills and Niobrara River valley.

EPA ECOREGIONS: 25a, 25f?, 43r?

ENVIRONMENTAL DESCRIPTION: This community occurs on gentle to steep (5-40%) slopes on mostly north and east exposures of escarpments. Soils are well-drained sandy loams formed in colluvium and are often associated with sandstone outcrops.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Tree canopy: Ponderosa pine (*Pinus ponderosa*)

Tall shrub: Saskatoon serviceberry (*Amelanchier alnifolia*), chokecherry (*Prunus virginiana*)

Short shrub: Oregon grape (*Berberis repens*), fragrant sumac (*Rhus aromatica* var. *trilobata*), wolfberry (*Symphoricarpos occidentalis*), western poison ivy (*Toxicodendron rydbergii*)

Herbaceous: big bluestem (*Andropogon gerardii*), pasque flower (*Anemone patens*), spreading dogbane (*Apocynum androsaemifolium*), sun sedge (*Carex heliophila*), prairie sandreed (*Calamovilfa longifolia*), brittle bladder fern (*Cystopteris fragilis*), slender wildrye (*Elymus trachycaulus*), hairy wildrye (*E. villosus*), northern bedstraw (*Galium boreale*), starry false Solomon's-seal (*Maianthemum stellatum*), green needlegrass (*Nassella viridula*), western wheatgrass (*Pascopyrum smithii*), Kentucky bluegrass (*POA PRATENSIS*), smooth blue aster (*Symphyotrichum laeve*), buckbean (*Thermopsis rhombifolia*)

DIAGNOSTIC SPECIES: *Andropogon gerardii*, *Carex heliophila*, *Nassella viridula*, *Pascopyrum smithii*, *Pinus ponderosa*

VEGETATION DESCRIPTION: This community is dominated by a moderate to somewhat dense canopy of ponderosa pine with a very sparse to absent subcanopy and tall shrub layer, and a relatively dense herbaceous understory. Chokecherry and saplings of green ash may be widely scattered with a slightly more prominent short shrub layer that often includes skunkbrush sumac and wolfberry with a shorter underlayer of Oregon grape. Grasses usually dominate the herbaceous layer, with the invasive Kentucky bluegrass usually occurring most commonly. Taller grasses typically of open areas are generally present, including big bluestem, green needlegrass, western wheatgrass and less frequently prairie sandreed and porcupine grass (*Hesperostipa spartea*). In many places, especially on upper slopes, sun sedge is an abundant co-dominant species. Among the other common herbaceous plants are a mixture of prairie and woodland species including buckbean, pasque flower, spreading dogbane, pussytoes (*Antennaria* spp.), and starry false Solomon's-seal. Some upper slope phases of this community may represent former Dry Ponderosa Pine Open Woodland in which canopy cover has increased due to fire suppression. Species diversity is moderate to fairly high.

OTHER NOTEWORTHY SPECIES: Rattlesnake plantain (*Goodyera oblongifolia*) was found once in moderately open pine woods in Dawes County and is probably more widespread. White-

scale sedge (*Carex xerantica*) and pinedrops (*Pterospora andromedea*) are occasionally found in this community.

STATE RANK: S2

RANK JUSTIFICATION: Though many areas are present on the Pine Ridge, timber cutting and associated disturbance continues to degrade some sites. A dense cover of pine litter in some areas has decreased species richness of the understory and increases the threat of serious fire damage.

INVASIVE SPECIES OF CONCERN: Kentucky bluegrass is often abundant in the community, and other invasive species that could be present include hound's-tongue (*Cynoglossum officinale*), dame's-rocket (*Hesperis matronalis*), Dalmatian toadflax (*Linaria dalmatica*) and intermediate wheatgrass (*Thinopyrum intermedium*).

GLOBAL RANK: G3G4

COMMENTS: This community includes all pine-wooded sites with an understory of shade-tolerant graminoids, whereas in the Ponderosa Pine Woodland shade intolerant grasses may also be common. Such sites were previously classified as Ponderosa Pine Forest or Ponderosa Pine Woodland and may grade into these communities downslope and upslope, respectively. This community is very similar to both the *Pinus ponderosa* / *Pascopyrum smithii* Woodland (CEGL000188) and the *Pinus ponderosa* / *Carex inops* ssp. *heliophila* Woodland (CEGL000849) communities recognized by NatureServe for the Black Hills.

EXEMPLARY SITES: Metcalf Wildlife Management Area in Sheridan County and the West Ash Creek Canyon area on the Nebraska National Forest in Dawes County.

## **DRY PONDEROSA PINE OPEN WOODLAND AND SAVANNA**

ELEMENT CODE: CEGL000201

GLOBAL NAME: =*Pinus ponderosa* / *Schizachyrium scoparium* Woodland (Ponderosa pine / Little bluestem Woodland)

OTHER NAMES: =Pine savanna (Kantak 1995); <Ponderosa pine woodland (1<sup>st</sup>-3<sup>rd</sup> ed.)

SYSTEM PLACEMENT: Northwestern Great Plains Pine Woodland

RANGE: This community occurs in the Pine Ridge escarpment in Dawes, Sheridan and Sioux counties in northwest Nebraska, and along the Niobrara River in Brown, Cherry, and Keya Paha counties. It is present to a lesser extent in the Wildcat Hills in Banner and Scotts Bluff counties, and may occur along the south periphery of the Sandhills in central Nebraska.

EPA ECOREGIONS: 25a, 25d, 25f, 27e?, 43r, 44?

ENVIRONMENTAL DESCRIPTION: This community occurs on gentle to steep slopes (5–40%) on south and west-facing slopes and upper north and east-facing slopes in the Pine Ridge escarpment, along the Niobrara River, and in the Wildcat Hills. Soils are well-drained fine sandy loams formed in weathered sandstone or eolian sand, less frequently silt loams and silty clay loams formed in loess or chalky shale.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Tree canopy: ponderosa pine (*Pinus ponderosa*)

Shrub: skunkbrush sumac (*Rhus aromatica* var. *trilobata*), Arkansas rose (*Rosa arkansana*), wolfberry (*Symphoricarpos occidentalis*)

Herbaceous: white sage (*Artemisia ludoviciana*), sideoats grama (*Bouteloua curtipendula*), blue grama (*B. gracilis*), prairie sandreed (*Calamovilfa longifolia*), threadleaf sedge (*Carex filifolia*), sun sedge (*C. heliophila*), slender wheatgrass (*Elymus trachycaulus*), needle-and-thread (*Hesperostipa comata*), western wheatgrass (*Pascopyrum smithii*), Kentucky bluegrass (*POA PRATENSIS*), little bluestem (*Schizachyrium scoparium*), rough heath aster (*Symphotrichum falcatum*), yucca (*Yucca glauca*)

DIAGNOSTIC SPECIES: *Bouteloua gracilis*, *Carex filifolia*, *Pinus ponderosa*, *Schizachyrium scoparium*

VEGETATION DESCRIPTION: This community has an open canopy of ponderosa pine with Rocky Mountain juniper (*Juniperus scopulorum*) or eastern red-cedar (*J. virginiana*) sometimes present, but never abundant. A shrub layer may be scattered to extensive, consisting of skunkbrush sumac, Arkansas rose, western wild rose (*Rosa woodsii*) and wolfberry on lower slopes. Yucca (*Yucca glauca*) is sometimes present. In well-preserved sites, herbaceous cover is mostly of short to mid grasses and sedges, with blue grama, threadleaf sedge, and little bluestem often common in more open sites, and Kentucky bluegrass and sun sedge abundant where tree cover is greater. Other scattered graminoids include big bluestem and sand bluestem (*Andropogon gerardii* and *A. hallii*), prairie sandreed, slender wheatgrass, green needlegrass (*Nassella viridula*), western wheatgrass, and needle-and-thread. Herbaceous species include a mixture of mixed-grass prairie species such as rough heath aster, dotted gayfeather (*Liatris punctata*), purple coneflower (*Echinacea angustifolia*), and white sage, along with more shade-tolerant plants including pasque-flower (*Anemone patens*), pussytoes (*Antennaria* spp.), and Hood's phlox (*Phlox hoodii*). Species diversity is low to moderate.

OTHER NOTEWORTHY SPECIES: none recorded

STATE RANK: S3S4

**RANK JUSTIFICATION:** Pine woodland is fairly widespread in the Pine Ridge district of the Nebraska National Forest, but certain portions are threatened by timber cutting. Invasion by cedars has degraded the diversity of some sites.

**INVASIVE SPECIES OF CONCERN:** Kentucky bluegrass is frequently present in this community, though it is usually not as problematic as it is in other pine-dominated communities. Horehound (*Marrubium vulgare*) is problematic locally in the Pine Ridge.

**GLOBAL RANK:** G3G4

**COMMENTS:** In previous editions of this classification, the Ponderosa Pine Woodland community encompassed the currently-defined Dry Ponderosa Pine Woodland and portions of the Dry-Mesic Ponderosa Pine Woodland community, and the distinction between the two may at times be somewhat arbitrary. In general, the Dry Ponderosa Pine Woodland is defined as having an herbaceous understory predominately of upland mixed-grass prairie species, and at times all that distinguishes it from mixed-grass prairie is the presence of pine. In many sites, especially on northern and eastern exposures, the understory may include shade-tolerant species such as northern pussytoes (*Antennaria neodioica*), harebell (*Campanula rotundifolia*), mouse-ear chickweed (*Cerastium arvense*), smooth blue aster (*Symphyotrichum laeve*), Oregon woodsia (*Woodsia oregana*), and occasionally the low shrubs Oregon grape (*Berberis repens*) and dwarf juniper (*Juniperus communis*). Sites in which these woodland elements are conspicuous may be included in the Dry-Mesic Ponderosa Pine Woodland community.

In the Niobrara Valley, bur oak and other eastern deciduous forest elements are often present in this community. At present these sites are considered transitional between pine woodland and bur oak woodland, but someday may deserve recognition as a separate community because of their dissimilarity to pine woodlands of the Panhandle.

In the Panhandle, this community usually occurs in association with more densely-wooded ponderosa pine communities, likely in part because of increased canopy cover due to fire suppression. On steep north slopes that contained pine woodland prior to the 1989 fire at Fort Robinson, the woodland understory species still persist, and pine regeneration is often fairly high in these sites. Such sites may have been included within the Pine Ridge Sandy Slope Prairie community in previous classifications.

**EXEMPLARY SITES:** The Niobrara Valley Preserve in Keya Paha County, Metcalf Wildlife Management Area in Sheridan County, Fort Robinson State Park in Sioux County

## **PINE-JUNIPER SCARP WOODLAND**

**ELEMENT CODE:** CEG000861

**GLOBAL NAME:** =*Pinus ponderosa* / *Juniperus scopulorum* Woodland (Ponderosa Pine/Rocky Mountain Juniper Woodland)

**OTHER NAMES:** <Mixed Conifer Woodland (1<sup>st</sup>-3<sup>rd</sup> ed.)

SYSTEM PLACEMENT: Northwestern Great Plains Pine Woodland

RANGE: Historically, this community was probably limited to the Wildcat Hills of Banner and Scotts Bluff counties, the Chadron Dome area in northeastern Dawes and northwestern Sheridan counties, and probably portions of the Pine Ridge escarpment in Sioux and western Dawes counties. It is currently recorded also in the southern Panhandle in Cheyenne, Morrill, and Kimball counties.

EPA ECOREGIONS: 25a, 25d, 25f

ENVIRONMENTAL DESCRIPTION: This community occurs on fairly steep (25-45%) slopes, usually on the north sides of escarpments. Soils are shallow very well-drained fine sandy loams, silt loams, and silty clay loams formed in weathered sandstone, siltstone, and chalky shale.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Tree canopy: ponderosa pine (*Pinus ponderosa*)

Subcanopy: Rocky Mountain juniper (*Juniperus scopulorum*) and hybrids with eastern red cedar (*Juniperus virginiana*)

Shrub: chokecherry (*Prunus virginiana*), skunkbrush sumac (*Rhus aromatica* var. *trilobata*)

Short Shrub: western poison ivy (*Toxicodendron rydbergii*)

Herbaceous: sun sedge (*Carex heliophila*), littleseed ricegrass (*Piptatherum micranthum*), Kentucky bluegrass (*POA PRATENSIS*)

DIAGNOSTIC SPECIES: *Juniperus scopulorum*, *Piptatherum micranthum*, *Pinus ponderosa*

VEGETATION DESCRIPTION: Tree canopy is fairly open and 10-20 m tall, and consists mostly of scattered ponderosa pines. A 2-4 m tall subcanopy of Rocky Mountain juniper or hybrids with eastern red cedar is present and may be sparse to fairly dense. In openings where juniper cover is not dense, a shrub layer of skunkbrush sumac and chokecherry is commonly present, with mountain mahogany (*Cercocarpus montanus*) and western red currant (*Ribes cereum*) common at some sites in the Wildcat Hills. The herbaceous understory is usually very sparse to nearly absent as the density of the subcanopy increases. Common graminoids include littleseed ricegrass and sun sedge, though some species of upland prairie may be present in openings. Species diversity is low.

OTHER NOTEWORTHY SPECIES: none recorded

STATE RANK: S3



**RANK JUSTIFICATION:** This community is rather widespread in the Wildcat Hills and apparently in the Chadron Dome area as well. It is likely more widespread today due to fire suppression than it was prior to EuroAmerican settlement. Most sites are grazed, and Kentucky bluegrass often dominates the understory of more open sites.

**INVASIVE SPECIES OF CONCERN:** Kentucky bluegrass and cheat grasses (*Bromus* spp.) may be present in disturbed examples.

**GLOBAL RANK:** G4

**COMMENTS:** In previous classifications, this community included all open and densely-wooded areas of ponderosa pine with a juniper understory. Steinauer (2007) suggested that sites in the Wildcat Hills represent examples of Ponderosa Pine Woodland that are degraded by juniper invasion due to fire suppression. While this is undoubtedly true for many sites defined as Mixed Conifer Woodland in previous classifications, Rydberg (Kiener 1951) mentioned the presence of juniper and pines on slopes in the Wildcat Hills, and it seems reasonable that both species occurred together historically on steep, eroded slopes of ravines and canyons where both species would have been afforded protection from fire. As currently defined, this community consists primarily of stands of scattered pine with a dense juniper subcanopy on steep slopes, often associated with siltstone, in the Wildcat Hills and portions of the Pine Ridge.

Sites in the Niobrara Valley in which eastern red cedar is abundant were formerly included in this community (*cf.* Kantak 1995) but are now considered ecotones of historically juniper-rich upland deciduous woods and Dry Ponderosa Pine Woodland. More study is needed.

**EXEMPLARY SITES:** Sites are preserved at Scotts Bluff National Monument and Wildcat Hills State Recreation Area in Scotts Bluff County and along the upper portions of Sand Creek on the Oglala National Grasslands in Sioux County.

## **ROCKY MOUNTAIN JUNIPER WOODLAND**

**ELEMENT CODE:** CEGl000747

**GLOBAL NAME:** =*Juniperus scopulorum* / *Piptatherum micranthum* Woodland (Rocky Mountain Juniper / Littleseed Ricegrass Woodland)

**OTHER NAMES:** <Juniper Woodland (1<sup>st</sup>-3<sup>rd</sup> ed.), =Closed-canopy juniper groves (Kaul *et al.*, 1983)

**SYSTEM PLACEMENT:** Great Plains Wooded Draw, Ravine and Canyon

**RANGE:** This community is most common in the Nebraska Panhandle, especially along escarpments south of the North Platte River from Scotts Bluff and Banner counties east to Keith County (including the Wildcat Hills). It is probably also present in the Chadron Dome area in northeastern Dawes and northwestern Sheridan counties, and possibly in portions of the Pine Ridge and Lodgepole Creek drainage.

EPA ECOREGIONS: 25a?, 25c, 25f

ENVIRONMENTAL DESCRIPTION: This community occurs frequently on shallow ravines to deep canyons on relatively steep north and east-facing slopes of escarpments. Soils are shallow, rapidly drained, poorly developed loamy sands, loams, and silt loams formed in weathered sandstone, siltstone, and chalky shale.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Tree canopy: Rocky Mountain juniper (*Juniperus scopulorum*) and hybrids with eastern red-cedar (*Juniperus virginiana*)

Shrub: skunkbrush sumac (*Rhus aromatica* var. *trilobata*), buffalo currant (*Ribes odoratum*), western poison ivy (*Toxicodendron rydbergii*).

Herbaceous: Fremont goosefoot (*Chenopodium fremontii*), littleseed ricegrass (*Piptatherum micranthum*), Pennsylvania pellitory (*Parietaria pennsylvanica*)

DIAGNOSTIC SPECIES: *Chenopodium fremontii*, *Juniperus scopulorum*, *J. virginiana*, *Piptatherum micranthum*.

VEGETATION DESCRIPTION: This community is usually dominated by a moderate to dense canopy of juniper 4–6 m tall. Where canopy cover is moderate, herbaceous and shrubby prairie species are scattered in the understory. Most frequent shrubs include chokecherry (*Prunus virginiana*), skunkbrush sumac, and buffalo currant. Where cover is dense, the understory is sparse to nearly absent and consists of patches of littleseed ricegrass and shade-tolerant native annuals such as Fremont goosefoot, maple-leaf goosefoot (*Chenopodium simplex*) and Pennsylvania pellitory and a sparse short shrub layer of western poison ivy. Remnant prairie species such as pasque-flower (*Anemone patens*) are often present, but rarely flower in the dense shade. Much of the groundlayer is covered by a frequently thick layer of fallen needles and is unvegetated. Species diversity is low.

OTHER NOTEWORTHY SPECIES: Purple cliff-brake (*Pellaea atropurpurea*) is known from this community in Keith County.

STATE RANK: S4

RANK JUSTIFICATION: This community is expanding from its native range due to fire suppression. Grazing tends to eliminate the herbaceous understory (Kaul *et al.*, 1983).

INVASIVE SPECIES OF CONCERN: Few invasives are able to invade dense juniper groves other than Kentucky bluegrass. Smooth brome and leafy spurge could be problematic in open stands.

GLOBAL RANK: G3G4

COMMENTS: In Garden and Keith counties, the dominant trees in this community are intermediate between *Juniperus scopulorum* and *J. virginiana*. Eastward, this community occurs as isolated patches on upper bluff slopes associated with deciduous woodland. Westward, it is usually associated with pine woodland. This community is likely far more common than it was prior to European settlement, but apparently existed in deep canyons prior to fire suppression. It is possible that more open phases of this community may represent NatureServe's *Juniperus scopulorum* / *Schizachyrium scoparium* woodland. Examples of this community east of the Panhandle are now mostly included within the Green Ash–Eastern Red Cedar Scarp Woodland Community

EXEMPLARY SITES: Relatively undisturbed sites are found extensively in the vicinity of Cedar Point Biological Station in Keith County.

## WETLAND SHRUBLAND COMMUNITIES

### SANDBAR WILLOW SHRUBLAND

ELEMENT CODE: CEG001203, CEG008562

GLOBAL NAME: >*Salix exigua* / Mesic Graminoids Shrubland (Coyote Willow / Mesic Graminoids Shrubland), >*Salix exigua* Temporarily Flooded Shrubland (Coyote Willow Temporarily Flooded Shrubland)

OTHER NAMES: >willow wetland zone, >willow shrubland zone, >>false indigobush/willow shrubland (Currier 1982)

SYSTEM PLACEMENT: Eastern Floodplain Wetland, Western Great Plains Floodplain

RANGE: This community is found primarily along rivers and larger streams throughout the state.

EPA ECOREGIONS: 25, 27, 42, 43, 44, 47

ENVIRONMENTAL DESCRIPTION: This community is found on sandbars, islands, and shorelines in stream channels, and occasionally on floodplain terraces or below grassland seeps in uplands. The soils are poorly-developed and consist primarily of sand (though silt, clay or gravel may be present to a lesser extent), and are formed in recently deposited alluvium. Drainage varies with height of the community above the water surface.

COWARDIN WETLAND SYSTEM: Palustrine scrub-shrub temporarily and seasonally flooded.

**MOST ABUNDANT SPECIES:**

Shrub: false indigobush (*Amorpha fruticosa*), red osier (*Cornus sericea*), Plains cottonwood (*Populus deltoides*) [saplings], peachleaf willow (*Salix amygdaloides*) [saplings], diamond willow (*S. famelica*), sandbar willow (*S. interior*).

Herbaceous: redtop (*AGROSTIS GIGANTEA*), common ragweed (*Ambrosia artemisiifolia*), Emory's sedge (*Carex emoryi*), woolly sedge (*C. pellita*), bald spikerush (*Eleocharis erythropoda*), common scouringrush (*Equisetum hyemale*), rice cutgrass (*Leersia oryzoides*), common water-horehound (*Lycopus americanus*), sweetclovers (*MELILOTUS* spp.), smartweeds (*Persicaria* spp.), reed canarygrass (*PHALARIS ARUNDINACEA*), northern fog-fruit (*Phyla lanceolata*), goldenrods (*Solidago* spp.), docks (*Rumex* spp.), three-square bulrush (*Schoenoplectus pungens*), prairie cordgrass (*Spartina pectinata*), paniced aster (*Symphyotrichum lanceolatum*), stinging nettle (*Urtica dioica*)

**DIAGNOSTIC SPECIES:** *Salix interior*

**VEGETATION DESCRIPTION:** The vegetation of this community is dominated by shrubs and sapling trees 2–4 m tall with sandbar willow the dominant species, sometimes with lesser amounts of diamond willow and red osier. False indigobush is often present, and may be somewhat common on mesic (rather than wet) ground. The understory is highly variable due to the early successional nature of the community and may consist of bare sand, annuals, or perennial hydrophytes. In wetter sites, perennial hydrophytes such as Emory's sedge, common water-horehound and spikerushes may be common. On slightly higher ground, prairie cordgrass, common scouringrush, paniced aster, northern fog-fruit, and goldenrods are present. In some mature mesic sites, a distinct canopy may develop and a mixture of herbaceous woodland plants and hydrophytes may occur. On the driest sites, plants typical of disturbed floodplain terraces, such common ragweed and cheat grasses (*Bromus* spp.) may be scattered. On some frequently inundated sites, scattered hydrophytic annuals may occur. Species diversity is low to moderate.

**OTHER NOTEWORTHY SPECIES:** Information not available

**STATE RANK:** S4S5

**RANK JUSTIFICATION:** These sites are quite abundant along many rivers throughout the state, but may be decreasing or even absent from channelized streams.

**INVASIVE SPECIES OF CONCERN:** Purple loosestrife (*Lythrum salicaria*) and reed canarygrass may invade and displace herbaceous understory in some sites.

**GLOBAL RANK:** G5

**COMMENTS:** Because of its early successional nature, this community is relatively short-lived (10–20 years) before succeeding to riparian woodland. Some exceptionally mature stands may contain woodland understory species, but tend not to develop a shrub layer typical of Diamond Willow Woodland. This community may occur as an open patch type in the Perennial Sandbar

community, and sites on higher ground may intergrade with Riparian Dogwood-False Indigobush Shrubland. Carrier (1982) recognized three highly overlapping subtypes along the Platte River, but these do not encompass the entire range of variation within the community throughout the state.

EXEMPLARY SITES: Many sites are present along the Loup and Platte rivers.

## **RIPARIAN DOGWOOD-FALSE INDIGOBUSH SHRUBLAND**

ELEMENT CODE: CEG005220

GLOBAL NAME: =*Cornus drummondii* – *Amorpha fruticosa* – *Cornus sericea* Shrubland (Dogwood Floodplain Shrubland)

OTHER NAMES: >*Amorpha/Cornus* community, >*Cornus/Amorpha* community (Carrier 1982)

SYSTEM PLACEMENT: Eastern Floodplain Wetland

RANGE: This community is found along rivers and streams in the eastern half of the State, but is likely scattered westward.

EPA ECOREGIONS: 27, 47

ENVIRONMENTAL DESCRIPTION: This community occurs on high banks and raised islands, and occasionally on terraces above stream channels. Soils are moderately well drained and formed in alluvium. These sites are periodically flooded in the late winter and early spring.

COWARDIN WETLAND SYSTEM: Palustrine scrub-shrub, intermittently flooded

MOST ABUNDANT SPECIES:

Shrub: false indigobush (*Amorpha fruticosa*), roughleaf dogwood (*Cornus drummondii*), red osier (*Cornus sericea*), Plains cottonwood (*Populus deltoides*) [saplings], sandbar willow (*Salix exigua* var. *sericans*)

Herbaceous: annual ragweed (*Ambrosia artemisiifolia*), Emory's sedge (*Carex emoryi*), woolly sedge (*C. pellita*), orange jewelweed (*Impatiens capensis*), switchgrass (*Panicum virgatum*), reed canarygrass (*PHALARIS ARUNDINACEA*), northern fog-fruit (*Phyla lanceolata*), Kentucky bluegrass (*POA PRATENSIS*), prairie cordgrass (*Spartina pectinata*)

DIAGNOSTIC SPECIES: *Amorpha fruticosa*, *Cornus drummondii*, *C. sericea*

VEGETATION DESCRIPTION: This community consists of patches with moderate to locally dense cover of broadleaf shrubs 2–3 m tall dominated by false indigobush and roughleaf or red

osier dogwood. Occasional patches of sandbar willow and cottonwood saplings may also be present. Herbaceous understory varies in response to depth to water and flooding, and may include sedges such as *Carex cristatella*, *C. emoryi*, and *C. pellita*, and mesophytic grasses such as switchgrass and prairie cordgrass. In more xeric sites, weedy annual herbs such as ragweed may be abundant, whereas wetter sites are dominated by forbs typical of marshes, such as orange jewelweed and field mint (*Mentha canadensis*). A short shrub layer of western poison ivy (*Toxicodendron rydbergii*) is present at some sites. Species diversity is low to moderate.

**OTHER NOTEWORTHY SPECIES:** *Geum laciniatum* has been found in this community in Howard County.

**STATE RANK:** S4?

**RANK JUSTIFICATION:** The full extent of this community is unknown, but it appears to expand and thrive where frequency of flooding has decreased, and is becoming quite common along the Platte River.

**INVASIVE SPECIES OF CONCERN:** Few have been recorded, though purple loosestrife and reed canarygrass could eventually become problematic.

**GLOBAL RANK:** G4?

**COMMENTS:** This community type is poorly studied and not currently well-defined. It is based on the work of Currier (1982) who described it as a riparian shrubland that mostly occupied sites on higher ground than Sandbar Willow Shrubland. Some sites surveyed along the Middle Loup River are far wetter than those described by Currier, often wetter even than most examples of Sandbar Willow Shrubland. Drier phases are similar in some respects to shrub thickets typically associated with upland woods, but occur on high river terraces as well and differ mostly in the absence of false indigobush. Still other sites may represent part of the tall shrub layer component of open riparian woodland communities. Further analysis of this and all other riparian shrubland communities is needed.

**EXEMPLARY SITES:** Few sites of high quality are known, the best and most extensive being along the Loup and Platte rivers.

## **UPLAND SHRUBLAND COMMUNITIES**

### **BUCKBRUSH SHRUBLAND**

**ELEMENT CODE:** CEG001131

**GLOBAL NAME:** =*Symphoricarpos occidentalis* Shrubland (Western snowberry shrubland)

**SYSTEM PLACEMENT:** Great Plains Wooded Draw, Ravine and Canyon

RANGE: This community occurs primarily in the western half of the state, and its eastern limits are poorly known.

EPA ECOREGIONS: 25, 27, 42, 43

ENVIRONMENTAL DESCRIPTION: This community is found on low slopes at the bases of escarpments, as well as in mesic swales, depressions, ravine bottoms and floodplains. Soils are deep, moderately well to somewhat poorly drained silt loams and sandy loams formed in colluvium or alluvium and are occasionally flooded briefly after heavy rains.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Shrub: skunkbrush sumac (*Rhus aromatica* var. *trilobata*), buffalo currant (*Ribes odoratum*), wolfberry (*Symphoricarpos occidentalis*)

Short shrub: western poison ivy (*Toxicodendron rydbergii*)

Vine: woodbine (*Parthenocissus vitacea*)

Herbaceous: sideoats grama (*Bouteloua curtipendula*), cheatgrass (*BROMUS* spp.), catnip (*NEPETA CATARIA*), western wheatgrass (*Pascopyrum smithii*), Kentucky bluegrass (*POA PRATENSIS*), Pennsylvania pellitory (*Parietaria pennsylvanica*), little bluestem (*Schizachyrium scoparium*)

DIAGNOSTIC SPECIES: *Symphoricarpos occidentalis*

VEGETATION DESCRIPTION: This community is usually densely vegetated by shrubs mostly under 1 m tall. Shrub cover is usually >50% and often may approach 100%. Wolfberry is the most abundant species. Chokecherry (*Prunus virginiana*), buffalo currant, and skunkbrush sumac are often scattered among the wolfberry, forming a sparse 1-2 m tall overstory. A short shrub understory of western poison ivy is often present and is sometimes the dominant ground cover. Woody and herbaceous vines are sometimes present, including western virgin's bower (*Clematis ligusticifolia*) and woodbine. The herbaceous layer is poorly developed in most sites and often consists of weedy aliens (cheatgrass, catnip, Kentucky bluegrass) and a few native annuals such as Pennsylvania pellitory. In more open sites, native grasses fill the spaces between shrubs, the most common species being sideoats grama, prairie sandreed (*Calamovilfa longifolia*), western wheatgrass and little bluestem. Species diversity is relatively low.

OTHER NOTEWORTHY SPECIES: Information not available

STATE RANK: S4

RANK JUSTIFICATION: This community is fairly common through its range. Most sites are weedy due to grazing or deposition of sand or silt following heavy rains.

INVASIVE SPECIES OF CONCERN: Kentucky bluegrass and cheat grasses are commonly associated with this community.

GLOBAL RANK: G4G5

COMMENTS: Small patches of buckbrush commonly occur in "extra-formational thickets" associated with upland woodlands in eastern Nebraska, and may be included in this community if desired, although the descriptions here are oriented toward the more extensive stands typically found in mixed-grass prairie settings in western and central Nebraska.

EXEMPLARY SITES: The best-studied examples are at Scotts Bluff National Monument in Scotts Bluff County, and the most extensive stands are probably associated with the Pine Ridge in northwest Nebraska.

## **BUFFALOBERRY SHRUBLAND**

ELEMENT CODE: CEG001128

GLOBAL NAME: =*Shepherdia argentea* Shrubland (Silver Buffaloberry Shrubland)

SYSTEM PLACEMENT: Great Plains Wooded Draw, Ravine and Canyon

RANGE: This community occurs primarily in northern and western Nebraska, though it may have been more extensive historically.

EPA ECOREGIONS: 25, 27?, 42?, 43, 44, 47k

ENVIRONMENTAL DESCRIPTION: This community is associated either with bottomland drainages (northwest Nebraska) or upland bluffs and slopes (northern and central Nebraska). Soils are moderately well to somewhat poorly drained silt loams, clay loams and sandy loams formed in Tertiary sandstone or siltstone, colluvium, loess, or alluvium.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Shrub: buffaloberry (*Shepherdia argentea*)

Herbaceous: a variety of grasses and shade-tolerant grassland herbs, varying by habitat and location within the state (none yet recorded)

DIAGNOSTIC SPECIES: *Shepherdia argentea*

VEGETATION DESCRIPTION: This community consists of densely (in lowland) to rather open (in uplands) patches of buffaloberry occurring with shade-tolerant grasses and herbs.



Associated species are not recorded, but this community is known to occur in badlands (extreme northwest Nebraska), mixed-grass prairie (southwest Nebraska), Sandhills grassland (Dismal River valley, based on historic reports) and in tall-grass prairie associated with loess bluffs in northeast Nebraska.

OTHER NOTEWORTHY SPECIES: Information not available

STATE RANK: S2?

RANK JUSTIFICATION: This community is fairly uncommon where it occurs and has been poorly studied.

INVASIVE SPECIES OF CONCERN: none recorded

GLOBAL RANK: G3G4

COMMENTS: This community has long been recognized as a small but significant component of upland shrub vegetation in portions of the state, and is probably most abundant in the drainages associated with badlands on the Oglala National Grasslands and in the escarpments associated with the North Platte River in the Panhandle. It is sparingly distributed elsewhere.

EXEMPLARY SITES: The Sand Creek drainage on the Oglala National Grasslands.

### **SKUNKBRUSH SUMAC SHRUBLAND**

ELEMENT CODE: not yet determined

GLOBAL NAME: not yet determined

SYSTEM PLACEMENT: Great Plains Wooded Draw, Ravine and Canyon

RANGE: This community is known from the Pine Ridge escarpment in Sioux County.

EPA ECOREGION: 25a

ENVIRONMENTAL DESCRIPTION: This community occurs on moderately steep footslopes of escarpments, usually on north-facing slopes. Soils are well-drained loams and fine sandy loams formed in calcareous Tertiary sandstone and colluvium.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Shrub: skunkbrush sumac (*Rhus aromatica* var. *trilobata*)

Short shrub: western poison ivy (*Toxicodendron rydbergii*)

Vine: woodbine (*Parthenocissus vitacea*)

Herbaceous: sideoats grama (*Bouteloua curtipendula*), cheatgrass (*BROMUS* spp.), catnip (*NEPETA CATARIA*), western wheatgrass (*Pascopyrum smithii*), Kentucky bluegrass (*POA PRATENSIS*), Pennsylvania pellitory (*Parietaria pensylvanica*), little bluestem (*Schizachyrium scoparium*)

DIAGNOSTIC SPECIES: *Rhus aromatica* var. *trilobata*

VEGETATION DESCRIPTION: This community is usually densely vegetated by shrubs mostly under 1 m tall. Shrub cover is usually >50%, with skunkbrush sumac the most abundant species. A short shrub understory of western poison ivy is often present and is sometimes the dominant ground cover. Woody and herbaceous vines are sometimes present, including western virgin's bower (*Clematis ligusticifolia*) and woodbine. The herbaceous layer is poorly developed in most sites and often consists of weedy aliens (cheatgrass, catnip, Kentucky bluegrass) and a few native annuals such as Pennsylvania pellitory. In more open sites, native grasses fill the spaces between shrubs, the most common species being sideoats grama, prairie sandreed (*Calamovilfa longifolia*), western wheatgrass and little bluestem. Species diversity is relatively low.

OTHER NOTEWORTHY SPECIES: Information not available

STATE RANK: S2?

RANK JUSTIFICATION: This community is locally common where it occurs, and is often weedy due to grazing or deposition of sand or silt following heavy rains.

INVASIVE SPECIES OF CONCERN: Kentucky bluegrass (*Poa pratensis*) and cheat grasses (*Bromus japonicus*, *B. tectorum*) are commonly associated with this community.

GLOBAL RANK: GNR

COMMENTS: Whereas skunkbrush sumac is often a common constituent of rocky upland prairie in the Nebraska Panhandle, it only occurs in densities sufficient to qualify as shrubland in the Nebraska Pine Ridge, where it has been observed in the Hat Creek drainage. These sites are similar to buckbrush shubland in species composition, and may occur with it, though always on the higher, steeper slopes above that community.

EXEMPLARY SITES: Bluffs in the vicinity of the Hudson-Meng Bison Bonebed on the Oglala National Grassland in Sioux County.

## **CHOCKECHERRY-PLUM SHRUB THICKET**

ELEMENT CODE: CEG001108

GLOBAL NAME: =*Prunus virginiana* (*Prunus americana*) Shrubland (Chokecherry (American Plum) Shrubland)

OTHER NAMES: none available

SYSTEM PLACEMENT: Great Plains Wooded Draw, Ravine and Canyon

RANGE: This community occurs widely in northern Nebraska.

EPA ECOREGIONS: 25, 27?, 42?, 43, 44, 47?

ENVIRONMENTAL DESCRIPTION: This community is commonly associated with slopes and bottoms of ravines and canyons. Soils are moderately well to somewhat poorly drained silt loams, clay loams and sandy loams formed in Tertiary sandstone or siltstone, colluvium, loess, or alluvium.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Shrub: wild plum (*Prunus americana*), chokecherry (*Prunus virginiana*)

Herbaceous: a variety of grasses and shade-tolerant grassland herbs, varying by habitat and location within the state (none yet recorded)

DIAGNOSTIC SPECIES: *Prunus americana*, *Prunus virginiana*

VEGETATION DESCRIPTION: This community consists of densely to moderately open patches of chokecherry and/or wild plum 1-3 m tall, usually occurring with shade-tolerant grasses and herbs. Associated species are not recorded, but this community is known to occur in the Pine Ridge and Niobrara River valley and also in the Sandhills and Loess Hills of central Nebraska, among other places. In some places it may occur in association with eroding steep side slopes and have little associated herbaceous understory.

OTHER NOTEWORTHY SPECIES: Information not available

STATE RANK: S3?

RANK JUSTIFICATION: This community is fairly common through its range and is often fairly weedy due to grazing or deposition of sand or silt following heavy rains.

INVASIVE SPECIES OF CONCERN: none recorded

GLOBAL RANK: G4?

COMMENTS: This community has long been recognized as occurring in ravines and draws in much of the state but was not included in previous versions of this classification. It is commonly associated with woodland ravines and was constantly mentioned as a element of the vegetation in historic accounts. Plum thickets were commonly recorded in Public Land Office surveys in eastern Nebraska.

EXEMPLARY SITES: Numerous sites are known on the Nebraska Pine Ridge, and an extensive Sandhills site occurs on the south side of Dad's Lake on the Valentine National Wildlife Refuge in Cherry County.

### **MOUNTAIN MAHOGANY SHRUBLAND**

ELEMENT CODE: CEG001086

GLOBAL NAME: =*Cercocarpus montanus* / *Bouteloua curtipendula* Shrubland (Alder-leaf Mountain Mahogany / Sideoats Grama Shrubland)

SYSTEM PLACEMENT: Great Plains Wooded Draw, Ravine and Canyon

RANGE: This community occurs primarily in the Wildcat Hills and on bluffs associated with Pumpkin Creek and its tributaries in Banner, Morrill, Scotts Bluff and extreme northwestern Cheyenne counties. It is also present to a lesser extent in the Pine Ridge in Dawes and Sioux counties.

EPA ECOREGIONS: 25a, 25f

ENVIRONMENTAL DESCRIPTION: This community is generally found on ridge crests and steep (20-60%) upper and middle slopes of various aspects on escarpments. On north and east-facing slopes occurrences more frequently extend to lower slopes. Soils are poorly developed, with the majority of occurrences being on shallow loamy sands derived from calcareous Tertiary sandstones. To a lesser degree, this community occurs on shallow silt loams associated with siltstone. Rock outcrops with little to no soil development are common within this community.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Shrub: mountain mahogany (*Cercocarpus montanus*), skunkbrush sumac (*Rhus aromatica* var. *trilobata*)

Herbaceous: purple three-awn (*Aristida purpurea* var. *longiseta*), fringed sage (*Artemisia frigida*), sideoats grama (*Bouteloua curtipendula*), blue grama, (*Bouteloua gracilis*), cheatgrass

(*BROMUS* spp.), threadleaf sedge (*Carex filifolia*), thickspike wheatgrass (*Elymus lanceolatus*), needle-and-thread (*Hesperostipa comata*), plains muhly (*Muhlenbergia cuspidata*)

DIAGNOSTIC SPECIES: *Bouteloua curtipendula*, *Cercocarpus montanus*

VEGETATION DESCRIPTION: This community is characterized by a canopy of mountain mahogany to 2 m tall. Density of canopy is variable depending on aspect. South and west-facing slopes are typically fairly sparsely vegetated with mountain mahogany coverage often in the 20-30% range. North and east-facing slopes often support dense (ca. 70-80%) nearly impenetrable stands of mountain mahogany and skunkbrush sumac, with choke cherry (*Prunus virginiana*) sometimes common on the most mesic north-facing slopes. Herbaceous vegetation is typically fairly sparse to moderate with sideoats grama, plains muhly and species typical of western mixed grass prairie including, threadleaf sedge, needle-and-thread, blue grama, fringed sage and purple three awn most commonly. Broom snakeweed (*Gutierrezia sarothrae*), yucca (*Yucca glauca*), and prickly pear (*Opuntia* spp.) are often common on xeric south and west-facing exposures. Cheatgrass is abundant on heavily grazed and/or eroded sites and is sometimes the dominant species present under dense shrub canopies with an otherwise sparse herbaceous layer on north-facing slopes. On less disturbed sites annual bromes are much less common. Green needlegrass (*Nasella viridula*) and plains muhly are the dominant herbaceous species on the lower north-facing slope within one occurrence on Greenwood Creek in Morrill County. Barren rocky areas with very sparse mountain mahogany coverage support species typical of rock outcrops.

OTHER NOTEWORTHY SPECIES: Information not available.

STATE RANK: S3

RANK JUSTIFICATION: The extent of this community in Nebraska is limited. Many occurrences are apparently naturally disturbed from soil erosion and dominated by invasive species.

INVASIVE SPECIES OF CONCERN: Cheatgrasses (*Bromus japonicus*, *B. tectorum*) are frequently problematic.

GLOBAL RANK: S5

COMMENTS: In Nebraska, this community is associated with western coniferous woodland and is often present under a very open *Pinus ponderosa* canopy. The most extensive examples of this community in Nebraska apparently occur on the bluffs of Pumpkin Creek and its tributaries including Lawrence Fork and Greenwood Creek in southern Morrill County. The Greenwood Creek occurrence is apparently the eastern limit of this community.

EXEMPLARY SITES: On private lands, extensive examples of this community occur on canyons and bluffs associated with Greenwood Creek in Morrill County; Lawrence Fork in southwest Morrill, southeastern Banner, and northwestern Cheyenne counties; and, near the juncture of Hackberry and Pumpkin Creeks in Banner County. Protected sites include the

Wildcat Hills State Recreation Area and Cedar Canyon Wildlife Management Area in Scotts Bluff County.

## WETLAND HERBACEOUS COMMUNITIES

### FRESHWATER SEEP

ELEMENT CODE: C EGL002033

GLOBAL NAME: =*Typha latifolia* - *Equisetum hyemale* - *Carex (hystericina, pellita)* Seep  
Herbaceous Vegetation (Great Plains Neutral Seep)

OTHER NAMES: >Streamside marsh association (Pool 1914), =Spring Seep/Stream (1<sup>st</sup>, 2<sup>nd</sup> ed.), >Spring Seep (3<sup>rd</sup> ed.), >Marsh Seep (3<sup>rd</sup> ed.)

SYSTEM PLACEMENT: Eastern Great Plains Wet-Meadow, Prairie, and Marsh; Western Great Plains Open Freshwater Depression Wetland

RANGE: This community occurs throughout the state, but appears to most abundant in the Sandhills, Pine Ridge and Smoky Hills regions.

EPA ECOREGIONS: 25, 27, 42, 43, 44, 47

ENVIRONMENTAL DESCRIPTION: This community occurs on slopes of hills, in valleys, at bases of bluffs, and occasionally on faces of bluffs associated with streams. Seeps form where rainwater or snowmelt permeates through loess, sand, glacial till, limestone or sandstone contacts an impervious layer of shale, clay or siltstone and then flows on this layer until reaching an outlet. Artesian springs may also be present in some areas. Seep soils consist usually of sand with organic matter and are formed in sand or gravel derived from eolian sand, bedrock or colluvium, though in eastern and central Nebraska they may be silt loams derived from loess or glacial till. Soils may be shallow or deep depending on the degree of slope and the parent material. Groundwater of near neutral pH (6.0-6.9) continually saturates at least part of the community. The zone of cold water rivulets flowing from the seeps is included as part of this community type.

COWARDIN WETLAND SYSTEM: Palustrine emergent, saturated

### MOST ABUNDANT SPECIES:

Herbaceous: sedges (*Carex* spp.), willow herb (*Epilobium* spp.), common scouringrush (*Equisetum hyemale*), fowl mannagrass (*Glyceria striata*), watercress (*NASTURTIUM OFFICINALE*), bulrushes (*Schoenoplectus* spp.), cattails (*Typha* spp.)

DIAGNOSTIC SPECIES: *Berula erecta*, *Carex hystericina*, *Glyceria striata*, *Equisetum hyemale*, *Marchantia polymorpha* (a liverwort), *Mimulus glabratus*

VEGETATION DESCRIPTION: The vegetation of this community varies greatly with hydrology, substrate, and exposure to sunlight. Two basic types of seeps can be recognized based on hydrology:

- 1) Marsh-type – These seeps occur as depressions usually in the bottoms of ravines or on valley floors and usually occur on well-developed soils, often with much organic matter, and are typically drained rather slowly. These sites frequently exhibit complex zonation or may exist as a mosaic of various herbaceous and woody wetland zones. Species diversity is moderate to high. Three general zones are often recognizable:
  - a) In areas that are usually flooded, small patches of hydrophytic macrophytes 1–2 m tall predominate, most commonly the bulrushes (*Schoenoplectus acutus*, *S. pungens*, and *S. tabernaemontani*), large-fruit bur-reed (*Sparganium eurycarpum*), and broadleaf cattail (*Typha latifolia*).
  - b) In areas in which the ground remains saturated but not flooded, sedges and mesophytic grasses are often common, including bottlebrush sedge (*Carex hystericina*) and fowl mannagrass. Scattered shrubs such as willows (mostly *Salix interior* or *S. famelica*), red osier dogwood (*Cornus sericea*), or false indigobush (*Amorpha fruticosa*) are sometimes present. Many sites contain very few vascular plant species but may have abundant liverworts, especially *Marchantia polymorpha* and mosses.
  - c) A "wet-meadow" type of area is often found along the outer margins of larger seep complexes that varies from mesic to seasonally saturated, and is infrequently flooded. It often contains dense stands of field horsetail (*Equisetum arvense*) or common scouringrush (*Equisetum hyemale*) and is often invaded by redtop (*Agrostis gigantea*) in more open stands.
- 2) Spring-type – These seeps occur as a cold water rivulet flowing directly from the ground usually with little soil development. These rivulets often have submersed vegetation including common waterweed (*Elodea canadensis*), leafy pondweed (*Potamogeton foliosus*), longbeak water-crow's-foot (*Ranunculus longirostris*), and horned pondweed (*Zannichellia palustris*). These are rarely abundant and with the exception of horned pondweed, rarely flower. The margins of the rivulet are dominated by bands of partly emergent hydrophytes usually restricted to cold, clear flowing water, including native and alien species rooted in or along the stream banks that may form a partly-submergent "mat" along the waters surface. Common species include water parsnip (*Berula erecta*), roundleaf monkey-flower (*Mimulus glabratus*), watercress, and brook speedwell (*Veronica americana*). Brookgrass (*Catabrosa aquatica*), and the water speedwells (*Veronica anagallis-aquatica* and *V. catenata*) may be emergent in shallow water of slow-moving streams. Though often associated with the sources of spring streams, these species may be found well downstream of seeps in streams in the Sandhills (and sometimes drainage ditches) and in the Pine Ridge. Species diversity is low to moderate.

**OTHER NOTEWORTHY SPECIES:** Uncommon species found in this community include *Caltha palustris*, *Cardamine pensylvanica*, *Carex diandra*, *C. prairea*, *C. utriculata*, *Cicuta bulbifera*, *Liparis loeselii*, *Mimulus guttatus*, *Ophioglossum pusillum*, *Pedicularis lanceolata*, *Platanthera aquilonis*, and *Ranunculus sceleratus* var. *multifidus*.

**STATE RANK:** S3

**RANK JUSTIFICATION:** This habitat is still abundant in the Sandhills and in forested ravines in the east and west portions of the state, but could be affected in the long term by water mining, especially in the west. Some sites are degraded by heavy grazing, and pollution from agricultural runoff and livestock could impact certain species that are sensitive to water quality.

**INVASIVE SPECIES OF CONCERN:** Narrowleaf cattail (*Typha angustifolia*) and redtop (*Agrostis gigantea*) are sometimes abundant.

**GLOBAL RANK:** G3

**COMMENTS:** Despite the rather wide amplitude of variation shown by this community within the state, TNC recognizes only a single seepage community for Nebraska. Seeps with a noticeably thick layer of organic soil were classified in the previous version of this classification as the "Marsh Seep" community. The vegetation of the Marsh Seep community is very similar to fens (minus most fen indicator species) and that community is now included within a more broadly defined "Freshwater Seep" community, even though certain examples may fall within other communities in the National Classification.

Several types of seeps can be defined on the basis of vegetation: western seeps containing species such as brookgrass and showy monkeyflower (*Mimulus guttatus*) are similar to communities of the Rocky Mountains. Many peaty examples formerly included in the Marsh Seep community have species of northern and eastern affinity in common with Sandhills fens. The Smoky Hills contain both peaty fens with species found also in Sandhills fens, and rocky/sandy seeps with species not found elsewhere in the state such as bushy seedbox (*Ludwigia alternifolia*) and dwarf St. Johns'-wort (*Hypericum mutilum*). More vegetational and floristic surveys of the various types of seeps are needed before a workable classification can be proposed.

**EXEMPLARY SITES:** Many sites are present along streams in the Sandhills and in the Pine Ridge, an ungrazed example is found near the Hudson-Meng Bison Bonebed site in Sioux County. Several relatively undisturbed seeps occur on Rock Glen WMA in Jefferson County.

## **PRAIRIE FEN**

**ELEMENT CODE:** CEG002041

**GLOBAL NAME:** =*Carex pellita* - *Carex* spp. – *Schoenoplectus tabernaemontani* Plains Fen Herbaceous Vegetation (Central Tallgrass Fen)



OTHER NAMES: <Fen (1<sup>st</sup>, 2<sup>nd</sup> ed.)

SYSTEM PLACEMENT: Eastern Great Plains Wet-Meadow, Prairie, and Marsh

RANGE: This community is known only from sandstone canyons and ravines in the Little Blue River drainage in Jefferson County.

EPA ECOREGION: 27a

ENVIRONMENTAL DESCRIPTION: This community occurs on mid to lower slopes of hillsides and terraces in ravines or canyons. Soils are deep and consist of peat or muck, sometimes intermixed with sand, overlying an impervious clay layer. Peat layers range in depth from *ca.* 0.3 - 1.5 m and are constantly saturated by groundwater of pH 6.0 - 7.5. Most sites are <1 acre in size.

COWARDIN WETLAND SYSTEM: Palustrine emergent, saturated

MOST ABUNDANT SPECIES:

Herbaceous: sedges (*Carex emoryi*, *C. hystericina*, *C. interior*, *C. pellita*), water hemlock (*Cicuta maculata*), bald spikerush (*Eleocharis erythropoda*), common boneset (*Eupatorium perfoliatum*), orange jewelweed (*Impatiens capensis*), rice cutgrass (*Leersia oryzoides*), marsh fern (*Thelypteris palustris*)

DIAGNOSTIC SPECIES: *Carex hystericina*, *C. interior*, *Dulichium arundinaceum*, *Onoclea sensibilis*, *Thelypteris palustris*

VEGETATION DESCRIPTION: The vegetation consists primarily of hydrophytic graminoids <1 m tall, and is usually dominated by several species of sedges and bald spikerush. Marsh fern and sensitive fern (*Onoclea sensibilis*) may be common in undisturbed sites. Scattered shrubs are present, primarily willows (*Salix* spp.). Other herbaceous species include many typical of wet meadows and marshes, though some indicator species of peat soils, such as pond-sedge (*Dulichium arundinaceum*) may be present. Species composition of fens is probably related to factors such as depth and composition of organic soils, water chemistry and quality, and level of disturbance. These small sites tend to be remarkably uniform in species composition when compared to Sandhills fens, and vegetation zonation is usually most conspicuous based on position on the slope. Species diversity is moderate.

OTHER NOTEWORTHY SPECIES: Pond-sedge (*Dulichium arundinaceum*) and bushy seedbox (*Ludwigia alternifolia*) are known from Jefferson County fens.

STATE RANK: S1

RANK JUSTIFICATION: Very few sites are known, and these are quite small and susceptible to siltation and herbicide drift from adjacent cropland. Suspected fens that once occurred in

other areas of eastern Nebraska have been destroyed through agricultural ditching and drainage leading to peat decomposition. In one case the peat was mined.

INVASIVE SPECIES OF CONCERN: None recorded.

GLOBAL RANK: G1

COMMENTS: This community was formerly defined to include some saturated peaty wetlands associated with seeps and pond margins, which are now included in the Freshwater Seep community. This community is definable as a saturated wetland with pronounced peat layer and a significant fern component. It is unlike most other wetlands in eastern Nebraska, but is very similar in species composition to peaty seeps in the Sandhills and its periphery. Other prairie fens may be present elsewhere in southeast Nebraska, especially in the Smoky Hills region, and an inventory of the variation within fens and seeps in the state is needed.

EXEMPLARY SITES: Steele City Canyon in Jefferson County.

## **SANDHILLS FEN**

ELEMENT CODE: CEG002390

GLOBAL NAME: =*Carex interior* – *Eleocharis elliptica* – *Thelypteris palustris* Herbaceous Vegetation (Sandhills fen)

SYSTEM PLACEMENT: Western Great Plains Open Freshwater Depression Wetland

RANGE: This community occurs in interdunal valleys in the north-central Sandhills of Cherry and Grant counties, and in low, rolling dune areas in the eastern Sandhills in Boone, Garfield and Wheeler counties.

EPA ECOREGIONS: 44c, 44d

ENVIRONMENTAL DESCRIPTION: Sandhills fens are typically found at the headwaters of Sandhills stream valleys or at the upper ends of lakes and marshes, some are as large as 700 acres. Soils are predominately mucky peat consisting primarily of decayed organic matter, though layers of muck and fiborous peat are present. Organic deposits range from 0.3 m to >7 m thick and often contain interspersed layers of sand. The oldest deposits have been radiocarbon dated at 12,260 ± 60 yrs B.P. Peat mounds are an important feature of fens and are frequently areas of groundwater discharge. They are more prominent in fens in the western Sandhills. The groundwater pH of fens ranges from 6.0 - 6.9.

COWARDIN WETLAND SYSTEM: Palustrine emergent, saturated

## MOST ABUNDANT SPECIES:

Shrub: meadow willow (*Salix petiolaris*)

Herbaceous: sedges (*Carex interior*, *C. lacustris*, *C. nebrascensis*, *C. pellita*, *C. prairea*), bog spikerush (*Eleocharis elliptica*), sensitive fern (*Onoclea sensibilis*), common reed (*Phragmites australis* ssp. *americanus*), common arrowhead (*Sagittaria latifolia*), hardstem bulrush (*Schoenoplectus acutus*), marsh fern (*Thelypteris palustris*), broadleaf cattail (*Typha latifolia*)

DIAGNOSTIC SPECIES: *Caltha palustris*, *Carex aquatilis*, *C. interior*, *C. lasiocarpa*, *C. limosa*, *C. prairea*, *Doellingeria umbellata*, *Eriophorum angustifolium*, *E. gracile*, *Menyanthes trifoliata*, *Muhlenbergia glomerata*, *Onoclea sensibilis*, *Ophioglossum pusillum*, *Pedicularis lanceolata*, *Salix petiolaris*, *Symphyotrichum boreale*, *Thelypteris palustris*, *Triadenum fraseri*

VEGETATION DESCRIPTION: The vegetation of this community is patchy, and most fens occur as a mosaic with areas of Freshwater Seep, Sandhills Wet Meadow, Sandhills Bulrush Marsh, and Reed Marsh. The descriptions here are based on observations of the vegetation of fens with uplifted peat mounds and quaking sedge mats in Cherry County. Species diversity is relatively high. Two phases are described:

- 1) fern meadow fen - occurs on sedge mat peat mounds and is dominated by stands of meadow willow 1-2 m tall, or tall herbaceous macrophytes such as common reed, hardstem bulrush, or common cattail. The understory is commonly dominated by sensitive fern, marsh fern, and hydrophytic graminoids, most commonly bog spikerush. This zone may also occur as a mosaic in Sandhills marshes in areas composed primarily of mucky peat. Fen indicator species which may be present in this zone include marsh marigold (*Caltha palustris*), swamp lousewort (*Pedicularis lanceolata*), and marsh St. John's-wort (*Triadenum fraseri*). This zone usually occurs as a mosaic with the following.
- 2) sedge fen - usually consists of a single herbaceous layer dominated by hydrophytic sedges. Most abundant species include *Carex interior* and *C. prairea*. Most fen indicator species are restricted to this zone, including flat-top aster (*Doellingeria umbellata*), cottongrass (*Eriophorum* spp.), bog muhly (*Muhlenbergia glomerata*), northern adder's-tongue (*Ophioglossum pusillum*), and bog aster (*Symphyotrichum boreale*). In wetter sites, sedges typical of Sandhills marshes, such as ripgut sedge (*Carex lacustris*), and Nebraska sedge (*C. nebrascensis*) may dominate, with fen tussock sedge (*C. aquatilis*) or rarely woolly-fruit sedge (*C. lasiocarpa*) present in some areas. This zone is mostly confined to areas with fibrous sedge peat, and tends to become more extensive in mowed fens. In some instances, mowing may reduce the shrub and coarse graminoid component and convert areas of the fern meadow zone to the sedge zone.

OTHER NOTEWORTHY SPECIES: Vascular plant species uncommon in Nebraska which have been collected in this community include *Acorus americanus*, *Caltha palustris*, *Cardamine pensylvanica*, *Cicuta bulbifera*, *Doellingeria umbellata*, *Eriophorum angustifolium*, *E. gracile*,

*Carex aquatilis*, *C. bebbii*, *C. buxbaumii*, *C. diandra*, *C. lasiocarpa*, *C. limosa*, *C. prairea*, *C. utriculata*, *Dulichium arundinaceum*, *Juncus articulatus*, *Lilium philadelphicum*, *Liparis loeselii*, *Menyanthes trifoliata*, *Muhlenbergia glomerata*, *Ophioglossum pusillum*, *Pedicularis lanceolata*, *Sparganium emersum*, *Symphyotrichum boreale*, *Triadenum fraseri*, and *Zizania palustris*. In addition, the moss species uncommon in Nebraska that have been collected in this community, include *Aulacomnium palustre*, *Calliergonella cuspidata*, *Campylium stellatum*, *Climacium dendroides*, and *Hypnum pratense*.

STATE RANK: S1S2

RANK JUSTIFICATION: The majority of Sandhills fens have been ditched and seeded to exotic grasses and legumes for use as hay meadows. Decomposition of peat following ditching is a major concern. Very few high quality fens remain. The few small, protected sites occur in Cherry County, though the largest, most representative sites are all on private property.

INVASIVE SPECIES OF CONCERN: Mowed fens often have an abundance of redtop and reed canarygrass (*Phalaris arundinacea*). Species that pose a potential threat to Sandhills fens include purple loosestrife, the European subspecies of phragmites (*Phragmites australis* spp. *australis*), and Garsion creeping foxtail (*Alopecurus arundinaceus*).

GLOBAL RANK: G1G2

COMMENTS: Ditching and annual midsummer haying promotes the spread of invasive grasses and legumes, especially reed canarygrass, at the expense of native plants. This community harbors several native plant species far disjunct from their primary ranges to the north and east of the Great Plains. Fens along Cedar Creek and Beaver Creek in the eastern Sandhills share many species in common with fens farther west, but lack meadow willow, and do not exhibit mounding to the extent of western fens. False indigobush (*Amorpha fruticosa*) and diamond willow (*Salix famelica*) usually comprise the shrub layer at these sites. Some saturated peatlands in Cherry County are dominated by Sandhills marsh species with patches of shrubs, but have no mound development (e.g. the east end of Boardman Creek, the east side of Ballard's Marsh). These may represent degraded fens and can be treated as Sandhills Bulrush Marsh or as transitional between marsh and fen. Much smaller fen-like marshes have been found along the Calamus River and in other streams in the Sandhills that do not exhibit mounding, but which contain one or several fen indicators. For the time being, these sites may be regarded as belonging to the Freshwater Seep community.

EXEMPLARY SITES: Well-preserved examples are the Allen Valley Fen, Big Creek Fen, Jim Lee Fen, and portions of Boardman Creek Fen all in Cherry County, the Jim Carr Fen in Garfield County, and the Pelster Fen in Wheeler County.

## **EASTERN CORDGRASS WET PRAIRIE**

ELEMENT CODE: CEG002224

GLOBAL NAME: *Spartina pectinata* - *Carex* spp. - *Calamagrostis canadensis* - *Lythrum alatum* - (*Oxypolis rigidor*) Herbaceous Vegetation (Central Cordgrass Wet Prairie)

SYSTEM PLACEMENT: Eastern Great Plains Wet-Meadow, Prairie, and Marsh

RANGE: This community occurs in river valleys in the tall-grass prairie region of eastern Nebraska, particularly in the southeastern portion of the state.

EPA ECOREGIONS: 27a?, 27f, 47

ENVIRONMENTAL DESCRIPTION: This community is found on nearly level floodplains of rivers and streams, and is often found as strips or bands along stream channels. Soils are deep, well-developed, poorly drained clay loams and silt loams formed in alluvium. These soils often remain waterlogged much of the season, particularly in winter or spring or following heavy rains.

COWARDIN WETLAND SYSTEM: Palustrine, temporarily to seasonally (depressions) flooded.

MOST ABUNDANT SPECIES:

Herbaceous: sedges (*Carex emoryi*, *C. laeviconica*, *C. pellita*, *C. vulpinoidea*), flat-stem spikerush (*Eleocharis compressa*), Kentucky bluegrass (*POA PRATENSIS*), prairie cordgrass (*Spartina pectinata*).

DIAGNOSTIC SPECIES: *Spartina pectinata*

VEGETATION DESCRIPTION: Vegetative cover is fairly dense and is dominated by hydrophytic and mesophytic graminoids 0.5-1.5 m tall, principally prairie cordgrass, though in some sites in extreme southeast Nebraska eastern gama grass (*Tripsacum dactyloides*) may also be abundant. Smoothcone sedge (*Carex laeviconica*) is usually the most abundant sedge species, with *C. brevior*, *C. gravida*, and *C. vulpinoidea* commonly scattered with it. In higher quality sites, other sedges may be present including *C. brachyglossa*, *C. davisii*, *C. emoryi*, *C. grisea*, and *C. pellita*. In wetter sites this community may grade into the eastern sedge wet meadow, and leafy bulrushes such as *Scirpus atrovirens*, *S. pallidus*, and (in one site) *S. pendulus* are often present. In drier sites where the community borders mesic tall-grass prairie, big bluestem (*Andropogon gerardii*) may also be common. Scattered perennial herbs are usually present, and among the more frequently encountered species are meadow garlic (*Allium canadense* var. *canadense*), Philadelphia fleabane (*Erigeron philadelphicus*), panicled aster (*Symphotrichum lanceolatum*), common ironweed (*Vernonia fasciculata*) and blue meadow violet (*Viola pratincola*). Frequently mowed sites are commonly invaded by cool-season aliens such as Kentucky bluegrass, alsike clover (*Trifolium hybridum*) and red clover (*Trifolium pratense*). Overall species diversity is moderate.

OTHER NOTEWORTHY SPECIES: Yellow-fruit sedge (*Carex brachyglossa*), Spring forget-me-not (*Myosotis verna*), and foxglove penstemon (*Penstemon digitalis*) have been found in this community in Pawnee County.

STATE RANK: S1

RANK JUSTIFICATION: Very few extensive, high-quality sites remain. Most have been drained and converted to cropland or have been heavily grazed. Exotic species are often abundant in mowed sites, and unmowed sites may succumb to shrub invasion in the absence of fire.

INVASIVE SPECIES OF CONCERN: Redtop (*Agrostis gigantea*), aggressive genotypes of reed canary-grass (*Phalaris arundinacea*), timothy (*Phleum pratense*) and Kentucky bluegrass (*Poa pratensis*) are often abundant in degraded sites.

GLOBAL RANK: G3?

COMMENTS: The sites upon which the descriptions are based are in extreme southeast Nebraska, though this community is (or was) likely present in river valleys throughout eastern Nebraska.

EXEMPLARY SITES: Hayed sites are known on private property in southeast Nebraska.

### **EASTERN SEDGE WET MEADOW**

ELEMENT CODE: CEG005272

GLOBAL NAME: =*Carex* spp. - (*C. pellita*, *C. vulpinoidea*) Herbaceous Vegetation (Central Midwest Sedge Meadow)

SYSTEM PLACEMENT: Eastern Great Plains Wet-Meadow, Prairie, and Marsh

RANGE: This community is known from the eastern part of the state in the floodplain of the Missouri River and its tributaries.

EPA ECOREGIONS: 47

ENVIRONMENTAL DESCRIPTION: This community occurs in nearly-level floodplains, often in bands surrounding marshy channels. Soils are poorly drained silty and clay loams formed in alluvium. The areas are flooded for much of the summer, but may dry out late in the year.

COWARDIN WETLAND SYSTEM: Palustrine emergent, seasonally and semi-permanently flooded.

MOST ABUNDANT SPECIES:

Herbaceous: redtop (*AGROSTIS GIGANTEA*), sedges: (*Carex cristatella*, *C. pellita*, *C. stipata*, *C. vulpinoidea*), foxtail barley (*Hordeum jubatum*), dark-green bulrush (*Scirpus atrovirens*), pale bulrush (*S. pallidus*), blue vervain (*Verbena hastata*)

DIAGNOSTIC SPECIES: *Carex cristatella*, *C. vulpinoidea*, *Scirpus atrovirens*, *S. pallidus*

VEGETATION DESCRIPTION: Vegetative cover is fairly dense and is often quite patchy. The dominants are graminoids 0.5-1.5 m tall, namely fox sedge (*Carex vulpinoidea*) and other sedges, particularly *C. cristatella*, *C. molesta*, *C. pellita*, *C. stipata*, and *C. tribuloides*. In some sites in northeast Nebraska, pale bulrush may be the dominant species. Other frequent graminoids include spikerushes (*Eleocharis* spp.), inland rush (*Juncus interior*), Torrey's rush (*J. torreyi*), and bulrushes. Rice cutgrass (*Leersia oryzoides*) may be common where this community borders a marsh. Perennial herbs are often common and conspicuous and include hemp dogbane (*Apocynum cannabinum*), common water-horehound (*Lycopus americanus*), winged loosestrife (*Lythrum alatum*), late goldenrod (*Solidago gigantea*), panicled aster (*Symphotrichum lanceolatum*), and blue vervain. In many places, these species may appear to comprise the dominant vegetation. Overall species diversity is moderate.

OTHER NOTEWORTHY SPECIES: Frank's sedge (*Carex frankii*), eastern star sedge (*Carex radiata*) and foxglove penstemon (*Penstemon digitalis*) are known from this community in Richardson County.

STATE RANK: S1

RANK JUSTIFICATION: Few extensive sites are known. Most have been drained and converted to cropland. Many remnants were heavily grazed. Reed canarygrass often invades disturbed sites.

INVASIVE SPECIES OF CONCERN: Redtop (*Agrostis gigantea*) is often abundant in this community, and reed canarygrass (*Phalaris arundinacea*) may sometimes invade to the near exclusion of the native species.

GLOBAL RANK: GNR

COMMENTS: The range of variation within this community still needs to be worked out, but for now it may serve as a catch-all for wet-meadow communities that border marshes in eastern Nebraska. In Dakota, Dixon, and Wayne counties sites have been observed that are almost wholly dominated by dense stands of pale bulrush, but which otherwise fit the description of this community.

EXEMPLARY SITES: Fairly extensive areas are preserved at Margrave Wildlife Management Area in Richardson County.

## **EASTERN SALINE MEADOW**

ELEMENT CODE: CEG002031

GLOBAL NAME: =*Distichlis spicata* - *Hordeum jubatum* - (*Poa arida* - *Iva annua*)  
Herbaceous Vegetation (Central Tallgrass Saline Meadow)

OTHER NAMES: >*Distichlis stricta* community, >dwarf *Distichlis* community, >Prairie-*Distichlis* community, >*Salicornia rubra* community, >*Suaeda depressa* community (Ungar *et al.* 1969)

SYSTEM PLACEMENT: Eastern Great Plains Wet-Meadow, Prairie, and Marsh

RANGE: This community is restricted to Lancaster and Saunders counties in southeastern Nebraska, primarily in the valleys of Salt Creek, Little Salt Creek, and Rock Creek.

EPA ECOREGION: 47i

ENVIRONMENTAL DESCRIPTION: This community occupies shallow depressions and nearly level ground on floodplains and terraces of streams. Soils are deep, poorly drained silty clay loams formed in alluvium that is slightly to moderately affected by soluble salts. The salts accumulate from saline seeps associated with Dakota Sandstone that forms the bedrock below these areas. The water table varies from just above to about two feet below the surface. Soils of this community are drier than those of the Eastern Saline Marsh community, and are more variable in soil salinity (0.2–4.7 % total salts). Shallow depressions in these areas accumulate clay and salts, and are usually flooded early in the growing season. As these depressions dry out, salt crusts form on the surface.

COWARDIN WETLAND SYSTEM: Palustrine emergent, temporarily flooded

MOST ABUNDANT SPECIES:

Herbaceous: inland saltgrass (*Distichlis spicata*), foxtail barley (*Hordeum jubatum*), annual marsh-elder (*Iva annua*), Plains bluegrass (*Poa arida*), saltwort (*Salicornia rubra*), prairie cordgrass (*Spartina pectinata*), seablite (*Suaeda calceoliformis*)

DIAGNOSTIC SPECIES: *Atriplex dioica*, *Distichlis spicata*, *Poa arida*, *Salicornia rubra*, *Sporobolus texanus*, *Suaeda calceoliformis*

VEGETATION DESCRIPTION: The vegetation consists primarily of saline-tolerant graminoids with scattered, mostly annual herbs <1 m tall. Species diversity usually is greater in areas of low salinity. Two intergrading zones can be recognized:

- 1) Saltgrass zone – is moderately to densely vegetated by saline-tolerant graminoids and annual herbs <1 m tall. Inland saltgrass is often dominant in sites with higher salinity (0.5-2.0%). As salinity decreases, prairie grasses typical of clay soils appear including blue grama (*Bouteloua gracilis*), buffalograss (*Buchloë dactyloides*) and western wheatgrass (*Pascopyrum smithii*). In areas of low salinity (ca 0.1%), typical upland prairie species may be found, particularly in disturbed areas.
- 2) Salt-flat zone - occupies shallow depressions and is often sparsely vegetated to unvegetated. Dominants include inland saltgrass and seablite. Slightly deeper



depressions, which remain wet longer, may be solely vegetated by saltwort and seablite. Salt crusts often form in this zone.

**OTHER NOTEWORTHY SPECIES:** Saltwort and Texas dropseed (*Sporobolus texanus*), both disjunct from their main ranges, are restricted to this community type in Nebraska.

**INVASIVE SPECIES OF CONCERN:** Alien species that may invade degraded sites include smooth brome (*Bromus inermis*), cheatgrasses (*Bromus japonicus*, *B. tectorum*), reed canarygrass (*Phalaris arundinacea*), and Kentucky bluegrass (*Poa pratensis*).

**STATE RANK:** S1

**RANK JUSTIFICATION:** This community has experienced extensive degradation and loss from overgrazing, urban and agricultural development, and lowered salinity due to streambed downcutting and subsequent invasion by alien species.

**GLOBAL RANK:** G2G3

**COMMENTS:** This community often grades into the Eastern Saline Marsh community, but does not always occur in association with it. As salinity decreases and saltgrass decreases, western wheatgrass becomes more common and this community may grade into Wheatgrass Playa Grassland or a similar community. It may also grade into Mesic Tall-grass Prairie, Eastern Sedge Wet Meadow and marsh communities.

**EXEMPLARY SITES:** Arbor Lake and Litle Salt Creek West Wildlife Management Areas in Lancaster County.

## **NORTHERN CORDGRASS WET PRAIRIE**

**ELEMENT CODE:** CEGl002027

**GLOBAL NAME:** *Spartina pectinata* - *Calamagrostis stricta* - *Carex* spp. Herbaceous Vegetation

**OTHER NAMES:** =Grazed grasslands (Currier 1982), <Hydrophytic tall grass area (Frolik & Keim 1933), =streamside wetland (Kantak 1995); <Hay Meadow Association (Pool 1914), <Mesophytic Tall-grass Zone (Tolstead 1942)

**SYSTEM PLACEMENT:** Western Great Plains Open Freshwater Depression Wetland

**RANGE:** This community is most extensive in permanent stream and river valleys from the Platte River valley northward in the central part of the state.

**EPA ECOREGIONS:** 27e, 27f?, 27g, 42?, 44?

**ENVIRONMENTAL DESCRIPTION:** This community is found in depressions on nearly level floodplains and terraces of rivers and streams, and is often found as strips or bands on banks of stream channels. Soils are deep, well-developed, poorly drained loams and sandy loams formed in alluvium. The water table is close to the soil surface, and the soil remains waterlogged much of the season. Standing water is normally present in winter or spring and following heavy rains.

**COWARDIN WETLAND SYSTEM:** Palustrine emergent, temporarily flooded

**MOST ABUNDANT SPECIES:**

Herbaceous: northern reedgrass (*Calamagrostis stricta*), Emory's sedge (*Carex emoryi*), woolly sedge (*C. pellita*), smooth scouringrush (*Equisetum laevigatum*), switchgrass (*Panicum virgatum*), swamp smartweed (*Persicaria coccinea*), prairie cordgrass (*Spartina pectinata*)

**DIAGNOSTIC SPECIES:** *Calamagrostis stricta*, *Spartina pectinata*

**VEGETATION DESCRIPTION:** Vegetative cover is fairly dense and may be patchy or homogeneous at a given site. Prairie cordgrass tends to dominate, sometimes mixed with other hydrophytic perennial herbs ca. 1 m tall such as Emory's sedge and woolly sedge, northern reedgrass and switchgrass. Shrubs may be scattered to patchy, the most common being sandbar willow (*Salix interior*), diamond willow (*S. famelica*), false indigobush (*Amorpha fruticosa*) and red osier (*Cornus sericea*). In some cases (especially on streambanks) coarse late-season perennials may shade the grasses and assume dominance. Among these species are viscid goldentop (*Euthamia gymnospermoides*), wild licorice (*Glycyrrhiza lepidota*), sneezeweed (*Helenium autumnale*), sawtooth sunflower (*Helianthus grosseserratus*), Nuttall's sunflower (*H. nuttallii*), tall goldenrod (*Solidago altissima*), late goldenrod (*S. gigantea*), paniced aster (*Symphyotrichum lanceolatum*), willow-leaf aster (*S. praealtum*), and common ironweed (*Vernonia fasciculata*).

Most examples of this community are annually hayed in mid summer resulting in a dominance of cool season species. Sedges and rushes frequently dominate, the most abundant being *Carex crawei*, *C. pellita*, *C. praegracilis*, *C. scoparia*, and *C. tetanica*. Spikerushes (particularly *Eleocharis compressa*) and rushes (*Juncus arcticus*, *J. nodosus*, and *J. torreyi*) are occasional to abundant. Native, warm season, grasses are usually conspicuously less common than sedges, with switchgrass and prairie cordgrass usually occurring as scattered patches. Invasive grasses, particularly reed canarygrass, timothy, and Kentucky bluegrass are frequently very common to dominant. Eurasian clovers (*Trifolium* spp.) have been seeded in the majority of hayed meadows. Scattered patches of shrubs, including sandbar willow (*Salix interior*), diamond willow (*S. famelica*), and false indigobush (*Amorpha fruticosa*) may be present, often in slightly wetter areas (e. g. adjacent to streams) that are less frequently hayed. Perennial herbs are scattered to locally common. Species diversity is low to moderate

**OTHER NOTEWORTHY SPECIES:** None recorded.

**STATE RANK:** S2

**RANK JUSTIFICATION:** Very few extensive, high-quality sites remain. Most have been drained and converted to cropland, and the remnants are often heavily grazed. Many sites have been seeded to Eurasian forage grasses to the near exclusion of native species. Reduced water levels in many streams may impact this community.

**INVASIVE SPECIES OF CONCERN:** Alien grasses that may become abundant in this community include reedtop (*Agrostis gigantea*), orchard grass (*Dactylis glomerata*), and Kentucky bluegrass (*Poa pratensis*). Yellow bedstraw may be invasive in this community in Cherry County, and narrowleaf trefoil (*Lotus tenuis*) and field sow-thistle (*Sonchus arvensis* var. *glabrescens*) show invasive tendencies in some places.

**GLOBAL RANK:** G2G3

**COMMENTS:** This community was originally conceived for Nebraska to include prairie cordgrass dominated grasslands of the Platte River and Niobrara River valleys, with such communities in the Sandhills falling under a broadly conceived "Northern Sedge Wet Meadow" in previous editions. Steinauer (2006) suggests the Northern Cordgrass Wet Prairie is synonymous with the Northern Sedge Wet Meadow and should be combined with it, as it represents a degraded state brought about by annual mid-summer haying. Commonly, prairie cordgrass dominated areas in the Sandhills occur in relatively level situations and grade freely into sedge-dominated and bluestem-dominated communities. In fact, previous workers have not generally recognized a prairie cordgrass dominated community in the Sandhills, having consistently combined it with either sedge wet meadow (Frolik & Keim 1933, Steinauer 2006), or with wet-mesic tallgrass prairie (Pool 1914, Tolstead 1942). It remains to be seen whether a true prairie cordgrass dominated wet prairie community similar to those seen in the Platte Valley occurs in the Sandhills. For distinctions between this and the Eastern Cordgrass Wet Prairie, see comments under that community.

**EXEMPLARY SITES:** Well-preserved, extensive examples are preserved at the Mormon Island Crane Meadows in Hall County.

## **SANDHILLS WET MEADOW**

**ELEMENT CODE:** CEG002028

**GLOBAL NAME:** =*Calamagrostis canadensis* - *Juncus* spp. - *Carex* spp. Sandhills Herbaceous Vegetation (Sandhills Wet Prairie)

**OTHER NAMES:** <Hydrophytic tall grass area (Frolik & Keim 1933), >Rush-sedge wet meadow, >Water hemlock association (Pool 1914), =Hydrophytic grass and sedge zone (Tolstead 1942); <Northern Sedge Wet Meadow (2<sup>nd</sup>, 3<sup>rd</sup> ed.)

**RANGE:** This community occurs throughout the Sandhills and the drainages of Sandhills rivers such as the Loup and Elkhorn. It may also be present along the Niobrara and Platte rivers.

EPA ECOREGIONS: 27e, 27g?, 44a, 44c, 44d, 471

ENVIRONMENTAL DESCRIPTION: This community occupies nearly level sites along streams and rivers, in wet interdunal valleys and level, poorly-drained sand flats. The community often forms a zone bordering Sandhills lakes, marshes, and fens. Soils are poorly drained sandy loams and sands with high organic content at the surface, and are formed in eolian sand and alluvium. The water table is usually within one meter of the surface throughout the growing season, and portions of these sites may be temporarily flooded in late winter and early spring, or shallowly flooded (<1 dm) for longer periods.

COWARDIN WETLAND SYSTEM: Palustrine emergent, temporarily to seasonally flooded.

MOST ABUNDANT SPECIES:

Herbaceous: bluejoint (*Calamagrostis canadensis*), northern reedgrass (*C. stricta*), Nebraska sedge (*Carex nebrascensis*), woolly sedge (*C. pellita*), clustered field sedge (*C. praegracilis*), Sartwell's sedge (*C. sartwellii*), pointed broom sedge (*C. scoparia*), flat-stem spikerush (*Eleocharis compressa*), Baltic rush (*Juncus arcticus* var. *balticus*), knotted rush (*J. nodosus*), Torrey's rush (*J. torreyi*), swamp smartweed (*Persicaria coccinea*), reed canarygrass (*Phalaris arundinacea*), common hedge-nettle (*Stachys pilosa* var. *pilosa*)

DIAGNOSTIC SPECIES: *Calamagrostis canadensis*, *C. stricta*, *Carex sartwellii*

VEGETATION DESCRIPTION: This community is densely vegetated, predominately by hydrophytic graminoids 0.5-1.5 m tall with roots constantly in contact with the water table. Northern reedgrass, sedges and rushes frequently dominate, while spikerushes and swamp smartweed are sometimes locally abundant. Species diversity is low to relatively high. Two somewhat definable phases are recognizable:

- 1) Bluejoint-Sedge Meadow – occurs in wetter areas, often confined to a narrow band along the margins of bulrush marshes and fens. Scattered patches of bluejoint are present, often with sedges such as Sartwell's sedge and woolly sedge. Reed canarygrass has frequently been reported as occurring in these sites historically, and small patches currently found in undisturbed examples may represent a native genotype. Often such sites are dominated by conspicuous wetland perennials including swamp milkweed (*Asclepias incarnata*), common water-hemlock (*Cicuta maculata*), field mint (*Mentha canadensis*), northern water-horehound (*Lycopus uniflorus*), winged loosestrife (*Lythrum alatum*), heal-all (*Prunella vulgaris*), marsh skullcap (*Scutellaria galericulata*), and common hedge-nettle. Scattered patches of shrubs, including sandbar willow (*Salix interior*), diamond willow (*S. famelica*), meadow willow (*S. petiolaris*) and false indigobush (*Amorpha fruticosa*) may be present, often along streams. The full extent and species composition of this phase is poorly documented, in part because it is frequently not distinguished from Northern Cordgrass Wet Prairie community.
- 2) Northern Reedgrass-Sedge Meadow – is not usually associated with marshes, but rather occupies the bottoms of natural and artificial channels and depressions, usually

surrounded by prairie. Northern reedgrass commonly dominates, or shares dominance with pointed broom sedge or woolly sedge. Flatstem spikerush is often abundant or even dominant in portions of these areas with Baltic rush also common in slightly lower areas. Prairie cordgrass (*Spartina pectinata*) is sometimes also present, but is not dominant. Assorted rushes and other wildflower species found in the Bluejoint-Sedge Meadow phase may also be present. Species diversity is usually low to moderate, though a variety of northern and eastern disjunct species are sometimes present.

**OTHER NOTEWORTHY SPECIES:** *Carex bebbii*, *C. buxbaumii*, *Eleocharis wolfii*, *Juncus canadensis*, *Muhlenbergia filiformis*, *M. richardsonis*, *Pedicularis lanceolata*, *Rhynchospora capitellata*, *Schoenoplectus hallii*, *Viola lanceolata*, and *Xyris torta*.

**STATE RANK:** S2?

**RANK JUSTIFICATION:** Although some high-quality tracts remain, most have been drained and are annually hayed. Most such sites have been overseeded with cool-season European grasses and clovers (*Trifolium* spp.) which frequently displace native warm-season grasses when annually hayed in mid-summer. Future pressures on the Ogallala aquifer could endanger the relatively few intact wet meadows that remain.

**INVASIVE SPECIES OF CONCERN:** Redtop (*Agrostis gigantea*), Garrison creeping foxtail (*Alopecurus arundinaceus*), timothy (*Phleum pratense*) and the alien genotypes of reed canarygrass are often seeded into and may dominate this community. Eurasian phragmites (*Phragmites australis* ssp. *australis*) may potentially pose a threat. Yellow bedstraw (*Galium verum*) has invasive tendencies in portions of Cherry County.

**GLOBAL RANK:** G3G4

**COMMENTS:** This community serves as something of a catch-all for vegetation types of subirrigated meadows in the Sandhills and nearby river drainages that are too dry for marsh plants and too wet for coarse, rhizomatous prairie grasses. In previous classifications, this definition included areas of degraded Northern Cordgrass Wet Prairie in which annual mid-summer haying has shifted dominance from prairie cordgrass to an array of sedges and other cool-season plants (Steinauer 2006). However, areas of unmowed, ungrazed subirrigated wetland in the Sandhills that are not dominated by prairie cordgrass are currently known in the eastern Sandhills and are described in the literature (cf. Tolstead 1942). The highest quality examples are dominated by rushes, bluejoint, and/or northern reedgrass, among many other species. Since such sites are often of limited extent, they have been combined with cordgrass-dominated communities by some (e.g. Frolik & Keim 1933, Steinauer 2006), and in some cases this may be necessary for delineation purposes. Most examples of unmowed, ungrazed cordgrass dominated communities have relatively low species diversity, due to shading of associated species in dense stands.

The Northern Reedgrass-Sedge Meadow phase of the eastern Sandhills occupies a position in the landscape intermediate between the Bluejoint-Sedge Meadow phase and Northern Cordgrass Wet Prairie community. It may be equivalent to the *Carex pellita* – *Calamagrostis stricta* Herbaceous Vegetation (CEGL002254) of NatureServe, which they suggest may be better

treated as an inclusion within a prairie cordgrass-dominated wet prairie community. We have included it in the Sandhills Wet Meadow for convenience.

EXEMPLARY SITES: Well-preserved examples remain in the eastern Sandhills, largely on private property in the upper Elkhorn River and Cedar River drainages. Some high quality examples also occur in highway rights-of-way such as along U.S. 20 west of Newport.

## WESTERN ALKALINE MEADOW

ELEMENT CODE: C EGL002042

GLOBAL NAME: =*Distichlis spicata* - (*Hordeum jubatum*, *Poa arida*, *Sporobolus airoides*)  
Herbaceous Vegetation (Southern Great Plains Saline Meadow)

OTHER NAMES: >Ephemeral saline wetland, >Lowland saline prairie, >Upland saline prairie (Rolfmeier 1993b); >Alkaline stream bottom (Rolfmeier 1996); >Alkaline Intermittent Stream Bottom (1<sup>st</sup> ed.)

SYSTEM PLACEMENT: Western Great Plains Saline Depression Wetland

RANGE: This community occurs in the North Platte River valley, its smaller tributary valleys, and in the closed basin area of the western Sandhills. Some intermittent alkaline stream bottoms on the Pierre Shale Plains are also included in this community.

EPA ECOREGIONS: 25, 27, 43, 44

ENVIRONMENTAL DESCRIPTION: The community occurs on nearly level ground on bottomlands of rivers or streams, or interdunal valley bottoms in the vicinity of Sandhills alkaline wetlands and lakes. Soils are poorly drained, very strongly alkaline silt loams or sands with silty clay subsoil, and are formed in fine-textured alluvium (Minatare-Janise complex) or eolian sands (Wildhorse complex). Shallow depressions in these areas are flooded early in the spring. Salt crusts form on the soil surface as it dries. The upper soil layers often have a pH near 9.5 and high ratios of adsorbed sodium (SAR).

COWARDIN WETLAND SYSTEM: Palustrine emergent, temporarily flooded

MOST ABUNDANT SPECIES:

Herbaceous: clustered field sedge (*Carex praegracilis*), inland saltgrass (*Distichlis spicata*), slender wheatgrass (*Elymus trachycaulus*), foxtail barley (*Hordeum jubatum*), scratchgrass (*Muhlenbergia asperifolia*), meadow bluegrass (*Poa arida*), alkali sacaton (*Sporobolus airoides*), seablite (*Suaeda calceoliformis*), alkali arrowgrass (*Triglochin maritima*)

DIAGNOSTIC SPECIES: *Amphiscirpus nevadensis*, *Atriplex dioica*, *Cleomella angustifolia*, *Distichlis spicata*, *Plantago eriopoda*, *Primula pauciflora*, *Sporobolus airoides*, *Thelypodium integrifolium*

VEGETATION DESCRIPTION: The vegetation of this community is moderately dense to sparse and is predominately composed of alkaline-tolerant herbaceous graminoids <1 m tall, with scattered broadleaf species present to a lesser extent. Species diversity is relatively low, and decreases with increasing alkalinity. Two zones may be recognized:

- 1) alkaline prairie zone - consists of alkali-tolerant grasses and forbs, and is dominated by inland saltgrass and alkali sacaton, with clustered field sedge, foxtail barley, and meadow bluegrass frequent in more mesic areas. Halophytic herbs are scattered, and include salt-marsh sparscale (*Atriplex dioica*), alkali aster (*Symphyotrichum ciliatum*), viscid camphor-daisy (*Rayjacksonia annua*), and thelypody (*Thelypodium integrifolium*). Eurasian halophytes are commonly present in most sites, but are not usually a serious problem.
- 2) salt flat zone - is often sparsely vegetated to unvegetated and is usually dominated by inland saltgrass and seablite, with stunted plants of alkali arrowgrass common in some of the wetter depressions. Nevada bulrush (*Amphiscirpus nevadensis*) is locally common in some sites. Salt crusts are often present in this zone.

OTHER NOTEWORTHY SPECIES: Species uncommon in Nebraska that occur in this community include *Amphiscirpus nevadensis*, *Cleomella angustifolia*, *Heliotropium curassavicum* var. *obovatum*, and *Lysimachia maritima*

STATE RANK: S3

RANK JUSTIFICATION: Relatively few well-preserved sites remain in the North Platte River valley, a great many have been drained and seeded to alien species as well as overgrazed.

INVASIVE SPECIES OF CONCERN: Tall wheatgrass (*Thinopyrum ponticum*) has been seeded into some areas where it predominates. Clasping pepperwort (*Lepidium perfoliatum*) may be established in other sites. Other alien species that may be locally common include strawberry clover (*Trifolium fragiferum*), Russian orache (*Atriplex heterosperma*) and spreading alkali-grass (*Puccinellia distans*).

GLOBAL RANK: G3

COMMENTS: All alkaline meadows in the western Sandhills were tentatively placed here in earlier versions of this classification, but some could belong in the Subirrigated Alkaline Wet Meadow community. Species composition of the North Platte Valley alkaline meadows is very similar to those of the western Sandhills, (with the exception that alkali sacaton is usually absent from Sandhills sites), and the presence of conspicuous salt crusts in many Sandhill sites probably indicates an affinity with the Western Alkaline Meadow community. Most examples of mildly

alkaline wet meadows in the Sandhills are presently included in the Northern Cordgrass Wet Prairie community. More comparative studies are needed.

Riparian alkaline wetland communities observed on the Oglala National Grasslands and formerly designated as Alkaline Intermittent Stream Bottom in the first edition of this classification are probably best assigned here or to the alkaline phase of the Western Floodplain Terrace Meadow community.

EXEMPLARY SITES: Fliesbach Wildlife Management Area in Morrill County and Kiowa Basin Wildlife Management Area in Scotts Bluff County.

## **WESTERN SUBIRRIGATED ALKALINE MEADOW**

ELEMENT CODE: CEGLO01838

GLOBAL NAME: =? *Juncus balticus* Herbaceous Vegetation (Baltic Rush Wet Meadow)

SYSTEM PLACEMENT: Western Great Plains Saline Depression Wetland

RANGE: This community is extensive in the upper Niobrara River valley and patchy to locally common in the North Platte River valley in the Nebraska Panhandle. It may also be present in the Sandhills and (at least formerly) along Lodgepole Creek in the Nebraska Panhandle.

EPA ECOREGIONS: 25, 44?

ENVIRONMENTAL DESCRIPTION: The community occurs in nearly level ground on bottomlands of rivers or streams, and possibly in interdunal valley bottoms in the vicinity of Sandhills alkaline wetlands and lakes. Soils are somewhat poorly drained, deep, fine sandy loams formed in sandy alluvium. The water table varies seasonally from one to three feet below the surface and water generally does not pond at the surface. The upper soil layers are slightly to moderately saline.

COWARDIN WETLAND SYSTEM: Palustrine emergent, temporarily flooded

MOST ABUNDANT SPECIES:

Herbaceous: woolly sedge (*Carex pellita*), clustered field sedge (*Carex praegracilis*), inland saltgrass (*Distichlis spicata*), slender wheatgrass (*Elymus trachycaulus*), foxtail barley (*Hordeum jubatum*), Baltic rush (*Juncus arcticus* var. *balticus*), scratchgrass (*Muhlenbergia asperifolia*), switchgrass (*Panicum virgatum*), alkali cordgrass (*Spartina gracilis*)

DIAGNOSTIC SPECIES: *Juncus arcticus* var. *balticus*, *Spartina gracilis*

VEGETATION DESCRIPTION: The vegetation of this community is relatively dense and dominated by alkaline-tolerant herbaceous graminoids <1 m tall, with Baltic rush and woolly sedge often dominating wetter areas, and with inclusions of Nebraska sedge (*Carex*



*nebrascensis*) and bald spikerush (*Eleocharis erythropoda*) common in the wettest portions. Slightly higher areas may contain a mixture of both Baltic rush and woolly sedge, along with clustered field sedge, slender wheatgrass, foxtail barley, scratchgrass, switchgrass and alkali cordgrass. Inland saltgrass is locally common in the most noticeably alkaline areas along the upper periphery of the community. Unmowed areas may contain locally dense stands of coarse perennials including wild licorice (*Glycyrrhiza lepidota*), and tall goldenrod (*Solidago altissima*). Species diversity is moderate.

**OTHER NOTEWORTHY SPECIES:** The federally threatened *Spiranthes diluvialis* is present in this community on the upper Niobrara in Sioux County. *Lysimachia maritima* and *Pedicularis crenulata* are also present in this area, most likely in this community.

**STATE RANK:** S2?

**RANK JUSTIFICATION:** The full extent of this community is poorly known. Most of the better examples are hayed, and those that are not are vulnerable to invasion by aggressive alien species.

**INVASIVE SPECIES OF CONCERN:** Canada thistle (*Cirsium arvense*) and field sow-thistle (*Sonchus arvensis* var. *glabrescens*) may be locally common in examples of this community along the Niobrara River. Garrison creeping foxtail (*Alopecurus arundinaceus*) and quackgrass (*Elymus repens*) may also be associated with this community in this area.

**GLOBAL RANK:** G3

**COMMENTS:** Unlike the similar Western Alkaline Meadow community, this community generally does not occur in proximity to alkaline marshes, is not dominated by inland saltgrass, and does not contain salt flats with conspicuous crusts, except as small inclusions on higher ground. The distribution of these two communities in the Sandhills has yet to be determined. The relationship of this community to the global name needs to be determined.

**EXEMPLARY SITES:** This community is extensive along the Niobrara River in the eastern half of Agate Fossil Beds National Monument, and on the Prairie Plains Resource Institute's Guadalcanal Memorial Prairie and Ranch in Sioux County.

## **WHEATGRASS PLAYA GRASSLAND**

**ELEMENT CODE:** C EGL002038

**GLOBAL NAME:** =*Pascopyrum smithii* - *Buchloë dactyloides* - (*Phyla cuneifolia* - *Oenothera canescens*) Herbaceous Vegetation (Wheatgrass Playa Grassland)

**OTHER NAMES:** =Transition zone (Gilbert 1989)

SYSTEM PLACEMENT: Western Great Plains Closed Depression Wetland

RANGE: This community occurs most abundantly in level loess-mantled plains in the Rainwater Basin region of south-central and southwest Nebraska, but is also apparently present in extreme northwest Nebraska, in the Loess Hills of central Nebraska, and possibly in the Todd Valley in the eastern part of the State.

EPA ECOREGIONS: 25d, 27e?, 27f, 43?

ENVIRONMENTAL DESCRIPTION: This community occurs in nearly level ground and in very shallow depressions in uplands. Soils are shallow and somewhat poorly drained silty clay loams underlain by a clay pan and are usually formed in loess (Scott series). These areas may be temporarily flooded in winter or early spring, but usually dry out by early summer.

COWARDIN WETLAND SYSTEM: Palustrine emergent, temporarily flooded

MOST ABUNDANT SPECIES:

Herbaceous: ticklegrass (*Agrostis hyemalis*), common ragweed (*Ambrosia artemisiifolia*), bur ragweed (*Ambrosia grayi*), buffalograss (*Buchloë dactyloides*), shortbeak sedge (*Carex brevior*), largespike spikerush (*Eleocharis macrostachya*), foxtail barley (*Hordeum jubatum*), inland rush (*Juncus interior*), western wheatgrass (*Pascopyrum smithii*), wedgeleaf fog-fruit (*Phyla cuneifolia*), Kentucky bluegrass (*POA PRATENSIS*), prairie ironweed (*Vernonia fasciculata*)

DIAGNOSTIC SPECIES: *Buchloë dactyloides*, *Pascopyrum smithii*, *Phyla cuneifolia*, *Oenothera canescens*, *Vernonia fasciculata*

VEGETATION DESCRIPTION: Perennial herbaceous graminoids less than 1 m tall dominate in this community. Broadleaf species diversity and density is often very low, and overall species diversity is low to moderate. Two intergrading zones are recognized:

- 1) wheatgrass prairie zone – occurs in areas of shallow topsoil, usually 1-3 inches deep over clay pans, and is intermittently flooded. It is dominated by western wheatgrass and occasionally scattered sedges including shortbeak sedge and heavy sedge (*Carex gravida*). The most common perennial herbs include wedgeleaf fog-fruit, prairie ironweed, and bur ragweed, with fog-fruit sometimes abundant in ungrazed sites. Annuals are often scattered through these sites and include annual ragweed, prairie trefoil (*Acmispon americanus*), and Venus'-looking-glass (*Triodanis leptocarpa* and *T. perfoliata*). In grazed sites, buffalograss and foxtail barley are often common, and ironweed tends to increase. Kentucky bluegrass is the most common invader in this community and may often be nearly as abundant as western wheatgrass in idle sites. In south-central Nebraska, this zone frequently borders and intergrades with upland tall-grass and mixed-grass prairie. In southwestern Nebraska, this community may intergrade with Playa Wetland and may contain early-season ephemeral annuals such as Carolina foxtail (*Alopecurus carolinianus*), waterwort (*Elatine rubella*), mudwort

(*Limosella aquatica*), mousetail (*Myosurus minimus*), popcorn flower (*Plagiobothrys scouleri*), and water purslane (*Veronica peregrina* var. *xalapensis*).

- 2) sedge meadow zone – occurs in soils mostly 3-6 inches deep and is temporarily flooded. It is primarily dominated by shortbeak sedge, but woolly sedge (*Carex pellita*) may be common in lower places. Other common graminoids include ticklegrass (*Agrostis hyemalis*), bald spikerush (*Eleocharis erythropoda*), western wheatgrass (*Pascopyrum smithii*), and rice cutgrass (*Leersia oryzoides*). Herbaceous plants typically associated with the outer margins of the Cattail Shallow Marsh community are often common, including Plains coreopsis (*Coreopsis tinctoria*), western water clover (*Marsilea vestita*), smartweeds (*Persicaria* spp.), docks (*Rumex* spp.), and prairie ironweed (*Vernonia fasciculata*), along with species in the wheatgrass prairie zone.

STATE RANK: S1

RANK JUSTIFICATION: The vast majority of these sites, which occur in level grassland, have been destroyed through agricultural conversion. The remaining areas are often heavily grazed. Few sites are protected, and those are mostly quite degraded from past overgrazing.

INVASIVE SPECIES OF CONCERN: Kentucky bluegrass often becomes established in this community.

GLOBAL RANK: G2G3

COMMENTS: This community is broadly defined here as including all types of intermittently-flooded western wheatgrass dominated grassland areas occurring in upland depressions with an underlying clay pan (including the transition zone of Gilbert [1989]). This primarily includes the Rainwater Basins of south-central Nebraska and the Perkins Table and vicinity in southwest Nebraska. Scattered examples of this community type may be found in shallow depressions in the loess-derived soils of the tall-grass prairie region of eastern Nebraska and in the loess mixed-grass prairies of central Nebraska. Similar communities in the clay soils of extreme northwest Nebraska are included here as well, but may in fact be synonymous with the *Pascopyrum smithii* – *Hordeum jubatum* Herbaceous Vegetation community of NatureServe. The sedge meadow zone described here intergrades with the outer marsh zone of the Cattail Shallow Marsh community.

EXEMPLARY SITES: Ungrazed or lightly grazed examples of this community are preserved at Verona Wildlife Production Area in Clay County, Ritterbush WPA in Franklin County, Bluestem Basin WPA in Kearney County, Petersen WPA in Gosper County, and Deep Well Wildlife Management Area in Hamilton County.

## WESTERN SEDGE WET MEADOW

ELEMENT CODE: CEG001813

GLOBAL NAME: >*Carex nebrascensis* Herbaceous Vegetation (Nebraska sedge wet meadow)

OTHER NAMES: Sedge-bulrush meadow (2<sup>nd</sup> ed.), Western streamside wet meadow (3<sup>rd</sup> ed.).

SYSTEM PLACEMENT: Northwestern Great Plains Riparian

RANGE: This community is known from the Nebraska Panhandle and could occur farther eastward in the state within the geographic range of *Carex nebrascensis*.

EPA ECOREGIONS: 25, 43

ENVIRONMENTAL DESCRIPTION: This community occurs along stream banks and margins, usually along small, flowing permanent streams or streambeds that contain standing water for much of the growing season. Occasionally it is associated with seeps. Soils are poorly drained clay, silt, and sandy loams formed in alluvium.

COWARDIN WETLAND SYSTEM: Palustrine emergent, temporarily to seasonally flooded

MOST ABUNDANT SPECIES:

Herbaceous: redtop (*AGROSTIS GIGANTEA*), bottlebrush sedge (*Carex hystericina*), Nebraska sedge (*C. nebrascensis*), woolly sedge (*C. pellita*), bald spikerush (*Eleocharis erythropoda*), three-square bulrush (*Schoenoplectus pungens*)

DIAGNOSTIC SPECIES: *Carex nebrascensis*, *Carex pellita*, *Schoenoplectus pungens*

VEGETATION DESCRIPTION: This community is dominated by hydrophytic graminoids 0.5-1 m tall and is generally divisible into two zones:

- 1) Nebraska sedge seasonally flooded wetland – is generally dominated by Nebraska sedge, which may be emergent in shallow water at the margins of streams early in the season. Where this community occurs in association with flowing springs, three-square bulrush may be co-dominant, while in bottomland seeps bottlebrush sedge may also be common. A few other wetland perennials such as field mint (*Mentha canadensis*) are sometimes present. Species diversity is usually low.
- 2) Woolly sedge temporarily flooded streambank – is generally dominated by woolly sedge, with redtop frequently invading and sharing dominance. Other perennials that may be present in this zone include late goldenrod (*Solidago gigantea*) and blue vervain (*Verbena hastata*). Species diversity is low to moderate.

OTHER NOTEWORTHY SPECIES: Northern green orchid (*Platanthera aquilonis*) may be present in this community, especially in the Pine Ridge.

STATE RANK: S2

RANK JUSTIFICATION: Though the range and extent of this community is still poorly-defined, it is highly susceptible to degradation by cattle grazing.

INVASIVE SPECIES OF CONCERN: Redtop and quackgrass (*Elymus repens*) are often frequently present. Invasive genotypes of reed canarygrass (*Phalaris arundinacea*) may also be problematic.

GLOBAL RANK: G4

COMMENTS: This community tends to be associated with permanent, spring-fed streams, and hence may at times intergrade with the Freshwater Seep community.

EXEMPLARY SITES: Intact sites are known in the Pine Ridge.

## PLAYA WETLAND

ELEMENT CODE: CEG002039

GLOBAL NAME: =*Polygonum* spp. - *Echinochloa* spp. - *Distichlis spicata* Playa Lake Herbaceous Vegetation (Playa Marsh)

SYSTEM PLACEMENT: Western Great Plains Closed Depression Wetland

RANGE: This community is found throughout the state, but is most abundant in the south-central and southwestern parts.

EPA ECOREGIONS: 25, 27, 42, 43, 44, 47

ENVIRONMENTAL DESCRIPTION: This community occurs in shallow depressions in nearly level ground. Soils are silty clay loam underlain by a clay pan in loess or other silty to sandy soils. In southwest Nebraska, they most frequently are associated with soils of the Lodgepole and Scott series. These areas are temporarily to seasonally flooded by ponded rain water and surface runoff, and usually dry out by mid to late summer in all but the wettest years.

COWARDIN WETLAND SYSTEM: Palustrine emergent, temporarily and seasonally flooded

MOST ABUNDANT SPECIES:

Herbaceous: water-hyssop (*Bacopa rotundifolia*), plains coreopsis (*Coreopsis tinctoria*), short-point flatsedge (*Cyperus acuminatus*), blunt spikerush (*Eleocharis obtusa*), barnyard grass (*Echinochloa* spp.), common waterwort (*Elatine rubella*), mud-plantains (*Heteranthera limosa*, *H. rotundifolia*), false pimpernel (*Lindernia dubia*), carpetweed (*Mollugo verticillata*), pink smartweed (*Persicaria bicornis*), nodding smartweed (*P. lapathifolia*), narrowleaf dock (*RUMEX STENOPHYLLUS*), hooded arrowhead (*Sagittaria calycina*)

DIAGNOSTIC SPECIES: *Coreopsis tinctoria*, *Echinochloa muricata*, *Limosella aquatica*, *Plagiobothrys scouleri*

**VEGETATION DESCRIPTION:** Annual herbaceous graminoids and other herbaceous plants mostly <1 m tall dominate the exposed mud flats of the playa, and species composition and extent of the community varies from site to site and year to year. In sites which have been dredged to hold water longer (drainage ditches, re-use pits), perennials such as largespike spikerush (*Eleocharis macrostachya*) and water clover (*Marsilea vestita*) may dominate. The frequent water fluctuation and thick clay pan prevent establishment of most perennial hydrophytes such as bulrushes (*Schoenoplectus* spp.) and cattails (*Typha* spp.). Species diversity is moderate to relatively high.

**OTHER NOTEWORTHY SPECIES:** Species uncommon in Nebraska which are found in this community include *Amaranthus californicus*, *Ammannia auriculata*, *Bergia texana*, *Elatine brachysperma*, *Eleocharis atropurpurea*, *Isoetes melanopoda*, *Rotala ramosior*, *Schoenoplectus saximontanus* and *Suckleya suckleyana*.

**STATE RANK:** S1

**RANK JUSTIFICATION:** The vast majority of playas have been converted to crop production at some time, and those still intact are usually heavily grazed. Dugouts or "reuse pits" have been created in many playas, significantly affecting hydrology and reducing floristic diversity. No sites in southwest Nebraska have been protected.

**INVASIVE SPECIES OF CONCERN:** none recorded

**GLOBAL RANK:** G2G4

**COMMENTS:** Playas in the clay soils of northwest Nebraska have many species in common with those playas elsewhere in the state, but also have *Amaranthus californicus*, *Bergia texana*, *Gnaphalium palustre*, *Plantago elongata*, and a few submerged hydrophytes not known from those sites. These species are generally associated with artificial impoundments. Temporary wetlands in the Sandhills containing such species as Hall's bulrush (*Schoenoplectus hallii*) may be grouped here, but generally lack the underlying clay pan typical of playa wetlands, and tend to be flooded by a seasonally high water table. Such sites may be synonymous with the playas reported by Tolstead (1942) from Cherry County, but he gave little detail of their species composition.

**EXEMPLARY SITES:** The south portion of Deep Well Wildlife Management Area in Hamilton County and the privately-owned Brinkerhoff Basin in Clay County.

### **SPIKERUSH VERNAL POOL**

**ELEMENT CODE:** C EGL001833

**GLOBAL NAME:** >*Eleocharis palustris* Herbaceous Vegetation (Common Spikerush Wet Meadow)

OTHER NAMES: >Spikerush Wet Meadow (1<sup>st</sup>, 2<sup>nd</sup> ed.), >Vernal Pool (1<sup>st</sup>, 2<sup>nd</sup> ed.)

SYSTEM PLACEMENT: Western Great Plains Closed Depression Wetland

RANGE: This community is known from northwestern and north-central Nebraska, but is potentially statewide.

EPA ECOREGIONS: 43, 44, 47?

ENVIRONMENTAL DESCRIPTION: This community occurs in small (<1 - 200 sq. m), relatively deep (0.5 - 1 m), basin-like depressions in shallow intermittent stream beds or in the vicinity of ponds and marshes. Soils are silty clays or sands formed in alluvium. These sites are flooded early in the season and usually dry out by mid-summer.

COWARDIN WETLAND SYSTEM: Palustrine emergent, temporarily to seasonally flooded

MOST ABUNDANT SPECIES:

Herbaceous: needle spikerush (*Eleocharis acicularis*), largespike spikerush (*Eleocharis macrostachya*)

Submerged: water starwort (*Callitriche palustris*), water clover (*Marsilea vestita*), water-thread pondweed (*Potamogeton diversifolius*)

DIAGNOSTIC SPECIES: *Callitriche palustris*, *Eleocharis acicularis*, *E. macrostachya*, *Potamogeton diversifolius*

VEGETATION DESCRIPTION: This community forms in basins that are deep enough to remain flooded through most of the spring, but generally dry out by mid-summer. They contain a short (<1 m tall) layer of permanent hydrophytic vegetation, generally made up mostly or wholly of spikerushes, with occasional annuals appearing as the basins dry out in the summer, such as nodding beggarticks (*Bidens cernua*), mudwort (*Limosella aquatica*), popcorn-flower (*Plagiobothrys scouleri*), and smartweeds (*Persicaria* spp.). A submersed aquatic layer is found in some communities which contains such species as water starwort and water-thread pondweed, which mature rather quickly and have unusually high fruit set for submersed aquatics. Water clover may also grow submersed in this community. Species diversity is low.

OTHER NOTEWORTHY SPECIES: Water starwort (*Callitriche palustris*) and water-thread pondweed (*Potamogeton diversifolius*) are uncommon in Nebraska, likely because of the limited distribution of this community.

STATE RANK: S1

RANK JUSTIFICATION: This community was very likely quite widespread at one time, but has disappeared due to conversion to cropland. The submersed species of vernal pools also appear to be highly sensitive to water quality, and often are not found in spring-grazed pastures.

INVASIVE SPECIES OF CONCERN: none recorded

GLOBAL RANK: G5

COMMENTS: This community appears to be related to the Playa Wetland community, except that the sites tend to be more bowl-shaped and have little or no zonation. Reuse pits dug into former playas in southwest Nebraska may contain similar dominants, but tend to lack the submersed aquatic elements. Ephemeral spring wetlands without hydrophytic vegetation are known from prairies and woodland in various places, and are often not readily distinguishable from the surrounding communities. In the NatureServe classification, this community is grouped with spikerush dominated zones of larger wetlands (not treated as a separate community as in this classification) and hence the global rank may not reflect the overall status of this community. There are historical collections of water-thread pondweed in southeast Nebraska, indicating this community or a similar one may have existed in tall-grass prairie as well.

EXEMPLARY SITES: Representative sites are found in Pasture 31E on the Oglala National Grasslands in Sioux County.

### **EASTERN BULRUSH DEEP MARSH**

ELEMENT CODES: CEGl002228, CEGl002389, (CEGl002229, CEGl002233 are possible in the Missouri Valley)

GLOBAL NAMES: >*Typha* spp. – *Schoenoplectus* spp. – Mixed Herbs Great Plains Herbaceous Vegetation (Northern Great Plains Cattail – Bulrush Marsh), >*Typha* spp. Great Plains Herbaceous Vegetation (Northern Great Plains Cat-tail Marsh)

OTHER NAMES: <Freshwater Marsh (1<sup>st</sup> - 3<sup>rd</sup> ed.)

SYSTEM PLACEMENT: Eastern Floodplain Wetland

RANGE: This community is generally found along banks and in backwaters of rivers and large streams in the east half of the state.

EPA ECOREGIONS: 27, 42?, 47

ENVIRONMENTAL DESCRIPTION: This community occupies depressions, swales and old channels on stream floodplains and terraces and may occur as a band along the edge of stream channels or along the shores of natural and artificial lakes and ponds. Soils are very poorly drained and consist of sand, silt, or muck, formed in alluvium. These areas usually remain flooded by 0.5-1 m of water most of the season, though they may be supplied with deeper, moving water in the winter and early spring. In mid to late summer the waters may become stagnant or may dry out, especially during periods of drought. In such cases, the water table usually remains near the surface.



COWARDIN WETLAND SYSTEM: Palustrine emergent, semi-permanently flooded

**MOST ABUNDANT SPECIES:**

Submerged: coontail (*Ceratophyllum demersum*), leafy pondweed (*Potamogeton foliosus*) dwarf pondweed (*P. pusillus*), horned pondweed (*Zannichellia palustris*)

Floating: turion duckweed (*Lemna turionifera*), greater duckweed (*Spirodela polyrhiza*), common watermeal (*Wolffia columbiana*)

Herbaceous: northern water-plantain (*Alisma triviale*), bald spikerush (*Eleocharis erythropoda*), rice cutgrass (*Leersia oryzoides*), common reed (*Phragmites australis* ssp. *americanus*), swamp smartweed (*Polygonum coccineum*), common arrowhead (*Sagittaria latifolia*), hardstem bulrush (*Schoenoplectus acutus*), threesquare bulrush (*S. pungens*), softstem bulrush (*S. tabernaemontani*), large-fruit bur-reed (*Sparganium eurycarpum*), broadleaf cattail (*Typha latifolia*)

**DIAGNOSTIC SPECIES:** *Sagittaria latifolia*, *Schoenoplectus acutus*, *Schoenoplectus tabernaemontani*, *Sparganium eurycarpum*, *Typha latifolia*

**VEGETATION DESCRIPTION:** This community is dominated by emergent hydrophytic macrophytes that grow to 2 meters tall. Softstem bulrush is usually dominant in high quality sites, often with smaller patches of hardstem bulrush. Zonation is often quite conspicuous, and the dominants may form dense patches or bands in response to water depth, duration of flooding, siltation and other factors. Broadleaf cattail is often abundant with common arrowhead and large-fruit bur-reed in slightly shallower water, though dominance of cattails may also be a sign of degradation due to siltation. In relatively shallow water, sedges (*Carex* spp.), spikerushes (*Eleocharis* spp.), common reed and threesquare bulrush may be abundant. Submerged plants and duckweeds may often be found among the emergents in deeper water. Trees and shrubs are sometimes present in scattered patches within or at the periphery of this community, most commonly willows (*Salix amygdaloides*, *S. eriocephala*, *S. interior*), green ash (*Fraxinus pennsylvanica*), and false indigobush (*Amorpha fruticosa*), and a few sites may grade into floodplain woodland. Additional plants that may be scattered in shallow water include northern water-plantain, swamp milkweed (*Asclepias incarnata*), poison hemlock (*Cicuta maculata*) swamp smartweed (*Persicaria coccinea*), and prairie cordgrass (*Spartina pectinata*) may be present. Species diversity is low to moderate.

**OTHER NOTEWORTHY SPECIES:** Uncommon species present in this community include *Rumex verticillatus*, *Sagittaria rigida*, and *Zizania palustris*.

**STATE RANK:** S3

**RANK JUSTIFICATION:** Though reasonably intact examples remain in the northern part of the state, this deep marsh community has been extensively impacted by alteration of stream channels and flows. Drainage and siltation have degraded extensive tracts of bulrush marsh, particularly

in the Missouri River valley, converting them to semi-natural shallow marsh communities that are susceptible to invasion by aggressive alien species.

INVASIVE SPECIES OF CONCERN: Siltation promotes the spread of purple loosestrife (*Lythrum salicaria*), reed canarygrass (*Phalaris arundinacea*), phragmites (*Phragmites australis* ssp. *australis*), and narrowleaf cattail (*Typha angustifolia*).

GLOBAL RANK: G4G5

COMMENTS: The definition of this community is narrower than the "Freshwater Marsh" community of previous classifications in that it encompasses marsh communities dominated primarily by softstem bulrush, but may include hardstem bulrush as well. Most cattail-dominated shallow marshes have been grouped into what was formerly called the "Pond Marsh" community. Deep water cattail marshes may also be present, but the great bulrushes are generally often present, whereas they are commonly absent from the shallow marsh communities. Marshes containing *Carex hyalinolepis* may be present in the far southeastern part of the state, and may belong to a Midwest deep marsh community, which has been attributed to Nebraska by NatureServe. Further inventory of marsh communities in eastern Nebraska is necessary.

McAtee (1924) described marshes of the western Sandhills as dominated by softstem bulrush that may resemble the Eastern Bulrush Deep Marsh, but which we include in the Sandhills Hardstem Bulrush Marsh.

EXEMPLARY SITES: Beaver Marsh at the Niobrara Valley Preserve in Brown County and Wood Duck Wildlife Management Area in Stanton County contain examples.

## **CATTAIL SHALLOW MARSH**

ELEMENT CODES: CEGL002026, CEGL002010

GLOBAL NAMES: >*Schoenoplectus tabernaemontani* - *Typha* spp. - (*Sparganium* spp. - *Juncus* spp.) Herbaceous Vegetation (Bulrush – Cattail – Burreed Shallow Marsh); >*Typha* (*latifolia*, *angustifolia*) Western Herbaceous Vegetation (Broadleaf Cattail Marsh)

OTHER NAMES: >Pond Marsh (1<sup>st</sup>-3<sup>rd</sup> ed.), <Freshwater Marsh (1<sup>st</sup>-3<sup>rd</sup> ed.)

SYSTEM PLACEMENT: Eastern Great Plains Floodplain Wetland; Western Great Plains Floodplain; Eastern Great Plains Wet-Meadow, Prairie and Marsh; Western Great Plains Open Freshwater Depression; Western Great Plains Closed Depression Wetland

RANGE: This community can occur virtually statewide but is most abundant in the eastern half of the state, particularly in the Rainwater Basin region of south-central Nebraska from western Seward and Fillmore counties westward to Gosper County.

EPA ECOREGIONS: 25, 27, 42, 43, 44, 47

**ENVIRONMENTAL DESCRIPTION:** This community occurs most commonly in shallow backwater channels of rivers and large streams, as well as in basin-like depressions on level uplands. Sites tend to be flooded seasonally, or in a few cases are semi-permanently flooded by shallow (<0.5 m) standing water through most of the season. Soils are usually deep and very poorly drained, and are generally formed in alluvium or loess. In shallow basins, the soils may be underlain by an impervious clay pan.

**COWARDIN WETLAND SYSTEM:** Palustrine emergent, seasonally to semi-permanently flooded.

**MOST ABUNDANT SPECIES:**

Floating: lesser duckweed (*Lemna aequinoctialis*), turion duckweed (*L. turionifera*)

Herbaceous: river bulrush (*Bolboschoenus fluviatilis*), largespike spikerush (*Eleocharis macrostachya*), rice cutgrass (*Leersia oryzoides*), short-beak arrowhead (*Sagittaria brevirostra*), duck-potato arrowhead (*S. cuneata*), swamp smartweed (*Persicaria coccinea*), large-fruit bur-reed (*Sparganium eurycarpum*), narrowleaf cattail (*TYPHA ANGUSTIFOLIA*), broadleaf cattail (*Typha latifolia*)

**DIAGNOSTIC SPECIES:** *Bolboschoenus fluviatilis*, *Schoenoplectus heterochaetus*, *Typha latifolia*.

**VEGETATION DESCRIPTION:** The vegetation consists primarily of emergent hydrophytic macrophytes 1-2 m tall, sometimes with a sparse submersed aquatic layer in areas that remain flooded much of the season. Species composition is somewhat variable, but cattails usually dominate, with river bulrush often equally common or even dominant in the eastern half of the state. In relatively undisturbed sites, large-fruit bur-reed may be abundant, with other hydrophytes such as northern water-plantain (*Alisma triviale*), arrowheads (*Sagittaria* spp.) and large-spike spikerush. In shallower water along the outer margins, rice cutgrass and swamp smartweed may be abundant, often with assorted annuals and perennials including barnyard-grass (*Echinochloa* spp.), sprangletop (*Leptochloa fusca*), smartweeds (*Persicaria bicorne*, *P. hydropiper*, and *P. lapathifolia*), panicled aster (*Symphyotrichum lanceolatum*), beggarticks (*Bidens cernua*, *B. frondosa*), white boltonia (*Boltonia asteroides*), Norwegian cinquefoil (*Potentilla norvegica*) and bog yellowcress (*Rorippa* spp.). Degraded sites may become overrun by narrow-leaf cattail in wetter, and reed canary-grass in drier portions. Lower areas within sites may contain inclusions of Playa Wetland communities.

**OTHER NOTEWORTHY SPECIES:** Species uncommon in Nebraska occurring in these habitats include *Potamogeton diversifolius*, *Sagittaria graminea*, *S. longiloba*, and *S. rigida*.

**STATE RANK:** S2

**RANK JUSTIFICATION:** Well-preserved examples of this community are relatively scarce, since many have been destroyed by drainage and clearing for agriculture (particularly in the Rainwater Basin region). Remaining sites have usually been degraded by siltation, which

increases the likelihood of invasion by alien species. Some examples of shallow marsh communities (particularly along the Missouri River) may be degraded forms of deep marsh communities in which the hydrology and vegetation has been altered by silt accumulation.

**INVASIVE SPECIES OF CONCERN:** Narrowleaf cattail frequently invades sites and forms hybrids with the native broadleaf cattail. Purple loosestrife (*Lythrum salicaria*) poses a grave threat to marsh communities nearly statewide. Reed canarygrass (*Phalaris arundinacea*) and phragmites (*Phragmites australis* ssp. *australis*) pose a threat in drier portions of this community.

**GLOBAL RANK:** G5

**COMMENTS:** The term "Pond Marsh" community was used in previous versions of this classification to denote shallow marshes occurring in depressions in uplands, while shallow marshes occurring in floodplains (and other settings) were segregated into a rather broadly-defined "Freshwater Marsh" community. Although distinctive and biologically important, the Rainwater Basin marsh communities cannot be distinguished from other shallow marsh communities found in the state at this time, and the description of that community has been expanded to encompass other shallow cattail dominated types throughout the state. Two weakly separable types may be recognized: a cattail – river bulrush type in the east and a cattail near-monoculture type primarily in the west. Presently, the majority of examples of both types probably represent degraded, semi-natural communities. It is possible that some degraded deep marsh communities may be difficult to separate from shallow marsh in the field, and can be combined as a "freshwater marsh complex" for delineation purposes.

A slender bulrush (*Schoenoplectus heterochaetus*) dominated bulrush shallow marsh has been observed in the eastern Sandhills and warrants more study. Slender bulrush is commonly found in many Rainwater Basin wetlands.

**EXEMPLARY SITES:** Riverine examples are found at Wood Duck Wildlife Management Area in Stanton County, and good basin examples are Verona Waterfowl Production Area and the privately-owned Brinkeroff Basin in Clay County.

## **EASTERN SALINE MARSH**

**ELEMENT CODE:** CEG002043

**GLOBAL NAME:** =*Distichlis spicata* – *Schoenoplectus maritimus* – *Salicornia rubra*  
Herbaceous Vegetation (Eastern Great Plains Saline Marsh)

**OTHER NAMES:** >*Hordeum jubatum* - *Iva annua* community, >*Ruppia-Potamogeton* community, >*Scirpus maritimus* community (Ungar *et al.* 1969)

**SYSTEM PLACEMENT:** Eastern Great Plains Wet-Meadow, Prairie, and Marsh

RANGE: This community is restricted to Lancaster and southern Saunders counties in southeastern Nebraska, primarily in the valleys of Salt Creek, Little Salt Creek, and Rock Creek.

EPA ECOREGION: 47i

ENVIRONMENTAL DESCRIPTION: This community occupies swales and depressions on floodplains and terraces of streams. Soils are deep, poorly drained silty clay loams formed in alluvium that is slightly to moderately affected by soluble salts. The salts accumulate from saline seeps associated with Dakota Sandstone which forms the bedrock beneath these areas. The water table remains above the surface most of the year, but may drop below the surface in late summer.

COWARDIN WETLAND SYSTEM: Palustrine emergent, seasonally to semi-permanently flooded

MOST ABUNDANT SPECIES:

Herbaceous: saltmarsh bulrush (*Bolboschoenus maritimus* ssp. *paludosus*), foxtail barley (*Hordeum jubatum*), annual marsh-elder (*Iva annua*), bearded sprangletop (*Leptochloa fusca* ssp. *fasciculata*), dwarf bushy knotweed (*Polygonum prolificum*), prairie cordgrass (*Spartina pectinata*), narrowleaf cattail (*TYPHA ANGUSTIFOLIA*).

DIAGNOSTIC SPECIES: *Bolboschoenus maritimus* ssp. *paludosus*, *Ruppia maritima*

VEGETATION DESCRIPTION: The vegetation of this community consists primarily of emergent macrophytes and mesophytic graminoids tolerant of saline conditions. Species diversity is low. Three zones can be recognized within this community:

- 1) Aquatic zone - occurs in areas, which remain flooded throughout the year, and is dominated by the submerged aquatics spiral ditchgrass (*Ruppia maritima*) and sago pondweed (*Stuckenia pectinata*). No naturally occurring permanent wetlands are known in this community type in Nebraska, though one was reported by Ungar *et al.* (1969). Most occur in artificial ponds.
- 2) Marsh zone - occurs in shallow water, in semi-permanently flooded sites and is dominated by emergent hydrophytes 1-2 m tall including saltmarsh bulrush and dwarfed forms of narrowleaf cattail. In strongly saline sites, saltmarsh bulrush predominates. This zone is often developed along the margin of artificial ponds, but probably also exists below seeps.
- 3) Wet meadow zone - occurs in seasonally wet areas such as margins of marshes and is dominated by mesophytic graminoids and annual herbs such as foxtail barley, bearded sprangletop, dwarf bushy knotweed, and annual marsh-elder. In less saline areas, prairie cordgrass may be common.

OTHER NOTEWORTHY SPECIES: Saltmarsh aster (*Symphyotrichum subulatum*) is known from this community in Lancaster County.

STATE RANK: S1

RANK JUSTIFICATION: This community type has been extensively degraded and destroyed by headcutting of streams, ditching, agricultural conversion and urban development.

INVASIVE SPECIES OF CONCERN: Narrow-leaf cat-tail has invaded some sites, and phragmites (*Phragmites australis* ssp. *australis*) is beginning to invade sites as well. Other invasives that are less tolerant to saline conditions (e.g. reed canary-grass) may invade degraded wetlands from which salts have been diluted.

GLOBAL RANK: G1G2

COMMENTS: This community is often associated with artificial impoundments, and intergrades with the Eastern Saline Meadow community, and with the Lowland Tallgrass Prairie and Eastern Sedge Wet Meadow communities to a lesser extent. Some sites may be mosaics of several community types. Freshwater marshes often occur in proximity to the saline marshes.

EXEMPLARY SITES: Little Salt Fork Marsh at the upper end of Little Salt Creek in Lancaster County.

## **SANDHILLS HARDSTEM BULRUSH MARSH**

ELEMENT CODE: CEG002030

GLOBAL NAME: = *Schoenoplectus acutus* - *Typha latifolia* – (*Schoenoplectus tabernaemontani*) Sandhills Herbaceous Vegetation (Sandhills Bulrush Marsh)

OTHER NAMES: <Bulrush - Reed Grass Association (Pool 1914), <Sandhills Freshwater Marsh (2<sup>nd</sup>, 3<sup>rd</sup> ed.).

SYSTEM PLACEMENT: Western Great Plains Open Freshwater Depression Wetland

RANGE: This community occurs in the eastern half of the Sandhills from eastern Cherry County east to southern Holt County, south to Logan and Wheeler counties, and possibly extends into the Elkhorn River and Loup River drainages.

EPA ECOREGIONS: 27?, 42p?, 44a, 44c, 44d, 471?

ENVIRONMENTAL DESCRIPTION: This community occurs where the regionally high water table intersects the land surface in interdunal Sandhills valleys, and is commonly associated with Sandhill lakes, though it may also occur in smaller depressions as well. It is flooded most of the year, and surface water levels fluctuate seasonally with groundwater levels. Soils are deep, very

poorly drained, formed in eolian sand, and often contain much organic matter (peat or muck). The water in this community is fresh to slightly alkaline.

COWARDIN WETLAND SYSTEM: Palustrine emergent, semi-permanently flooded.

MOST ABUNDANT SPECIES:

Submersed: coontail (*Ceratophyllum demersum*), star duckweed (*Lemna trisulca*), pondweeds (*Potamogeton* spp.), horned pondweed (*Zannichellia palustris*)

Floating: duckweeds (*Lemna* spp.), watermeal (*Wolffia* spp.)

Herbaceous: ripgut sedge (*Carex lacustris*), bald spikerush (*Eleocharis erythropoda*), common reed (*Phragmites australis* ssp. *americanus*), water smartweed (*Persicaria amphibia*), hardstem bulrush (*Schoenoplectus acutus*), common arrowhead (*Sagittaria latifolia*), large-fruit bur-reed (*Sparganium eurycarpum*), broadleaf cattail (*Typha latifolia*)

DIAGNOSTIC SPECIES: *Schoenoplectus acutus*, *Sagittaria latifolia*, *Typha latifolia*

VEGETATION DESCRIPTION: The vegetation consists primarily of emergent hydrophytic macrophytes to 2 m tall, usually with a submersed aquatic component in areas flooded most of the season. Species composition is highly variable in response to hydrologic regime and soils. This community is distinguishable by the predominance of hardstem bulrush, making such areas conspicuous by their dark green color (though in some marshes in the western Sandhills, softstem bulrush [*Schoenoplectus tabernaemontani*] may dominate). Northern wild-rice (*Zizania palustris*) may share dominance in deeper water in some sites, while broadleaf cattail, common arrowhead and bald spikerush may share dominance in slightly more shallow areas. Openings among the dominants are frequently occupied by arrowhead, with lesser amounts of bur-reed, water smartweed, and ripgut sedge, while submersed rooted and free-floating aquatics are usually also present in such openings, as well as among the dominants. Scattered patches of common-reed are also usually present, but often are not widespread unless the water levels decline over an extended period of time. At some sites, the emergent form of water smartweed may form conspicuous patches in shallow water or occasionally in small seasonally flooded basins. In places where this community occurs in shallow basins, these sites may be overtaken by the alien narrowleaf cattail (*Typha angustifolia*). Species diversity is low, though high quality examples may be relatively species rich.

OTHER NOTEWORTHY SPECIES: Uncommon species present in this community include *Carex vesicaria*, *Dulichium arundinaceum*, *Glyceria borealis*, *Gratiola neglecta*, *Sagittaria graminea*, *Scolochloa festucacea*, *Sparganium emersum*, *Triadenum fraseri*, and *Zizania palustris*.

STATE RANK: S4

**RANK JUSTIFICATION:** Many unmodified marshes still remain in the Sandhills, though many have been drained, particularly in the eastern Sandhills. Other Sandhills marshes have been converted to lakes by plugging drainage outlets or increasing inflow through upstream ditching.

**INVASIVE SPECIES OF CONCERN:** Narrowleaf cattail (*Typha angustifolia*) has invaded marshes and formed hybrids with native cat-tails. Purple loosestrife (*Lythrum salicaria*) which is present along some roadsides in the Sandhills, poses the tremendous threat to this community, particularly in shallower water. Eurasian phragmites (*Phragmites australis* ssp. *australis*) has recently been found in the Sandhills as well. Carp also represent a threat to marshes through destruction of aquatic vegetation through feeding and grubbing.

**GLOBAL RANK:** G4

**COMMENTS:** This community often occurs in close proximity to and often intergrades with the Northern Pondweed Aquatic Wetland, Water-Lily Aquatic Wetland, Sandhills Wet Meadow, Western Alkaline Marsh, Freshwater Seep, and Sandhills Fen communities. McCarraher (1977) indicates that *Schoenoplectus tabernaemontani* is an uncommon constituent of this community, though McAtee (1924) lists it as dominant in southwest Cherry and northern Garden counties. These western Sandhills wetlands share similar dominant species as the Eastern Bulrush Deep Marsh community, and other similarities should be investigated. High quality marshes in the eastern Sandhills also differ in the presence of northern and eastern species disjunct from their main geographic ranges, such as *Glyceria borealis* and *Sparganium emersum*.

This community is generally separable by the dominance of hardstem bulrush and its apparent geographically restricted range. The "reed zone" recognized in previous classification is here separated as the "Reed Marsh" community.

**EXEMPLARY SITES:** Ballard's Marsh Wildlife Management Area and various lakes at the Valentine National Wildlife Refuge in Cherry County contain extensive examples.

## **REED MARSH**

**ELEMENT CODE:** CEG001475

**GLOBAL NAME:** = *Phragmites australis* Western North America Temperate Semi-Natural Herbaceous Vegetation (Western Reed Marsh)

**OTHER NAMES:** <Bulrush - Reed Grass Association (Pool 1914), <Sandhills Freshwater Marsh (2<sup>nd</sup>, 3<sup>rd</sup> ed.)

**SYSTEM PLACEMENT:** Western Great Plains Open Freshwater Depression Wetland

**RANGE:** This community occurs in the northern half of the state from the Platte River valley northward. Stands of the Eurasian common reed (*P. australis* ssp. *australis*) may be present along Republican River and Platte River, and in isolated stands in southeast Nebraska, and are not included as part of this community.



EPA ECOREGIONS: 25?, 42?, 44, 47

ENVIRONMENTAL DESCRIPTION: This community occurs along rivers and larger streams, in lakes, and in association with saturated soils of seeps and fens. Soils vary from sand to organic (peat or muck) and are usually shallowly flooded for a portion of the growing season or are saturated. The water in this community is fresh to slightly alkaline.

COWARDIN WETLAND SYSTEM: Palustrine emergent, temporarily to seasonally flooded

MOST ABUNDANT SPECIES:

Herbaceous: common reed (*Phragmites australis* ssp. *americanus*)

DIAGNOSTIC SPECIES: *Phragmites australis* ssp. *americanus*

VEGETATION DESCRIPTION: The vegetation consists primarily of common reed (*Phragmites australis*) stands 2–3 m tall. Patches of reeds may spread extensively during periods when the water table is low. Understory vegetation is usually sparse in the dense stands of reed, and consists of rice cutgrass (*Leersia oryzoides*), smartweeds (*Persicaria* spp.), and beggarticks (*Bidens* spp.). Scattered bulrushes (*Schoenoplectus* spp.) and arrowheads (*Sagittaria* spp.) may also be present in wetter areas. In drier areas along the margin of the community, reed canarygrass (*Phalaris arundinacea*) may be abundant. This community may be quite extensive in the upper ends of some Sandhills lakes and degraded fens. Species diversity is low.

OTHER NOTEWORTHY SPECIES: None recorded.

STATE RANK: S4

RANK JUSTIFICATION: Though this community is considered semi-natural, it is extensive in the northern Sandhills where it is often associated with Sandhills Hardstem Bulrush Marsh and Sandhills Fens. Since stands of common reed tend to shade out many other native species, they may become near monocultures which displace marsh vegetation in areas which have been drained. Since historical literature does not describe extensive stands of common reed, it may be increasing in overall extent. Invasive European phragmites (*P. australis* ssp. *australis*) could eventually displace the native reed.

INVASIVE SPECIES OF CONCERN: Reed canarygrass may crowd out more desirable species at the margin of reed marshes. The European phragmites has not yet been recorded as occurring in this community (though both subspecies evidently co-occur in the Platte River valley), but could displace the native reed.

GLOBAL RANK: G4

COMMENTS: This community was formerly included as a subtype within the Sandhills Freshwater Marsh community in previous editions, but has a much broader geographic distribution within the state. Historically it was not reported to form extensive stands, but such stands exist now in the Sandhills, and are probably increasing in places such as the Missouri

River valley as well. The recent concern about the spread of European phragmites may focus more attention on this poorly-studied community.

EXEMPLARY SITES: Reed marsh is extensive below Horse Creek fen in Cherry County.

## **WESTERN ALKALINE MARSH**

ELEMENT CODE: C EGL002040

GLOBAL NAME: =*Schoenoplectus pungens* - *Suaeda calceoliformis* Alkaline Herbaceous Vegetation (Western Great Plains Alkaline Marsh)

OTHER NAMES: >Permanent saline wetland, >Wet saline meadow (Rolfmeier 1993b)

SYSTEM PLACEMENT: Western Great Plains Saline Depression Wetland

RANGE: This community is most abundant in the "closed basin" region of the western Sandhills in Garden, Morrill, and Sheridan counties, and is also found in other areas of the Sandhills, in the North Platte River floodplain, and in other stream valleys in the Panhandle. It may also be present downstream on the Platte River and in extreme northwest Nebraska.

EPA ECOREGIONS: 25h, 27g?, 43g?, 44b

ENVIRONMENTAL DESCRIPTION: This community occupies depressions on the bottomlands of rivers and streams, and the margins of moderately to strongly alkaline lakes in interdunal basins and valleys with no surface inflow or outflow and poor subsurface drainage. Soils are poorly drained, very strongly alkaline silt loams or sandy loams with silty clay subsoil and are formed in siltstone, calcareous alluvium, or eolian sand. These sites remain inundated through most of the growing season, though portions may dry late in the season. Salts commonly accumulate as evaporites on shorelines, vegetation, and at times as a thin film on the water's surface. The most abundant salts are sodium and potassium carbonates, with calcium and magnesium carbonates common, but not abundant.

COWARDIN WETLAND SYSTEM: Palustrine, emergent, seasonally to semi-permanently flooded

MOST ABUNDANT SPECIES:

Herbaceous: Nevada bulrush (*Amphiscirpus nevadensis*), salt-marsh bulrush (*Bolboschoenus maritimus*), foxtail barley (*Hordeum jubatum*), Nuttall's alkali grass (*Puccinellia nuttalliana*), three-square bulrush (*Schoenoplectus pungens*)

DIAGNOSTIC SPECIES: *Amphiscirpus nevadensis*, *Schoenoplectus pungens*

**VEGETATION DESCRIPTION:** Vegetation is usually fairly sparse and consists of hydrophytic and to a lesser extent mesophytic graminoids <1 m tall. Three-square bulrush is usually the dominant emergent species, though in some sites Nevada bulrush may be abundant. Scattered clumps of hardstem bulrush (*Schoenoplectus acutus*) or softstem bulrush (*Schoenoplectus tabernaemontani*) are often associated with alkaline marshes in the Sandhills, but are never common. In some areas that remain flooded most of the year, some scattered submerged aquatic macrophytes may be present, most commonly sago pondweed (*Stuckenia pectinata*) with spiral ditchgrass (*Ruppia occidentalis*) present in some places. Along the outer margin of the marsh community salt-marsh bulrush may be present, but is generally never very common. Generally, the outer margin of the marsh community is dominated by mesophytic graminoids <1 m tall, primarily foxtail barley and Nuttall's alkali grass or the alien spreading alkali grass (*Puccinellia distans*). Species diversity is low.

**OTHER NOTEWORTHY SPECIES:** Saltmarsh sand-spurry (*Spergularia salina*) is known from the wet meadow phase of this community at Kiowa Wildlife Management Area. It is ranked S1 for Nebraska, but it has been speculated that it is introduced in the Great Plains.

**STATE RANK:** S3

**RANK JUSTIFICATION:** This community is still fairly widespread in the western Sandhills and most sites are not heavily impacted by drainage, grazing, or invasion by exotic species. Some sites in Box Butte County have been eliminated due to lowering of the water table by irrigation. Most of the marshes present in the North Platte River valley were evidently drained many years ago and impacted by alterations in the natural flow regime of the river.

**INVASIVE SPECIES OF CONCERN:** Few alien species are recorded in this community. Spreading alkali grass (*Puccinellia distans*) is frequent at some sites, but shows no signs of becoming problematic.

**GLOBAL RANK:** G3G4

**COMMENTS:** Outside of the Sandhills, alkaline aquatic and marsh communities are not extensive, and exist mostly as patches in alkaline meadows or intermittent stream bottoms where canal seepage or natural freshwater springs maintain higher than normal water levels. It seems possible that some bison wallows in the North Platte River valley may have been sufficiently deep to support marsh and aquatic vegetation, and several small ponds near Fleisbach WMA may represent former wallows. Previous editions of this classification included the Saline/Alkaline Aquatic Wetland within this community.

**EXEMPLARY SITES:** Smith Lake on the Crescent Lake National Wildlife Refuge in Garden County, Fliesbach Wildlife Management Area in Morrill County, and Kiowa Basin Wildlife Management Area in Scotts Bluff Counties.

## EASTERN PONDWEED AQUATIC WETLAND

ELEMENT CODE: C EGL002044

GLOBAL NAME: =? *Potamogeton* spp. - *Ceratophyllum demersum* Great Plains Herbaceous Vegetation (Great Plains Pondweed Submerged Aquatic Wetland)

OTHER NAMES: =Aquatic Community (Rolfsmeier 1988), <Pondweed Formation (Pound & Clements 1900), =Pondweed Open Water Marsh (1<sup>st</sup>, 2<sup>nd</sup> ed.), =Pondweed Aquatic Wetland (3<sup>rd</sup> ed.)

SYSTEM PLACEMENT: Eastern Floodplain Wetland

RANGE: This community was originally found in floodplains of larger rivers in the south half and eastern quarter of the state, but may have also occurred in association with lakes and pond marshes in central Nebraska. It has since spread to artificial impoundments elsewhere.

EPA ECOREGIONS: 27, 42?, 47

ENVIRONMENTAL DESCRIPTION: This community occurs in shallow (<0.5 m deep) water in natural and artificial freshwater basins, inlets, backwaters and oxbow ponds which remain flooded in all but the driest years. Soils are usually poorly developed and vary from silty clay to sand, with low to moderate amounts of organic matter.

COWARDIN WETLAND SYSTEM: Palustrine aquatic bed, permanently and semi-permanently flooded

MOST ABUNDANT SPECIES:

Floating and floating-leaved: turion duckweed (*Lemna turionifera*), longleaf pondweed (*Potamogeton nodosus*)

Submerged: coontail (*Ceratophyllum demersum*), stonewort (*Chara* spp.), southern naiad (*Najas guadalupensis*), leafy pondweed (*Potamogeton foliosus*), small pondweed (*P. pusillus*), sago pondweed (*Stuckenia pectinata*), horned pondweed (*Zannichellia palustris*)

DIAGNOSTIC SPECIES: *Ceratophyllum demersum*, *Najas guadalupensis*, *Potamogeton foliosus*, *Potamogeton nodosus*, *Zannichellia palustris*

VEGETATION DESCRIPTION: This community is sparsely to densely vegetated with submersed, rooted, and free-floating aquatic macrophytes. Species composition varies depending on substrate, water depth, water chemistry, turbidity, water temperature and other factors. This community frequently occurs in association with marsh communities in deeper areas where emergents are few, especially in bays and inlets of artificial lakes. Dominant species include leafy, small and sago pondweeds, southern naiad, and horned pondweed. Coontail is the most abundant submerged unrooted species. In quiet bays, longleaf pondweed (*Potamogeton*

*nodosus*) is often common with duckweeds. In higher quality sites with particularly clear water, greater bladderwort (*Utricularia macrorhiza*) may be present, with the floating aquatic mosquito fern (*Azolla mexicana*), star duckweed (*Lemna trisulca*), and the liverworts crystalwort (*Riccia fluitans*) and butterflywort (*Ricciocarpus natans*). Species diversity is usually low.

**OTHER NOTEWORTHY SPECIES:** Largeleaf pondweed (*Potamogeton amplifolius*) occurred historically in this community, but has evidently been extirpated from eastern Nebraska.

**STATE RANK:** S3?

**RANK JUSTIFICATION:** Many pre-settlement examples have been degraded or eliminated by stream channelization, drainage, and siltation, especially along the Missouri River. However, semi-natural pondweed communities have developed in artificial impoundments throughout and beyond this communities' natural range. Invasives may pose a threat to some sites.

**INVASIVE SPECIES OF CONCERN:** Curly pondweed (*Potamogeton crispus*) is becoming abundant in some occurrences of this community. Eurasian water milfoil (*Myriophyllum spicatum*) is established in a few lakes and may be spreading, though it very rarely flowers in our area. Both species thrive in somewhat sandy substrates.

**GLOBAL RANK:** G4G5

**COMMENTS:** This community closely matches the description of the Great Plains Pondweed Submerged Aquatic Wetland of NatureServe, yet is considered by them as a subset of that community. This community apparently occurred in close association to the water-lily aquatic wetland in eastern Nebraska in the 19<sup>th</sup> Century. It also occurs in association with marsh communities, and may overlap to a limited extent. Semi-natural communities of similar composition may occur in artificial wetlands throughout the state (including the Sandhills), including livestock watering troughs.

**EXEMPLARY SITES:** Natural examples of this community may be found in backwater ponds along the Big Blue, Loup, Platte and Elkhorn rivers.

## **AMERICAN LOTUS AQUATIC WETLAND**

**ELEMENT CODE:** CEG004323

**GLOBAL NAME:** =*Nelumbo lutea* Herbaceous vegetation (American Lotus Aquatic Wetland)

**SYSTEM PLACEMENT:** Eastern Floodplain Wetland

**RANGE:** This community is recorded historically from the Missouri River valley and at least one potentially natural occurrence may still be present. It also occurs as a semi-natural community in artificial ponds in Lancaster and Platte counties and elsewhere.

EPA ECOREGIONS: 47d. Perhaps introduced elsewhere in 27, 44, 47.

ENVIRONMENTAL DESCRIPTION: This community occurs in areas with a variety of hydrologic regimes from permanently flooded areas with water *ca.* 0.5-1.0 m deep to seasonally flooded sites, generally in freshwater. It occurred naturally in backwater channels and oxbows of the Missouri River though may now be found in artificial impoundments. Soils are generally silty or sandy.

COWARDIN WETLAND SYSTEM: Palustrine aquatic bed, seasonally to semi-permanently flooded.

MOST ABUNDANT SPECIES:

Floating and floating-leaved: American lotus (*Nelumbo lutea*).

DIAGNOSTIC SPECIES: *Nelumbo lutea*

VEGETATION DESCRIPTION: This community is usually comprised by a near monotypic stand of American lotus, the leaves floating on the water's surface during periods of high water, and generally emergent the remainder of the season. Associated species have not been recorded in Nebraska, with the exception of soft-stem bulrush (*Schoenoplectus tabernaemontani*) which occurs as scattered in a site in Thurston County. Species diversity is low.

OTHER NOTEWORTHY SPECIES: None recorded. *N. lutea* is listed as S1? by Nebraska Natural Heritage.

STATE RANK: S1?

RANK JUSTIFICATION: Most or all pre-settlement instances of this community have been extirpated, but a number of semi-natural instances (some covering several hectares) are present in ponds and other wetlands in eastern Nebraska.

INVASIVE SPECIES OF CONCERN: None recorded, but invasive species that threaten marshes, such as purple loosestrife (*Lythrum salicaria*) and phragmites (*Phragmites australis* ssp. *australis*) could pose a threat.

GLOBAL RANK: G4?

COMMENTS: This community differs from the Water-lily Aquatic Wetland in its variable hydrology, which is more similar to that of emergent marsh communities than to submerged aquatic wetlands. Plants are often emergent later in the season (whereas water lilies are only emergent during prolonged drought when the wetland has dried out). Pound & Clements (1900) reported that where American lotus occurs with water-lilies, that the latter always occur in deeper water and that sometimes emergent marsh vegetation may separate the lotus from the water-lilies.

EXEMPLARY SITES: Snyder-Winnebago Bends area in Thurston County has an example in an artificially flooded former river bend straddling the Nebraska-Iowa border.

## NORTHERN PONDWEED AQUATIC WETLAND

ELEMENT CODE: CEGLO02044

GLOBAL NAME: <*Potamogeton* spp. - *Ceratophyllum demersum* Great Plains Herbaceous Vegetation (Great Plains Pondweed Submerged Aquatic Wetland)

OTHER NAMES: <Pondweed Formation (Pound & Clements 1900), >Pondweed Formation (Pool 1914), >Stonewort Formation (Pound & Clements 1900), >Stonewort-Naiad Association (Pool 1914), <Sandhills Open Water Wetland (2<sup>nd</sup> ed.), <Sandhills Aquatic Wetland (3<sup>rd</sup> ed.)

SYSTEM PLACEMENT: Western Great Plains Open Freshwater Depression Wetland

RANGE: This community occurs in lakes and backwaters from the Platte River valley northward, and is best developed in the Sandhills, though other examples may be present in the Loup River, central Platte River, and sporadically westward, as along the Niobrara River.

EPA ECOREGIONS: 27, 43, 44

ENVIRONMENTAL DESCRIPTION: This community occurs in water *ca.* 0.5-1.5 m deep in near-neutral to slightly alkaline lakes and backwaters. Substrates vary from a fairly deep layer of unconsolidated organic matter to bare sand.

COWARDIN WETLAND SYSTEM: Palustrine aquatic bed, permanently and semi-permanently flooded.

MOST ABUNDANT SPECIES:

Floating and floating-leaved: turion duckweed (*Lemna turionifera*), water smartweed (*Polygonum amphibium*), floating-leaf pondweed (*Potamogeton natans*), watermeal (*Wolffia* spp.)

Submerged: coontail (*Ceratophyllum demersum*), common waterweed (*Elodea canadensis*), star duckweed (*Lemna trisulca*), Siberian water milfoil (*Myriophyllum sibiricum*), slender naiad (*Najas flexilis*), variable pondweed (*Potamogeton gramineus*), Illinois pondweed (*P. illinoensis*), small pondweed (*P. pusillus*), clasping-leaf pondweed (*P. richardsonii*), flat-stem pondweed (*P. zosteriformis*), longbeak water crow's-foot (*Ranunculus longirostris*), sago pondweed (*Stuckenia pectinata*), greater bladderwort (*Utricularia macrorhiza*)

DIAGNOSTIC SPECIES: *Lemna trisulca*, *Myriophyllum sibiricum*, *Najas flexilis*, *Potamogeton gramineus*, *P. illinoensis*, *P. natans*, *P. zosteriformis*

**VEGETATION DESCRIPTION:** This community is dominated by submerged and floating-leaved, rooted and free-floating aquatic macrophytes and algae. Emergent vegetation is generally absent and floating-leaved plants may be locally common, but generally have a total cover of <25%. Species composition is strongly dependent on substrate, water chemistry, turbidity, and temperature. Species diversity is low to moderate. Two intergrading phases are recognized, the first mostly restricted to the Sandhills, the second more widespread:

- 1) Sandhills Broadleaf Pondweed phase - is best developed in Sandhills lakes with mucky bottoms, and usually contains among the most common species one to several mostly broad-leaved submersed pondweeds that are generally disjunct here from their main range in the northeastern United States. Flat-stem pondweed, variable pondweed, Illinois pondweed, and floating-leaf pondweed may be locally common. In high-quality examples, white-stem pondweed (*P. praelongus*) and flat-stalk pondweed (*P. friesii*) may be common. In such wetlands, this community may occur with and grade into the Water-Lily Aquatic Wetland. Species diversity is low to moderate, though very high in comparison with other Great Plains aquatic plant communities.
- 2) Stonewort-Naiad phase – is found in shallow ponds with clear, cold water and sandy bottoms in the Sandhills and along larger rivers outside the Sandhills in central Nebraska. It is usually dominated by various species of the green alga stonewort (*Chara* spp.), and often also naiads (*Najas* spp.) and horned pondweed (*Zannichellia palustris*). In many lakes in the north-central Sandhills, this phase may also contain species typical of the Sandhills Broadleaf Pondweed phase, making the two nearly impossible to separate. Elsewhere, it may also contain ditchgrass (*Ruppia* spp.), sago pondweed, and submersed spikerushes (*Eleocharis* spp.), and grade into the Saline/Alkaline Aquatic Wetland community.

**OTHER NOTEWORTHY SPECIES:** Uncommon species occurring in this community in Nebraska include *Hippuris vulgaris*, *Lemna gibba*, *Myriophyllum verticillatum*, *Nuphar variegata*, *Pilularia americana*, *Potamogeton amplifolius*, *P. friesii*, *P. praelongus*, and *P. strictifolius*.

**STATE RANK:** S4

**RANK JUSTIFICATION:** This community is still fairly extensive and undisturbed in the Sandhills, although many Sandhill lakes have been drained and converted to hay meadows. Invasion of lakes by carp is a serious threat to this community.

**INVASIVE SPECIES OF CONCERN:** Curly pondweed (*Potamogeton crispus*) is established in Cottonwood Lake in northwestern Cherry County and could spread. Eurasian water milfoil (*Myriophyllum spicatum*) has not yet been documented from the Sandhills, but has infested sandpit lakes in nearby counties.

**GLOBAL RANK:** G4G5



COMMENTS: This community is combined with the Great Plains Pondweed Aquatic Wetland association by NatureServe, even though its species composition more closely resembles aquatic wetland types of the upper Midwest and Great Lakes region. It is likely the Sandhills Broadleaf Pondweed phase is at least in part a Pleistocene relict community, much like the Sandhills fen. The stonewort-naiad association is roughly equivalent to the stonewort communities of Pound & Clements and Pool.

EXEMPLARY SITES: Watt's Lake, Rice Lake, Duck Lake, Little Hay Lake, Center Lake at the Valentine National Wildlife Refuge in Cherry County.

## WATER-LILY AQUATIC WETLAND

ELEMENT CODE: C EGL002562?

GLOBAL NAME: =? *Nymphaea odorata* – *Nuphar lutea* (ssp. *pumila*, ssp. *variegata*)  
Herbaceous Vegetation (Northern Water-lily Aquatic Wetland)

OTHER NAMES: =Pond-lily Formation (Pound & Clements 1900), =Water lily Association (Pool 1914); <Sandhills Open Water Marsh (1<sup>st</sup>, 2<sup>nd</sup> ed.), <Sandhills Aquatic Wetland (3<sup>rd</sup> ed.)

SYSTEM PLACEMENT: Eastern Floodplain Wetland, Western Great Plains Open Freshwater Depression Wetland

RANGE: This community is currently confined to lakes and ponds in the Sandhills. Historically it also occurred along the Missouri and lower Platte rivers, and along permanent streams in southeastern Nebraska.

EPA ECOREGIONS: 44, 47 (historically).

ENVIRONMENTAL DESCRIPTION: This community occurs in water *ca.* 0.5-1.5 m deep in near-neutral to slightly alkaline lakes and interdunal ponds in the Sandhills region. Soils consist of shallow to deep layers of unconsolidated organic matter over sand.

COWARDIN WETLAND SYSTEM: Palustrine aquatic bed, permanently and semi-permanently flooded.

MOST ABUNDANT SPECIES:

Emergent herbaceous: northern wild-rice (*Zizania palustris*)

Floating and floating-leaved: water shield (*Brasenia schreberi*), duckweeds (*Lemna* spp.), yellow pond-lily (*Nuphar variegata*), white water-lily (*Nymphaea odorata*), water smartweed (*Persicaria amphibia*), floating-leaf pondweed (*Potamogeton natans*), watermeal (*Wolffia* spp.)

Submerged: coontail (*Ceratophyllum demersum*), star duckweed (*Lemna trisulca*), Siberian water milfoil (*Myriophyllum sibiricum*), slender naiad (*Najas flexilis*), small pondweed (*Potamogeton pusillus*), sago pondweed (*Stuckenia pectinata*), greater bladderwort (*Utricularia macrorhiza*)

DIAGNOSTIC SPECIES: *Brasenia schreberi*, *Nuphar variegata*, *Nymphaea odorata*.

VEGETATION DESCRIPTION: This community is dominated by submerged and floating-leaved, rooted and free-floating aquatic macrophytes and algae, with a surface cover of water lilies (Order Nymphaeales) >25%. In Sandhills lakes, floating-leaf pondweeds and water smartweed are among the common rooted dominants, with other floating species such as duckweeds and watermeal often abundant. Common submerged plants include coontail, slender naiad, and narrow-leaved pondweeds such as small pondweed. Near the margins of marshes, scattered emergents may be conspicuous, such as northern wild-rice. This community generally occurs between open water submerged aquatic wetland and marsh, and in the Sandhills, most of the species associated with the Sandhills Broadleaf Pondweed phase of the Northern Pondweed Aquatic Wetland also may be associated with this community, but generally at lower densities due to shading by the water-lilies. Species diversity is relatively high in existing examples in Sandhills lakes, but it is poorly known in water-shield communities in the eastern Sandhills. Three subtypes are recognized, though the first two may be nearly equivalent:

- 1) Pond-lily phase – is dominated by yellow pond lily and is the most extensive phase, occurring in the Nebraska Sandhills in Arthur and Cherry counties, and historically along the Elkhorn, Missouri and Platte rivers in eastern Nebraska, based on pre-1900 collections. Associated species are as given above for extant sites in the Sandhills. White water-lily occurs with yellow pond lily in some Sandhills lakes, but there is no evidence it is native there.
- 2) Water-lily phase – was known historically only from eastern Nebraska, and was dominated by white water-lily (*Nymphaea odorata* ssp. *tuberosa*). Although white water lily currently occurs in the Sandhills ponds and lakes in Cherry, Sheridan, and Thomas counties, it was evidently introduced there (cf. Tolstead 1942), and many specimens cannot be distinguished as either ssp. *tuberosa* or the more widespread ssp. *odorata*. White water-lily is also widespread in artificial ponds through much of the state, and the only extant example that may represent a native occurrence is in an oxbow lake near Clearwater in Antelope County at the eastern edge of the Sandhills. Associated species recorded at the Clearwater site include coontail and greater bladderwort. The ecological requirements of yellow pond-lily and white water-lily are similar and the two grow together in a few sites in the Sandhills.
- 3) Water-shield association – is known from small interdunal ponds in the eastern Sandhills, where its presence was undetected until the late 1990s. Sites are dominated by plants of water-shield with associated aquatics typical of Sandhills lakes, including water smartweed, floating-leaved pondweed, variable pondweed (*Potamogeton gramineus*), and greater bladderwort, in addition to deep-water forms of some emergents such as grassleaf arrowhead (*Sagittaria graminea*). Most sites

occur in somewhat shallower, non-permanent wetlands, but otherwise appear similar to the pond-lily and water-lily dominated phases of this community. A watershield dominated wetland is recognized in the eastern U.S., but its description does not closely match Nebraska examples. Water-shield was reported from the Missouri River at the mouth of the Platte in 1811.

**OTHER NOTEWORTHY SPECIES:** Uncommon species occurring in this community in Nebraska include *Brasenia schreberi*, *Myriophyllum verticillatum*, *Nuphar variegata*, *Nymphaea odorata*, and *Sagittaria graminea*.

**STATE RANK:** S2

**RANK JUSTIFICATION:** This community was probably never very extensive in Nebraska, although Weaver (1960) reported stands of water lilies covering over 100 acres in the Missouri valley. All known examples outside the Sandhills were probably extirpated by the end of the 19<sup>th</sup> century, apparently due to cattle grazing and loss of wetlands. Channelization and dam construction on the Missouri has destroyed appropriate habitats there. Some lakes containing pond-lily are protected in the Sandhills.

**INVASIVE SPECIES OF CONCERN:** Yellow floating-heart (*Nymphoides peltata*) was introduced into a pond in Omaha, where it may have survived eradication efforts. Its likelihood of long-term survival in our climate seems minimal. Curly pondweed (*Potamogeton crispus*) and Eurasian water milfoil (*Myriophyllum spicatum*) are potential threats.

**GLOBAL RANK:** G5

**COMMENTS:** This community was treated as a subtype of the Northern Pondweed Aquatic Wetland in previous versions of this classification, as it tends to occur in association with that community in the Sandhills. Associated species occurring with water-lilies outside the Sandhills are poorly known.

**EXEMPLARY SITES:** Hackberry Lake and others at the Valentine National Wildlife Refuge, and Ballard's Marsh WMA in Cherry County have good examples of the yellow pond-lily phase.

## **SALINE/ALKALINE AQUATIC WETLAND**

**ELEMENT CODE:** CEG002004

**GLOBAL NAME:** = *Stuckenia pectinata* – *Ruppia maritima* Herbaceous Vegetation (Sago Pondweed Submerged Wetland)

**OTHER NAMES:** >*Ruppia* – *Potamogeton* community (Ungar *et al.* 1969)

**SYSTEM PLACEMENT:** Western Great Plains Saline Depression Wetland

**RANGE:** This community occurs most commonly in the closed basin region of the western Sandhills in southern Sheridan, northwest Garden, northeast Morrill and (formerly) southeastern Box Butte counties, and sporadically farther east. Semi-natural communities of this type are known from artificial ponds in the Salt Creek drainage near Lincoln and are possible in similar settings in the Platte River valley west to the Panhandle.

**EPA ECOREGIONS:** 25h, 27g?, 44b, 44d, 47i.

**ENVIRONMENTAL DESCRIPTION:** This community occurs in shallow water *ca.* 0.5-1.0 m deep in moderately to highly alkaline lakes or in seasonal pools associated with alkaline wetland habitats. Substrates vary from sand to clay.

**COWARDIN WETLAND SYSTEM:** Palustrine aquatic bed, permanently to semipermanently flooded.

**MOST ABUNDANT SPECIES:**

Floating and floating-leaved: water smartweed (*Polygonum amphibium*)

Submerged: coontail (*Ceratophyllum demersum*), needle spikerush (*Eleocharis acicularis*) [non-flowering], Siberian water milfoil (*Myriophyllum sibiricum*), slender naiad (*Najas flexilis*), small pondweed (*Potamogeton pusillus*), clasping-leaf pondweed (*P. richardsonii*), longbeak water crow's-foot (*Ranunculus longirostris*), western widgeon-grass (*Ruppia occidentalis*), sago pondweed (*Stuckenia pectinata*), greater bladderwort (*Utricularia macrorhiza*), horned pondweed (*Zannichellia palustris*)

**DIAGNOSTIC SPECIES:** *Ruppia maritima*, *R. occidentalis*, *Stuckenia pectinata*

**VEGETATION DESCRIPTION:** This community is dominated by a sparse to moderate layer of mostly submerged aquatic macrophytes and algae. Species diversity is often quite low. Two subtypes can be distinguished, largely on taxonomic and geographic differences:

- 1) Sago Pondweed-Spiral Ditchgrass Association - is best developed in the Sandhills and is usually dominated by sago pondweed, though in a few sites spiral ditchgrass may be the only species present. In the most highly alkaline examples, species of the green alga stonewort (*Chara* spp.) may be present with other blue-green algae in place of vascular plants. In moderately alkaline sites, sago pondweed is often present with horned pondweed and a few other alkali-tolerant species of Sandhill lakes including water smartweed, clasping-leaf pondweed and small pondweed. It is likely that examples are present outside the Sandhills in the North Platte River valley and along the Niobrara River, though ditchgrass is not currently known from either area.
- 2) Beaked Ditchgrass Association – was reported historically in seasonally flooded basins in the salt marsh areas of Lancaster County. Beaked ditchgrass is currently abundant in Oak Lake, an artificial pond in saline soils in Lincoln, and perhaps at other sites

along Little Salt Creek. It is unknown whether naturally occurring examples of this community are still extant in this area.

**OTHER NOTEWORTHY SPECIES:** Both species of ditchgrass are ranked S3? Some uncommon marine diatoms may be associated with this community. Prickly naiad (*Najas marina*) is documented from a saline pond in Morrill County and is ranked S1, although some sources suggest it is alien in our area.

**STATE RANK:** S3

**RANK JUSTIFICATION:** This community is still fairly extensive and relatively undisturbed in the western Sandhills, although most of the alkaline lakes in Box Butte County went dry in the 1960s following rapid increases in irrigated agriculture.

**INVASIVE SPECIES OF CONCERN:** none recorded

**GLOBAL RANK:** G2

**COMMENTS:** In previous classifications, the two phases of this community were previously treated as the "aquatic zone" of the Western Alkaline Marsh and Eastern Saline Marsh communities. Small inclusions of submerged aquatics are maintained in those communities.

**EXEMPLARY SITES:** Smith Lake and others in the north portion of the Crescent Lake National Wildlife Refuge in Garden County.

## **UPLAND HERBACEOUS COMMUNITIES**

### **UPLAND TALL-GRASS PRAIRIE**

**ELEMENT CODE:** CEG002025

**GLOBAL NAME:** =? *Andropogon gerardii* – *Sorghastrum nutans* – *Hesperostipa spartea* Loess Hills Herbaceous Vegetation (Central Tall-grass Big Bluestem Loess Prairie).

**OTHER NAMES:** <Tall-grass Prairie (1<sup>st</sup>-3<sup>rd</sup> ed.)

**SYSTEM PLACEMENT:** Central Tall-grass Prairie

**RANGE:** This community occurs primarily in glaciated portions of the eastern fifth of the state but extends westward in loess mantled areas to central Nebraska.

**EPA ECOREGIONS:** 27e?, 27f, 42?, 47

**ENVIRONMENTAL DESCRIPTION:** This community occurs on gentle to somewhat steep slopes of dissected hills and plains of all aspects, and sometimes on nearly level ground westward. Soils are deep, moderately well-drained very fertile loams, silt loams and silty clay

loams formed in loess and/or glacial till (less frequently in weathered sandstone or limestone bedrock).

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Short shrub: leadplant (*Amorpha canescens*)

Herbaceous: big bluestem (*Andropogon gerardii*), smooth brome (*BROMUS INERMIS*), porcupine grass (*Hesperostipa spartea*), Kentucky bluegrass (*POA PRATENSIS*), little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*), prairie dropseed (*Sporobolus heterolepis*)

DIAGNOSTIC SPECIES: *Andropogon gerardii*, *Sorghastrum nutans*, *Sporobolus heterolepis*

VEGETATION DESCRIPTION: This community is dominated primarily by tall grasses 1–2 m tall, namely big bluestem, with Indian grass conspicuous at some sites. On well-drained slopes and ridges the tall grasses may occur with conspicuous patches of little bluestem. On finer soils with higher clay content in the southeast, prairie dropseed is often common and even dominant in a few sites. Northward, and in sites with more silty or sandy soils porcupine grass may be common to locally abundant. On dry hill crests, particularly where mowed or grazed, short grasses including blue grama (*Bouteloua gracilis*) and hairy grama (*B. hirsuta*) are occasionally present, but are always subordinate to the tall and mid grasses. Patches of western wheatgrass (*Pascopyrum smithii*) and blue grama may also be locally common in some clay pans associated with tall-grass prairie. Lower slopes often contain patches of switchgrass (*Panicum virgatum*) and Indian grass (and often little bluestem), which may be locally common in uplands as well. Many prairies have been invaded and overtaken by the invasive perennial grasses smooth brome and Kentucky bluegrass. Shrubs are scattered in the prairie, and are often associated with the moist draws, though wild plum (*Prunus americana*) may form thickets on the uplands. Leadplant commonly occurs as scattered small shrubs with dwarf prairie rose (*Rosa arkansana*), and in some places, redroot New Jersey tea (*Ceanothus herbaceus*). Other characteristic species include bastard toadflax (*Comandra umbellata*), daisy fleabane (*Erigeron strigosus*), stiff sunflower (*Helianthus pauciflorus*), grooved yellow flax (*Linum sulcatum*), silverleaf scurfpea (*Pediomelum argophyllum*), many-flower scurfpea (*Psoralidium floribundum*), Missouri goldenrod (*Solidago missouriensis*), and heath aster (*Symphyotrichum ericoides*). Smooth scouringrush (*Equisetum laevigatum*) is the only pteridophyte common in the prairie. Species diversity is moderate to relatively high.

OTHER NOTEWORTHY SPECIES: The federally threatened western prairie fringed orchid (*Platanthera praeclara*) occurs in this community. Other uncommon species include *Asclepias amplexicaulis*, *Carex umbellata*, *Chaerophyllum tainturieri*, *Chenopodium pallescens*, *Dalea multiflora*, *Draba cuneifolia*, *Erysimum inconspicuum*, *Erythronium mesochoreum*, *Helianthus mollis*, *Krigia cespitosa*, *Liatris hirsuta*, *Mentzelia oligosperma*, *Mirabilis albida*, *Nothoscordum bivalve*, *Orobanche uniflora*, *Pyrrhopappus carolinianus*, *Ranunculus fascicularis*, *Spiranthes lacera*, *S. vernalis*, and *Triodanis biflora*.

STATE RANK: S1S2

RANK JUSTIFICATION: The vast majority of presettlement tall-grass prairie has been and continues to be converted to cropland. The remaining examples have been extensively degraded by overgrazing, herbicide spraying, and invasion by alien species. Fire suppression has promoted woody encroachment of many sites.

INVASIVE SPECIES OF CONCERN: Smooth brome dominates highly degraded sites, and Kentucky bluegrass and sweetclovers (*Melilotus* spp.) are often common. Northward, absinth wormwood (*Artemisia absinthium*) and plumeless thistle (*Carduus acanthoides*) may be abundant in degraded sites, while musk thistle (*C. nutans*), common St. John's-wort (*Hypericum perforatum*), sericea lespedeza (*Lespedeza cuneata*) and tall fescue (*Schedonorus arundinaceus*) are problematic in such sites southward. Leafy spurge (*Euphorbia esula*) is increasing in many sites of various quality.

GLOBAL RANK: G2

COMMENTS: In the previous edition, this community was expanded to include Sandhills Wet-Mesic Tall-grass Prairie and virtually every type of upland tall-grass prairie in the state. In this edition, we have decided to restrict it to the dry-mesic upland types occurring primarily on loess or glacial till. Inclusions of dry tall-grass prairie (containing mixed-grass elements) may be present in places, though extensive occurrences (like those atop the Missouri River bluffs) are included in the Northern Loess/Shale Bluff Prairie community. The application of the global name (which appears to have been described based on northerly examples in the Iowa Loess Hills) to all of our upland tall-grass may need to be re-examined. Prairies growing on substrates derived from Dakota Sandstone in the Smoky Hills are now segregated into the Dakota Sandstone Tall-grass Prairie community. The Central Mesic Tall-grass Prairie community of NatureServe was nominally included here, but more closely fits our description of Wet-Mesic Tall-grass Prairie and so now is combined with it in our "Lowland Tall-grass Prairie" community.

NatureServe's "Western Great Plains Big Bluestem Prairie" was also formerly included here, but is more similar to Lowland Tall-grass Prairie and Sandhills Wet-Mesic Prairie. More study is needed before its proper disposition is known. In the mixed-grass prairie region of central Nebraska, tall-grass prairie may occur on level ground, often associated with mixed-grass prairie on adjacent slopes. These communities have much lower species diversity than tall-grass prairie in eastern Nebraska, but cannot be separated from them on the basis of dominants.

EXEMPLARY SITES: Madigan Prairie in Saunders County, Table Rock Wildlife Management Area in Pawnee County.

## **DAKOTA SANDSTONE TALL-GRASS PRAIRIE**

ELEMENT CODE: CEGl005321

GLOBAL NAME: =*Andropogon gerardii* – *Panicum virgatum* – *Schizachyrium scoparium* – (*Tradescantia tharpii*) Herbaceous Vegetation (Dakota Sandstone Tall-grass Prairie)

OTHER NAMES: =Dakota Hills Tall-grass Prairie (Lauver *et al.* 1999), <Tall-grass Prairie (1<sup>st</sup>-3<sup>rd</sup> ed.)

SYSTEM PLACEMENT: Central Tall-grass Prairie

RANGE: This community occurs in the Smoky Hills region of southern Jefferson and southwestern Gage counties.

EPA ECOREGION: 27a

ENVIRONMENTAL DESCRIPTION: This community occurs on level to moderately sloping ground of various aspects. Soils are moderately well-drained loams and sandy loams formed in Cretaceous Dakota Sandstone and associated shales. Rock outcrops and seeps may occur as inclusions.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Herbaceous: big bluestem (*Andropogon gerardii*), Kentucky bluegrass (*POA PRATENSIS*), switchgrass (*Panicum virgatum*), little bluestem (*Schizachyrium scoparium*)

DIAGNOSTIC SPECIES: *Andropogon gerardii*, *Aristida purpurascens*, *Panicum virgatum*, *Schizachyrium scoparium*

VEGETATION DESCRIPTION: This community is dominated primarily by tall grasses 1–2 m tall, with big bluestem the most abundant species throughout, and with switchgrass often conspicuous in loamy sites. In sandier ground, little bluestem is often co-dominant with big bluestem. Sideoats grama (*Bouteloua curtipendula*), Junegrass (*Koeleria macrantha*), and Indian grass (*Sorghastrum nutans*) are locally common. A short shrub layer of leadplant (*Amorpha canescens*) is present in places, with dwarf prairie rose (*Rosa arkansana*) and coralberry (*Symphoricarpos orbiculatus*) sometimes also present. Eastern red-cedar (*Juniperus virginiana*), roughleaf dogwood (*Cornus drummondii*), smooth sumac (*Rhus glabra*) and occasionally honey locust (*Gleditsia triacanthos*) tend to encroach in unburned sites. Other common herbaceous associates include western ragweed (*Ambrosia psilostachya*), viscid goldentop (*Euthamia gymnospermoides*), round-head bush-clover (*Lespedeza capitata*), dotted gayfeather (*Liatris punctata*), and goldenrods (*Solidago altissima*, *S. nemoralis*, *S. rigida*, *S. speciosa*). Species diversity is moderate to fairly high.

OTHER NOTEWORTHY SPECIES: Uncommon species found in this community include *Aristida purpurascens*, *Asclepias amplexicaulis*, *Carex bushii*, *Crocanthemum bicknellii*, *Diodia teres*, *Desmodium sessilifolium*, *Gnaphalium purpureum*, *Spiranthes lacera*, *Tephrosia virginiana* and *Viola pedata*.



STATE RANK: S2

RANK JUSTIFICATION: Although much of the native prairie in this region is intact, Overgrazing and fire suppression have resulted in extensive woody encroachment and spread of invasive grasses.

INVASIVE SPECIES OF CONCERN: Smooth brome (*Bromus inermis*), downy brome (*B. tectorum*) and Kentucky bluegrass dominate highly degraded sites. Australian bluestem (*Bothriochloa bladhii*) is established in places and is becoming problematic.

GLOBAL RANK: G3?

COMMENTS: This community has long been recognized as occurring in Nebraska, but was not included in previous editions of this classification due to a lack of sufficient floristic and ecological information to separate it from tall-grass prairie elsewhere in the State. Additional survey work suggests these prairies are distinguishable from dry-mesic upland tall-grass prairie by the more conspicuous presence of little bluestem and often switchgrass, and by a number of floristic differences as well. Some of the sandier-soiled prairies in this area contain species also known from the eastern Sandhills, including *Crocantemum bicknellii*, *Nuttallanthus texanus* and *Scleria triglomerata*. Small outcroppings of Dakota Sandstone are sometimes present and may be included as part of this community. Such outcrops are present in tall-grass prairie north to Lincoln and elsewhere, and are sometimes home to sand-inhabiting species such as eastern prickly-pear (*Opuntia humifusa*) and shell-leaf penstemon (*Penstemon grandiflorus*), but are too small to compare with these communities.

EXEMPLARY SITES: One of the higher quality sites is Rock Glen Wildlife Management Area in Jefferson County.

## LOWLAND TALL-GRASS PRAIRIE

ELEMENT CODE: CEGl002024, CEGl002203

GLOBAL NAME: >*Andropogon gerardii* – *Panicum virgatum* - *Helianthus grosseserratus* Herbaceous Vegetation (Central Wet-Mesic Tall-grass Prairie), >*Andropogon gerardii* – *Sorghastrum nutans* – (*Sporobolus heterolepis*) – *Liatris* spp. – *Ratibida pinnata* Herbaceous Vegetation (Central Mesic Tall-grass Prairie)

OTHER NAMES: >Lowland (Floodplain) Prairie (Rolfmeier 1988); >Big Bluestem Prairie (Weaver 1960). >Wet-Mesic Tall-grass Prairie (1<sup>st</sup>-3<sup>rd</sup> ed.)

SYSTEM PLACEMENT: Central Tall-grass Prairie

RANGE: This community is restricted to the tallgrass prairie region in the eastern quarter of the state (possibly extending westward to central Nebraska in the Rainwater Basin Plains).

EPA ECOREGIONS: 27f, 47

ENVIRONMENTAL DESCRIPTION: This community occurs primarily in floodplains and on terraces of river and stream valleys and in other poorly-drained sites within uplands such as ravine bottoms. Soils are deep loams, silt loams and silty clay loams formed in alluvium, loess, or glacial till and are somewhat poorly drained. The water table is *ca.* 1 m below the surface, and standing water may be present from late winter into early spring or after heavy rains.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Herbaceous: big bluestem (*Andropogon gerardii*), smooth brome (*BROMUS INERMIS*), short-beak sedge (*Carex brevior*), woolly sedge (*Carex pellita*), flatstem spikerush (*Eleocharis compressa*), Canada wildrye (*Elymus canadensis*), smooth scouringrush (*Equisetum laevigatum*), wild licorice (*Glycyrrhiza lepidota*), sawtooth sunflower (*Helianthus grosseserratus*), Kentucky bluegrass (*POA PRATENSIS*), rosinweed (*Silphium integrifolium*), Indian grass (*Sorghastrum nutans*), prairie cordgrass (*Spartina pectinata*), paniced aster (*Symphotrichum lanceolatum*), blue meadow violet (*Viola pratincola*)

DIAGNOSTIC SPECIES: *Andropogon gerardii*, *Carex missouriensis*, *Helianthus grosseserratus*, *Liatris pycnostachya*, *Silphium integrifolium*, *Spartina pectinata*, *Veronicastrum virginicum*, *Zizia aurea*

VEGETATION DESCRIPTION: The vegetation of this community is dense and consists primarily of tall grasses 1-2 m or more tall. Big bluestem is usually dominant or co-dominant with prairie cordgrass and sometimes Indian grass. Canada wildrye, woolly sedge, and gama grass (*Tripsacum dactyloides*) are locally common. In slightly wetter places, such as in swales, prairie cordgrass may dominate. Patches of shrubs may be present, including roughleaf dogwood (*Cornus drummondii*), wild plum (*Prunus americana*), and wolfberry (*Symphoricarpos occidentalis*). Conspicuous herbaceous associates include fall-flowering composites such as sawtooth sunflower, goldenrods (*Solidago* spp.), and paniced aster. Other common herbs are rosinweed, Canada anemone (*Anemone canadensis*), prairie milkweed (*Asclepias sullivantii*), prairie ragwort (*Packera plattensis*), meadow rue (*Thalictrum dasycarpum*), spiderworts (*Tradescantia bracteata* and *T. ohiensis*), and prairie ironweed (*Vernonia fasciculata*). Species diversity is relatively high.

OTHER NOTEWORTHY SPECIES: *Platanthera praeclara* may be present in this community. Other uncommon species include *Carex brachyglossa*, *C. missouriensis*, *Cypripedium candidum*, *Eryngium yuccifolium*, *Liatris pycnostachya*, *Lilium michiganense*, *Packera pseud aurea* var. *semicordata*, *Pedicularis canadensis*, *Penstemon digitalis*, *Ranunculus caricetorum*, *Trifolium reflexum*, and *Veronicastrum virginicum*.

STATE RANK: S1

**RANK JUSTIFICATION:** Few lowland prairies remain, and many that do are infested by invasive grasses, especially in hayed sites. Fire suppression has led to woody encroachment of some sites.

**INVASIVE SPECIES OF CONCERN:** Smooth brome and Kentucky bluegrass may be abundant in some sites. Canada thistle (*Cirsium arvense*) is locally common in sites northward.

**GLOBAL RANK:** G2G3

**COMMENTS:** This community contains both mesic and wet-mesic tall-grass prairie, which often occur together as a mosaic and may be difficult to distinguish. In many places, it appears that the primary distinction between the two is that prairie cordgrass and sedges are less common or absent from mesic tall-grass prairie, and a few conspicuous fall-flowering composites such as sawtooth sunflower and rosinweed may be present. A floristically distinctive mesic tall-grass prairie community occurs in our southeasternmost counties and contains conspicuous eastern species such as *Liatris pycnostachya*, *Veronicastrum virginicum*, *Zizia aurea*, and rarely *Eryngium yuccifolium*. These sites closely fit the description of the Central Mesic Tall-grass Prairie of NatureServe, but the relationship of mesic tall-grass prairies elsewhere in the state to this community are unclear.

**EXEMPLARY SITES:** High quality sites are scattered on private lands in southeast Nebraska.

## **MISSOURI RIVER VALLEY DUNE GRASSLAND**

**ELEMENT CODE:** none presently designated

**GLOBAL NAME:** none presently designated

**SYSTEM PLACEMENT:** Central Tall-grass Prairie

**RANGE:** This community is on high terraces of the Missouri River in northeast Nebraska and in adjacent Iowa.

**EPA ECOREGION:** 47d

**ENVIRONMENTAL DESCRIPTION:** This community occurs on gently to moderately sloping sand dunes on river terraces. Soils are poorly-developed sands formed from wind-blown alluvium and are well-drained.

**COWARDIN WETLAND SYSTEM:** Upland

**MOST ABUNDANT SPECIES:**

Herbaceous: Canada wildrye (*Elymus canadensis*), switchgrass (*Panicum virgatum*), sand dropseed (*Sporobolus cryptandrus*)

DIAGNOSTIC SPECIES: *Corispermum villosum*, *Elymus canadensis*, *Sporobolus cryptandrus*

VEGETATION DESCRIPTION: This grassland probably represents a recently-stabilized sand prairie community and is sparsely vegetated even in comparison with other sand prairie. It currently is dominated by mid-grasses 0.5-1 m tall, primarily sand dropseed, with patches of Canada wildrye present in some areas. Cottonwoods (*Populus deltoides*) are scattered on the dunes, with patches of roughleaf dogwood (*Cornus drummondii*) often associated with them. In more level areas, switchgrass is more common and Siberian elm (*Ulmus pumila*) is present. Interdunal swales are often populated by switchgrass and Canada goldenrod (*Solidago canadensis*). Forb density and diversity is fairly low, with a few perennial prairie herbs such as western ragweed (*Ambrosia psilostachya*) and round-headed bush clover (*Lespedeza capitata*) scattered here and there. Eastern prickly pear (*Opuntia humifusa*) is present, but uncommon. Prairie shrubs such as smooth sumac (*Rhus glabra*) may form patches in places as well. In this community, species diversity is often highest in naturally and artificially disturbed areas of open sand, where native annuals and perennials such as woolly bugseed (*Corispermum villosum*), winged pigweed (*Cycloloma atriplicifolium*), Plains sunflower (*Helianthus petiolaris*), lemon scurfpea (*Psoralidium lanceolatum*), annual skeletonweed (*Shinnersoseris rostrata*) and sandgrass (*Triplasis purpurea*) are scattered to common. Overall species diversity for this community is lower than that of other sand prairie communities in Nebraska.

OTHER NOTEWORTHY SPECIES: Woolly bugseed (*Corispermum villosum*) is known in Nebraska only from this community.

STATE RANK: S2

RANK JUSTIFICATION: This community appears to be very limited in extent in the state, but all sites recorded so far appear to be protected.

INVASIVE SPECIES OF CONCERN: Few invasives are recorded, though Kentucky bluegrass (*Poa pratensis*) and Siberian elm (*Ulmus pumila*) may sometimes be present.

GLOBAL RANK: GNR

COMMENTS: This distinctive community was reported by Eilers & Roosa (1994) in northwest Iowa, but apparently has not been classified by NatureServe. Most occurrences in Nebraska are relatively small (20-80 acres) and sometimes occur as a patchy mosaic with riparian woodland. Along the unchannelized portion of the Missouri River at Ponca State Park, a very small area of sparsely-vegetated sand dunes borders the river. Even though they are apparently fairly young, they contain woolly bugseed and are already being overtaken by trees.

EXEMPLARY SITES: The largest known site is at the Snyder-Winnebago Bend area in Thurston County.

## MISSOURI RIVER FLOODPLAIN TERRACE GRASSLAND

ELEMENT CODE: none presently designated

GLOBAL NAME: none presently designated

SYSTEM PLACEMENT: Central Tall-grass Prairie

RANGE: This community is on high terraces of the Missouri River in northeast Nebraska and in adjacent Iowa.

EPA ECOREGION: 47d

ENVIRONMENTAL DESCRIPTION: This community occurs on level river terraces. Soils are poorly-developed sands formed in alluvium and are well-drained.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Herbaceous: smooth brome (*BROMUS INERMIS*), crested sedge (*Carex cristatella*), Canada wildrye (*Elymus canadensis*), switchgrass (*Panicum virgatum*), Kentucky bluegrass (*POA PRATENSIS*)

DIAGNOSTIC SPECIES: *Elymus canadensis*, *Panicum virgatum*

VEGETATION DESCRIPTION: This community is dominated by a relatively sparse layer of mid and tall grasses 1 m tall with switchgrass most common, and Canada wildrye also conspicuous, especially in slightly higher ground. Most sites are severely degraded and dominated by smooth brome and Kentucky bluegrass. Two weakly definable phases can be recognized: a switchgrass – bluegrass – sedge phase, which frequently borders wetlands, and a smooth brome – Kentucky bluegrass – Canada wildrye – switchgrass type, found on higher sites, often near woodland. Common scouringrush frequently replaces sedges in the first type and switchgrass in the second. The lower phase may intergrade with wetland communities and may be invaded by reed canarygrass (*Phalaris arundinacea*). The higher phase is commonly invaded by roughleaf dogwood, sometimes to such an extent as to transform it into a shrubland community. Overall species diversity is low.

OTHER NOTEWORTHY SPECIES: Information not available.

STATE RANK: S2?

RANK JUSTIFICATION: The full extent of this community in the state is poorly known, and most sites appear to have been converted to cropland. Many remaining sites are in poor condition.

INVASIVE SPECIES OF CONCERN: Smooth brome and Kentucky bluegrass are often abundant.

GLOBAL RANK: GNR

COMMENTS: This community is mentioned by Weaver (1960) as a transition between wet prairie and tall-grass prairie along the Missouri River. Apparently it may be restricted to a narrow transition band in southeast Nebraska, but in sandy soils upstream it is more extensive and may occur in place of tall-grass prairie, which is unknown in the Missouri River floodplain in northeast Nebraska. This community may intergrade with the Missouri River Valley Dune Grassland community and is usually highly degraded. It may extend westward along the Platte River, but no records of it are known.

This community tends to be fairly disturbed and probably was once maintained as open grassland by occasional wildfires. In the absence of fire, shrubs quickly invade, and many of these sites may eventually succeed to woodland. Currently they are mostly restricted to narrow bands along the margins of marshes and woodland and may grade into the surrounding communities to such a large extent that they are difficult to identify in the field. Species composition varies based on minor differences in elevation and soil moisture. These sites are frequently invaded by alien species.

EXEMPLARY SITES: Sites are present at Ponca State Park in Dixon County, but are mostly invaded by trees.

## **SOUTHERN SAND/GRAVEL PRAIRIE**

ELEMENT CODE: CEG005221

GLOBAL NAME: =*Schizachyrium scoparium* – *Aristida basiramea* – *Sporobolus cryptandrus* – *Eragrostis trichodes* Herbaceous Vegetation.

OTHER NAMES: =Southern Sand/Gravel Mixed-grass Prairie (3<sup>rd</sup> ed.)

SYSTEM PLACEMENT: Central Tall-grass Prairie

RANGE: This community occurs on uplands along the Little Blue River and Big Sandy Creek in southwestern Jefferson and eastern Thayer counties, and on the north side of the Republican River valley in Nuckolls and Webster counties.

EPA ECOREGIONS: 27b, 27f

ENVIRONMENTAL DESCRIPTION: This community occurs on eroded slopes, rolling uplands and in shallow draws associated with river valleys. It occurs in very-well drained sandy-gravelly soils of the Meadin series formed in Pleistocene alluvium on ancient river terraces.

COWARDIN WETLAND SYSTEM: Upland

#### MOST ABUNDANT SPECIES:

Herbaceous: western ragweed (*Ambrosia psilostachya*), purple three-awn (*Aristida purpurea*), forktip three-awn (*A. basiramea*), western sagewort (*Artemisia campestris* var. *caudata*), sideoats grama (*Bouteloua curtipendula*), blue grama (*B. gracilis*), hairy grama (*B. hirsuta*), sand lovegrass (*Eragrostis trichodes*), hairy golden-aster (*Heterotheca villosa*), little bluestem (*Schizachyrium scoparium*), sand dropseed (*Sporobolus cryptandrus*), yucca (*Yucca glauca*)

DIAGNOSTIC SPECIES: *Aristida basiramea*, *Artemisia campestris* var. *caudata*, *Eragrostis trichodes*, *Froelichia gracilis*, *Polygonum tenue*, *Sporobolus cryptandrus*

VEGETATION DESCRIPTION: This is a moderately vegetated mixed-grass prairie community occurring in sandy and gravelly soils in a predominantly tall-grass prairie region of silty soils. Species diversity is variable based on soil texture. In areas with predominately gravelly soils, primary species include sideoats grama, blue grama and little bluestem, while sand lovegrass and sand dropseed are more common where soils are primarily sandy. Scattered tall-grasses such as big bluestem (*Andropogon gerardii*), Indiangrass (*Sorghastrum nutans*), and switchgrass (*Panicum virgatum*) may be present near the contact of these areas with tall-grass prairie. Herbaceous species are often conspicuous and include many species common in mixed-grass prairie farther west such as western sagewort, hairy golden-aster, Plains yellow primrose (*Calylophus serrulatus*), yellow woollywhite (*Hymenopappus tenuifolius*), eastern prickly pear (*Opuntia humifusa*), and cutleaf ironplant (*Xanthisma spinulosum* var. *glaberrimum*) in addition to many annual species typical of sandy prairies. Snake cotton (*Froelichia gracilis*), and slender knotweed (*Polygonum tenue*) are annuals that are mostly restricted to gravelly sites. Ledge spike-moss (*Selaginella rupestris*) is often a common in many gravelly sites along with numerous non-vascular cryptogams. Yucca (*Yucca glauca*) is often common on slopes. Species diversity is moderate to relatively high.

OTHER NOTEWORTHY SPECIES: Information not available

STATE RANK: S2?

RANK JUSTIFICATION: Although the extent of this community is fairly well established, its full condition has not been assessed. In generally, sandier sites north of the Republican River appear to be in poorer condition than gravelly sites. Some sites are quarried for gravel.

INVASIVE SPECIES OF CONCERN: Cheatgrasses (*Bromus japonicus*, *B. tectorum*) may be common.

GLOBAL RANK: GNR

COMMENTS: In early editions of this classification, this community was more broadly defined and included the gravelly upland prairie of the High Plains of southwestern Nebraska—now included in the Great Plains Gravel/Cobble Prairie community. In the third edition, the current circumscription was adopted and the name altered to "Southern Sand/Gravel Mixed-grass Prairie". Since most sites occur as small patches within tall-grass prairie, we have dropped the

"mixed-grass" portion of the name. This community is confined to Nebraska according to NatureServe, but is also common along the Little Blue River in Washington County, Kansas, where it is extensively quarried. Exposures of Pliocene Long Pine Gravels in northeast Nebraska have similar species and this community may need to be included here, but more data are needed. Sandy prairies north of the Republican valley in Webster County are poorly studied and need to be compared with the Eastern Sand Prairie community.

EXEMPLARY SITES: Alexandria Wildlife Management Area in Jefferson County.

## LOESS MIXED-GRASS PRAIRIE

ELEMENT CODE: CEGLO02036

GLOBAL NAME: =*Schizachyrium scoparium* – *Bouteloua curtipendula* Loess Mixed-grass Herbaceous Vegetation (Little Bluestem Loess Mixed-grass Prairie)

OTHER NAMES: =Mixed-grass type (Hopkins 1951)

SYSTEM PLACEMENT: Central Mixed-grass Prairie

RANGE: This community is found on the loess-mantled hills and plains of central and south-central Nebraska west to Lincoln, Hayes, and Hitchcock counties (its eastern limit is poorly known). It also may occur in northern Nebraska in Boyd and northwestern Knox counties.

EPA ECOREGIONS: 27b, 27e, 42g, 42h?

ENVIRONMENTAL DESCRIPTION: This community occurs on steep to nearly level slopes in level, rolling, and dissected loess plains. Soils are deep silt loams formed in loess, and are moderately to rapidly well-drained. Some sites are associated with outcrops of sandstone, limestone or shale (see comments section below).

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Shrub: leadplant (*Amorpha canescens*)

Herbaceous: western ragweed (*Ambrosia psilostachya*), big bluestem (*Andropogon gerardii*), side-oats grama (*Bouteloua curtipendula*), blue grama (*B. gracilis*), western wheatgrass (*Pascopyrum smithii*), Kentucky bluegrass (*POA PRATENSIS*), slender-flower scurfpea (*Psoralidium tenuiflorum*), little bluestem (*Schizachyrium scoparium*), yucca (*Yucca glauca*)

DIAGNOSTIC SPECIES: *Andropogon gerardii*, *Bouteloua curtipendula*, *B. gracilis*, *Mimosa quadrivalvis* var. *nuttallii*, *Schizachyrium scoparium*



**VEGETATION DESCRIPTION:** This community is dominated by a mixture of tall (1–2 m) and mid (0.5–1 m) grasses, often with an understory of short (<0.5 m) grasses. On nearly level ridgetops and toe slopes, blue grama tends to dominate the short-grass layer, often occurring with western wheatgrass and lesser amounts of sideoats grama, little bluestem and big bluestem. In some sites, particularly where heavy grazing has recently occurred, the short grasses blue grama and buffalo grass (*Buchloë dactyloides*) may dominate, along with alien grasses such as Japanese brome (*Bromus japonicus*). On slopes (particularly steep slopes), the mid-grasses little bluestem and sideoats grama may dominate or may share dominance with big bluestem. On lower slopes and the bottoms of draws, tall and mid-grasses dominate, including big bluestem, sideoats grama, and western wheatgrass. Switchgrass (*Panicum virgatum*) is abundant in bottoms of draws at one site, though in most places the bottoms are heavily grazed and invaded by western wheatgrass, buffalo grass (in areas), and weedy species. Kentucky bluegrass is the most abundant invasive in this community, with smooth brome (*Bromus inermis*) abundant at some sites. Both species often dominate disturbed sites. Eastern red cedar (*Juniperus virginiana*) is often invasive on steep north and east-facing slopes, and other shrubs may also form patches among them, including chokecherry (*Prunus virginiana*), smooth sumac (*Rhus glabra*), and wolfberry (*Symphoricarpos occidentalis*). Leadplant is the most common short shrub on slopes not infested with red-cedar, and in places sandsage (*Artemisia filifolia*), skunkbrush sumac (*Rhus aromatica* var. *trilobata*), and western poison ivy (*Toxicodendron rydbergii*) are locally common. Yucca is often common in uplands especially where soils are better-drained or slightly sandy. Common herbaceous plants include western ragweed, fringed sage (*Artemisia frigida*), Plains evening primrose (*Calylophus serrulatus*), daisy fleabane (*Erigeron strigosus*), scarlet gaura (*Gaura coccinea*), broom snakeweed (*Gutierrezia sarothrae*), slender-flower scurfpea, silverleaf scurfpea (*Pediomelum argophyllum*), prairie coneflower (*Ratibida columnifera*), Missouri goldenrod (*Solidago missouriensis*), scarlet globe mallow (*Sphaeralcea coccinea*), and heath aster (*Symphyotrichum ericoides*). Ungrazed sites, particularly eastward, may be dominated by big bluestem to the extent they are difficult to distinguish from tall-grass prairie communities. Species diversity is moderate to relatively high in well-preserved sites.

**OTHER NOTEWORTHY SPECIES:** Species uncommon in Nebraska which are present in this community include *Allium drummondii*, *Chaetopappa ericoides*, *Erysimum inconspicuum*, *Minuartia michauxii* var. *texana*, *Pediomelum cuspidatum*, *Symphyotrichum fendleri*, and *Triodanis holzingeri*.

**STATE RANK:** S3

**RANK JUSTIFICATION:** This community has largely been converted to cropland, though large areas remain in some parts of the state, especially on dissected river breaks. The majority of remaining sites are overgrazed and/or dominated by invasive grasses. Herbicide spraying for noxious weeds has greatly reduced the plant species diversity over large areas of this community type.

**INVASIVE SPECIES OF CONCERN:** Kentucky bluegrass and smooth brome dominate large areas. Cheatgrasses (*Bromus japonicus*, *B. tectorum*), musk thistle (*Carduus nutans*), leafy spurge (*Euphorbia esula*), and Siberian elm (*Ulmus pumila*) are abundant in areas. The native eastern red-cedar has extensively encroached into many sites in the absence of fire.

GLOBAL RANK: G3?

COMMENTS: Hopkins (1951) reports short-grass prairie in the loess hills of central Nebraska. These may, in part, be consequences of the drought of the 1930s and the fact that most of the sites he studied were regularly mowed. A calcareous mixed-grass prairie type may be associated with limestone outcroppings near the Kansas border. Rock outcrops occur as inclusions at many sites. In south-central Nebraska, Niobrara Chalk outcrops are frequently associated with the Republican River, while Tertiary sandstone outcrops may be present in southwest Nebraska. Some or all of these may represent recognizable variants of Loess Mixed-grass Prairie or separate communities, but more data are needed before these can be formally categorized.

EXEMPLARY SITES: Well-preserved sites are present at Red Willow Reservoir in Frontier County and Jeffrey Reservoir in Lincoln County.

### **NORTHERN LOESS/SHALE BLUFF PRAIRIE**

ELEMENT CODE: CEG002035

GLOBAL NAME: >*Schizachyrium scoparium* - *Bouteloua curtipendula* - *Bouteloua hirsuta* - (*Yucca glauca*) Herbaceous Vegetation (Loess Hills Little Bluestem Dry Prairie)

OTHER NAMES: >Loess Bluff Prairie (1<sup>st</sup>-3<sup>rd</sup> ed.)

RANGE: This community is primarily associated with bluffs along the south side of the Missouri River from Dixon County west to Boyd County, and smaller examples may also be present along the north side of the Niobrara River valley in Boyd County, and along the Keya Paha River in Boyd and Keya Paha counties.

SYSTEM PLACEMENT: Central Mixed-grass Prairie

EPA ECOREGIONS: 42h, 47k

ENVIRONMENTAL DESCRIPTION: This community occurs on gently sloping to steep slopes associated with river bluffs. Soils are moderately deep to shallow silt loams and clay loams formed in loess or Cretaceous Pierre Shale.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Herbaceous: big bluestem (*Andropogon gerardii*), sideoats grama (*Bouteloua curtipendula*), hairy grama (*B. hirsuta*), porcupine grass (*Hesperostipa spartea*), little bluestem (*Schizachyrium scoparium*)

DIAGNOSTIC SPECIES: *Andropogon gerardii*, *Anemone patens*, *Bouteloua curtipendula*, *B. hirsuta*, *Castilleja sessiliflora*, *Dalea enneandra*, *D. oligophylla*, *Nassella viridula*, *Pascopyrum smithii*, *Yucca glauca*

VEGETATION DESCRIPTION: This community is dominated by a layer of tall grasses 1-2 m tall and mid grasses *ca.* 0.5-1.5 m tall including big bluestem, sideoats grama, and little bluestem. A short grass underlayer of blue grama and hairy grama is commonly present. On Pierre Shale, green needlegrass (*Nassella viridula*) and western wheatgrass (*Pascopyrum smithii*) may be common locally. Scattered shrubs are present, including species typical of tall-grass prairie, such as leadplant (*Amorpha canescens*), redroot New Jersey tea (*Ceanothus herbaceus*), and dwarf prairie rose (*Rosa arkansana*) in addition to western species such as buffaloberry (*Shepherdia argentea*) and yucca (*Yucca glauca*). Herbaceous plants typical of prairie in the Great Plains are often conspicuous in this community, among them pasque-flower (*Anemone patens*), lotus milkvetch (*Astragalus lotiflorus*), Missouri milkvetch (*A. missouriensis*), Great Plains Indian paintbrush (*Castilleja sessiliflora*), nine-anther dalea (*Dalea enneandra*), white prairie clover (*D. oligophylla*), scarlet gaura (*Gaura coccinea*), stiffstem flax (*Linum rigidum*), purple locoweed (*Oxytropis lambertii*), white beardtongue (*Penstemon albidus*), scarlet globe mallow (*Sphaeralcea coccinea*) and cutleaf ironplant (*Xanthisma spinulosum* var. *glaberrimum*). Species diversity is moderate.

OTHER NOTEWORTHY SPECIES: *Amorpha nana* may be associated with this community in Boyd County.

STATE RANK: S2

RANK JUSTIFICATION: This community is limited in its extent and many examples (particularly those associated with Pierre Shale) are dominated by invasive grasses, likely due to overgrazing and erosion. Eastern red-cedar (*Juniperus virginiana*) may encroach in this community in the absence of fire.

INVASIVE SPECIES OF CONCERN: Smooth brome (*Bromus inermis*) is particularly problematic at many sites, especially westward, and Kentucky bluegrass (*Poa pratensis*) may be common in grazed situations. Tall fescue (*Schedonorus arundinaceus*) has been recorded from a site in Boyd County.

GLOBAL RANK: G2

COMMENTS: This community is well studied on the eastern side of the Missouri River in Iowa and Missouri, but has received much less attention in Nebraska, where its range is somewhat limited. It occurs on loess bluffs from north-central Knox County east to Dixon County, where it resembles sites found in the Loess Hills of northwestern Iowa and southeastern South Dakota. It continues westward along the south side of the Missouri River beyond the loess mantled bluffs, where it usually occurs on Pierre Shale bluffs, as in Boyd and northwestern Knox counties. These sites were overlooked in previous classifications or lumped with the Loess Mixed-grass Prairie of central Nebraska, but tend to resemble the Loess Bluff Prairie in having a very conspicuous tall-grass layer, even on slopes, so that the community often appears to resemble

tall-grass prairie, and in containing an array of Great Plains species that extend eastward outside their main ranges. The Pierre Shale prairies were referred to as "Tall-grass Prairie" by Steinauer (2002), and appear in many respects to be intermediate between tall-grass and mixed-grass prairie.

In northeastern Knox and northwest Cedar counties, this community may be associated with chalky limestone outcrops, and may contain additional Great Plains species.

EXEMPLARY SITES: Loess bluff prairie is preserved at Wiseman Wildlife Management Area in Cedar County, and intact shale bluff prairie occurs on private property in the vicinity of Old Baldy in Boyd County.

## **EASTERN SAND PRAIRIE**

ELEMENT CODE: CEG001473

GLOBAL NAME: <*Calamovilfa longifolia* – *Hesperostipa comata* Herbaceous Vegetation (Prairie Sandreed – Needle-and-thread Prairie)

OTHER NAMES: =Climax *Stipa- Bouteloua* Community (Frolik & Keim 1933), =Spear-grass Association (Pool 1914), =Sandhills Needlegrass Prairie (1<sup>st</sup> ed.), =Eastern Sandhills Needlegrass Prairie (2<sup>nd</sup> ed.)

SYSTEM PLACEMENT: Western Great Plains Sand Prairie

RANGE: This community occurs most extensively along the northern, eastern, and southern periphery of Sandhills from northeastern Cherry County and southwestern Logan County eastward. It also extends as isolated outliers eastward along the Elkhorn River to Dodge County and along the Platte and Loup drainages from Buffalo, Custer, and Phelps counties east to northwestern Butler County. Outliers are apparently present in the Niobrara drainage east to northwestern Knox County.

EPA ECOREGIONS: 27b?, 27e, 27g, 42h, 42p, 43i, 44a, 44c, 47k, 47l

ENVIRONMENTAL DESCRIPTION: This community occurs on nearly level to moderate slopes of low to moderately high, rolling sand dunes. Soils are formed in well-drained fine sands and loamy fine sands formed in eolian sand (with lesser amounts of loess).

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Shrub: leadplant (*Amorpha canescens*)

Herbaceous: western ragweed (*Ambrosia psilostachya*), blue grama (*Bouteloua gracilis*), hairy grama (*B. hirsuta*), prairie sandreed (*Calamovilfa longifolia*), sun sedge (*Carex heliophila*),

Scribner's panicum (*Dichanthelium oligosanthos* var. *scribnerianum*), six-weeks fescue (*Festuca octoflora*), needle-and-thread (*Hesperostipa comata*), porcupine grass (*H. spartea*), Junegrass (*Koeleria macrantha*), little bluestem (*Schizachyrium scoparium*)

DIAGNOSTIC SPECIES: *Amorpha canescens*, *Hesperostipa comata*, *H. spartea*, *Schizachyrium scoparium*

VEGETATION DESCRIPTION: Total cover in this community is moderate to relatively high and is dominated by a mixture of mostly mid grasses 0.5–1 m tall, with needle-and-thread and/or porcupine grass often dominant, and with little bluestem abundant in places. Prairie sandreed may be common with the needlegrasses on steeper slopes, but is uncommon on level to gently rolling sites, where switchgrass (*Panicum virgatum*) may be present. A short graminoid layer primarily of blue grama and sun sedge is also present, and other associated short grasses include Scribner's panicum and Junegrass. Leapdplant is the most conspicuous shrub component, and often occurs at a greater density than in other sand prairie communities. The subshrub fringed sage (*Artemisia frigida*) is common in many sites north of the Niobrara River. Other species common in Nebraska sites include western ragweed, purple prairie coneflower (*Echinacea angustifolia*), dotted gayfeather (*Liatris punctata*), clammy groundcherry (*Physalis heterophylla*), prairie coneflower (*Ratibida columnifera*), Missouri goldenrod (*Solidago missouriensis*), heath aster (*Symphotrichum ericoides*), and others. Disturbed sites are fairly susceptible to invasion by weedy aliens. Overall species diversity is moderate to fairly high.

OTHER NOTEWORTHY SPECIES: Information not available.

STATE RANK: S4

RANK JUSTIFICATION: Many sites are heavily grazed and extensively invaded by alien species.

INVASIVE SPECIES OF CONCERN: Heavily-grazed areas may be nearly dominated by cheatgrasses (*Bromus japonicus*, *B. tectorum*), and ungrazed sites may be occupied by Kentucky bluegrass (*Poa pratensis*) or smooth brome (*Bromus inermis*), especially eastward. Diffuse knapweed (*Centaurea diffusa*), leafy spurge (*Euphorbia esula*), and sulphur cinquefoil (*Potentilla recta*) are locally problematic.

GLOBAL RANK: G3

COMMENTS: This community was included as Sandhills Needlegrass Prairie and Eastern Sandhills Needlegrass Prairie in the first and second editions of this classification. In practice, these names were often applied to all communities in the Sandhills that included conspicuous amounts of needlegrasses (*Hesperostipa* spp.), including some examples of Sandhills Dry Valley Prairie and other communities, and it was lumped into Sandhills Dune Prairie in the third edition. Its definition here is similar to the "Sandhills Borders Mixed-grass Prairie" of Kaul & Rolfsmeier (2003), generally referring to sand prairie mostly at the periphery of the Sandhills with finer-textured soils with a mixture of Sandhills species along with those of other prairie types. Some sites within the Sandhills may qualify as this community as well.

Along the northern periphery of the Sandhills, porcupine grass is often more common on low upland rises, such as the tops of sand ridges associated with wet meadows, while needle-and-thread is more common on slopes, and is often found with prairie sandreed on steeper slopes, where it may grade into Sandhills Dune Prairie. Eastern Sand Prairie and Sandhills Dune Prairie occur as a mosaic in much of Keya Paha County, but eastward the two are usually separate, with Eastern Sand Prairie associated with valley bottoms and low slopes. East of the Sandhills, Eastern Sand Prairie may replace Sandhills Dune Prairie on dunes as well. The distinctions between Eastern Sand Prairie and Western Sand Prairie are based primarily on floristics (prairie species vs. Plains species) and need more study.

EXEMPLARY SITES: Sites are generally associated with private lands, but a few small tracts occur on Oak Valley Wildlife Management Area in Madison County and at Cub Creek Reservoir in Keya Paha County.

### **SANDHILLS MESIC TALL-GRASS PRAIRIE**

ELEMENT CODE: CEG002023

GLOBAL NAME: *>Andropogon gerardii – Panicum virgatum* Sandhills Herbaceous Vegetation (Sandhills Wet-Mesic Prairie)

OTHER NAMES: *<Hay Meadow Association (Pool 1914), =Mesophytic Tall-grass Zone (Tolstead 1942), =Subirrigated Subclimax Tall-grass Area (Frolik & Keim 1933), >Sandhills Wet-Mesic Prairie (1<sup>st</sup>, 2<sup>nd</sup> eds.), >Dry-Mesic Sand Prairie (3<sup>rd</sup> ed.)*

SYSTEM PLACEMENT: Western Great Plains Sand Prairie

RANGE: This community occurs throughout the eastern Sandhills west to Logan and eastern Cherry counties, and outside the Sandhills in areas of eolian sand in the Loup River and Platte River valleys of central Nebraska, and in the Elkhorn River drainage in northeast Nebraska. Some sites associated with the North Platte River valley in the Panhandle may be part of this community as well.

EPA ECOREGIONS: 27e, 27g, 42p, 44a, 44c, 44d, 47l

ENVIRONMENTAL DESCRIPTION: This community occurs in level to gently sloping ground in interdunal valleys, on stream terraces, and sand sheets. Soils are sandy loams and loams which may have considerable organic matter, and are formed in eolian sand and alluvium. The water table remains relatively close (0.5-1.5 m) to the surface.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Herbaceous: big bluestem (*Andropogon gerardii*), switchgrass (*Panicum virgatum*), Kentucky bluegrass (*POA PRATENSIS*), Indian grass (*Sorghastrum nutans*)

DIAGNOSTIC SPECIES: *Andropogon gerardii*, *Juncus brachyphyllus*, *Fimbristylis puberula* var. *puberula*, *Sorghastrum nutans*

VEGETATION DESCRIPTION: A dense to somewhat open layer of mesophytic grasses 1–2 m tall dominate this community, with big bluestem most abundant in the majority of sites, and with either switchgrass or Kentucky bluegrass common. In a few sites on the northeast periphery of the Sandhills, Indian grass and prairie dropseed (*Sporobolus heterolepis*) may also be abundant. In hayed meadows, cool-season aliens such as Kentucky bluegrass may be abundant, with redtop (*Agrostis gigantea*) and timothy (*Phleum pratense*) common in lower places. Shrubs may be somewhat common (less so in hayed areas) and include leadplant (*Amorpha canescens*), sand cherry (*Prunus pumila* var. *besseyi*), dwarf prairie rose (*Rosa arkansana*) and prairie willow (*Salix humilis*). Among the more common herbaceous plants are yarrow (*Achillea millefolium*), western ragweed (*Ambrosia psilostachya*), field pussytoes (*Antennaria neglecta*), ground-plum (*Astragalus crassicaarpus*), Flodman's thistle (*Cirsium flodmanii*), stiff sunflower (*Helianthus pauciflorus*), black-eyed Susan (*Rudbeckia hirta*), and rosinweed (*Siphium integrifolium*). Species diversity is rather high in undisturbed sites, and decreases as a result of early-season haying. Two types may be recognized that were treated as separate communities in the previous edition of this classification:

- 1) Sandhills Wet-Mesic Prairie – typically occurs in nearly level sites with loamy soils and may be densely vegetated by big bluestem, with switchgrass common in unmowed sites, and Kentucky bluegrass common where mowed. Sites in the eastern part of the Sandhills may be indistinguishable from tall-grass prairie of eastern Nebraska in regard to species composition. Westward the most abundant associated species include leadplant, western poison ivy (*Toxicodendron rydbergii*), western ragweed, viscid goldentop (*Euthamia gymnospermoides*), stiff sunflower, Maximilian's sunflower (*Helianthus maximiliani*), Nuttall's sunflower (*H. nuttallii*), tall goldenrod (*Solidago altissima*), and willowleaf aster (*Symphotrichum praealtum*). Species diversity is moderate to somewhat high (lower on hayed sites seeded to alien forage species).
- 2) Sandhills Dry-Mesic Prairie – typically occurs on low slopes near wet meadows on sandier, better-drained soils, and is usually somewhat open and dominated by Indian grass and switchgrass, with hairy fimbry (*Fimbristylis puberula* var. *puberula*) and short-leaf rush (*Juncus brachyphyllus*) abundant in some high-quality sites. Tapered spring-panicum (*Dichanthelium acuminatum* var. *fasciculatum*) is abundant in some sites as well. Sites are often very species rich with both annual and perennial herbs including western ragweed, frostweed (*Crocyanthemum bicknellii*), stiff sunflower, clammy ground-cherry (*Physalis heterophylla*) and stiff goldenrod (*Solidago rigida*).

OTHER NOTEWORTHY SPECIES: The federally threatened western prairie fringed orchid (*Platanthera praeclara*) occurs in this community type. Other uncommon species found in this community include *Allium canadense* var. *fraseri*, *Crocyanthemum bicknellii*, *Lechea mucronata*,

*L. stricta*, *L. tenuifolia*, *Nuttallanthus texanus*, *Phemeranthus rugospermus*, and *Scleria triglomerata*.

STATE RANK: S2

RANK JUSTIFICATION: Many subirrigated hay meadows in the eastern Sandhills were converted to irrigated cropland in the 1980s and many were subsequently abandoned, though future attempts at irrigated agriculture could threaten to lower the high water table necessary to maintain tall-grass prairie. Many sites that remain are extensively invaded by alien forage grasses and weedy herbs, and regular early-season haying promotes their dominance.

INVASIVE SPECIES OF CONCERN: Kentucky bluegrass is extensive in many stands, and other locally problematic species include Canada thistle (*Cirsium arvense*), leafy spurge (*Euphorbia esula*), and yellow bedstraw (*Geum verum*).

GLOBAL RANK: G3

COMMENTS: The Sandhills Wet-Mesic Prairie, as recognized in the first two editions of this classification, was combined with Tall-grass Prairie in the third edition, since the two could not be distinguished on the basis of species composition. In this edition, our original concept of Sandhills Wet-Mesic Prairie is combined with the "Dry-Mesic Sand Prairie" community (a name which was frequently misapplied to what is now known as Eastern Sand Prairie), into a single community encompassing both tall-grass prairie communities of the eastern Sandhills. These community rarely occur together, but both tend to be found on the margins of wetlands, with the former occupying loamy soils and often intermingling with prairie cordgrass (*Spartina pectinata*), while the latter occurs in sandy soils often near wetland dominated by northern reedgrass (*Calamagrostis stricta*). Steinauer (2006) reports an Indian grass dominated transition between wet-mesic tall-grass prairie and Sandhills Dry Valley Prairie in Cherry County. Whether this or the areas of little bluestem and Indian grass in the Sandhills briefly mentioned by Weaver (1965) are synonymous with the Dry-Mesic Sand Prairie has yet to be determined.

EXEMPLARY SITES: The Valentine National Wildlife Refuge in Cherry County contains a number of good examples.

## **SANDHILLS DUNE PRAIRIE**

ELEMENT CODE: CEG001467

GLOBAL NAME: =*Andropogon hallii* - *Calamovilfa longifolia* Herbaceous Vegetation

OTHER NAMES: >Choppy Sands Range site, >Rolling Sands Range site (Burzlaff 1962); >Ridge Community, >Sandhill Prairie Community (Kantak 1995); >Slope Community (Keeler *et al.* 1977); >Bunchgrass Association, >*Muhlenbergia* Association, >Blowout Association (Pool, 1914); =Sandhills Prairie (1<sup>st</sup> ed.)



SYSTEM PLACEMENT: Western Great Plains Sand Prairie

RANGE: This community occurs throughout the Nebraska Sandhills from the Panhandle east to southwest Antelope and northwest Boone counties, south to the North Platte valley of Keith and Lincoln counties, and north through Cherry County into South Dakota. Outliers occur eastward along the Niobrara, Elkhorn, Platte and Loup rivers, southwestward in southwest Lincoln County, and south of the Platte in Adams, Kearney, and Franklin counties.

EPA ECOREGIONS: 25g?, 27g, 27f, 43i, 44, 47l

ENVIRONMENTAL DESCRIPTION: This community occurs on stabilized rolling to choppy sand dunes. Soils are poorly developed very fine to moderately coarse sands that are rapidly drained, and are formed in eolian sand. Soils are highly permeable and runoff is often negligible.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Shrub: leadplant (*Amorpha canescens*), dwarf prairie rose (*Rosa arkansana*), yucca (*Yucca glauca*)

Herbaceous: sand bluestem (*Andropogon hallii*), hairy grama (*Bouteloua hirsuta*), prairie sandreed (*Calamovilfa longifolia*), sun sedge (*Carex heliophila*), sand lovegrass (*Eragrostis trichodes*), Plains sunflower (*Helianthus petiolaris*), needle-and-thread (*Hesperostipa comata*), sand muhly (*Muhlenbergia pungens*), Sandhills ground-cherry (*Physalis hispida*), little bluestem (*Schizachyrium scoparium*)

DIAGNOSTIC SPECIES: *Andropogon hallii*, *Bouteloua hirsuta*, *Calamovilfa longifolia*, *Carex heliophila*, *Chenopodium subglabrum*, *Muhlenbergia pungens*, *Penstemon haydenii*, *Redfieldia flexuosa*

VEGETATION DESCRIPTION: Vegetative cover in this community is relatively sparse in comparison with other grasslands, and is dominated by a mixture of tall grasses 1–2 m high, with an underlayer of mid grasses (0.5–1 m tall) and short grasses (<0.5 m tall). Prairie sandreed is the most common tall grass, with hairy grama and sun sedge commonly forming a short-graminoid underlayer. Other conspicuous grasses include sand bluestem, sand lovegrass, and needle-and-thread. On steep slopes, little bluestem may become conspicuous, and may increase with grazing pressure. Wind-blown dune crests and slopes of choppy dunes are often dominated by sand muhly and other species typical of blowouts, in addition to short shrubs such as yucca (*Yucca glauca*) and sand cherry (*Prunus pumila* var. *besseyi*). Other shrubs which may be found scattered in this community include leadplant (*Amorpha canescens*), dwarf prairie rose (*Rosa arkansana*), and western poison ivy (*Toxicodendron rydbergii*). In a few places, wild plum (*Prunus americana*) and chokecherry (*Prunus virginiana*) may form dense patches on dunes. Perennial herbs are plentiful, and among the more conspicuous are stiff sunflower (*Helianthus pauciflorus*), bush morning-glory (*Ipomoea heterophylla*), Plains gayfeather (*Liatris glabrata*), hairy puccoon (*Lithospermum carolinense*), brittle prickly pear (*Opuntia fragilis*), narrowleaf

beardtongue (*Penstemon angustifolius*), and others. Native annuals are also conspicuous, particularly in areas of active natural and man-made erosion, and include pitseed goosefoot (*Chenopodium berlandieri*), desert goosefoot (*C. pratericola*), winged pigweed (*Cycloloma atriplicifolium*), Sandhills fleabane (*Erigeron bellidiastrum*), annual wild buckwheat (*Eriogonum annuum*), Geyer's spurge (*Euphorbia geyeri*), prairie spurge (*E. missurica* var. *petaloidea*), field snake cotton (*Froelichia floridana*), showy ipomopsis (*Ipomopsis longiflora*), and stiffstem flax (*Linum rigidum*). Alien species are infrequent in areas not modified by anthropomorphic disturbance, and Russian thistles (*Kali collina* and *K. tragus*) are the most common. Species diversity is low to moderate, though quite high when compared with other inland dune ranges throughout the world. Blowouts are a noteworthy natural disturbance within this community, and consist of crater-like depressions ca. 50 m to several hectare large formed by wind erosion on dune crests. The soil in a blowout is loose and moving due to wind erosion and slippage. Active blowouts are often unvegetated or sparsely vegetated by rhizomatous "sand-binding" species. The initial plant invading the loose sand is blowout grass (*Redfieldia flexuosa*), though other species such as lemon scurfpea, sand muhly, sand bluestem, and prairie sandreed may replace it in some locations. Annuals are conspicuously absent from active blowouts because of the inability of seedlings to withstand constant burial and uprooting in the moving sand. They appear as the blowouts begin to stabilize and eventually "heal over" and succeed to Sandhills Dune Prairie.

**OTHER NOTEWORTHY SPECIES:** Blowout penstemon (*Penstemon haydenii*) is a federally endangered species found in blowouts in the central and western Nebraska Sandhills. Other uncommon species in this community include smooth goosefoot (*Chenopodium subglabrum*), smooth four-o'clock (*Mirabilis glabra*), rockpink fameflower (*Phemeranthus calycinus*), and Sandhills fameflower (*P. rugospermus*).

**STATE RANK:** S4S5

**RANK JUSTIFICATION:** This community type is extensive. Overall very little of this community has been converted for crop production, however, in recent decades some low rolling dunes have been converted to center pivots. Cautious grazing practices employed by most ranchers have resulted in many sites that are in relatively good condition.

**GLOBAL RANK:** G4G5

**COMMENTS:** Sandhills Dune Prairie is distinguished from other sandy prairie communities in the state by its overlayer of prairie sandreed and the underlayer of hairy grama and sun sedge. Sand bluestem has commonly been described as the "controlling" species of Sandhills prairie, but it is seldom dominant except on a local basis. Schacht *et al.* (2000) noted that north-facing dune slopes in a grazed Sandhills range site in Brown County were dominated by little bluestem and cool-season grasses including needlegrasses (*Hesperostipa* spp.) and Junegrass (*Koeleria macrantha*). It is unknown if these differences occur consistently throughout the Sandhills. Other authors have subdivided this community, based primarily on degree of slope or position on the dune slope. The "rolling sands range site" of Burzlaff (1962), and the "slope community" of Keeler *et al.* (1980) may be transitional between Sandhills Dune Prairie and Sandhills Dry Valley

Prairie, but are included in the former because of high similarity in overall species composition (*cf.* Burzlaff 1962).

EXEMPLARY SITES: Ungrazed or lightly grazed examples of this community are found at Arapaho Prairie in Arthur County, Crescent Lake National Wildlife Refuge in Garden County, and Valentine National Wildlife Refuge in Cherry County. A well-managed site grazed by bison is present on the Niobrara Valley Preserve in Brown and Cherry counties.

## SANDHILLS DRY VALLEY PRAIRIE

ELEMENT CODE: CEG001473

GLOBAL NAME: *<?Calamovilfa longifolia – Hesperostipa comata* Herbaceous Vegetation (Prairie Sandreed – Needle-and-thread Prairie)

OTHER NAMES: *<Hay Meadow Association (Pool 1914), =True Prairie Zone (Tolstead 1942), =Valley Community (Keeler & Harrison 1980)*

SYSTEM PLACEMENT: Western Great Plains Sand Prairie

RANGE: This community occurs primarily in the western two-thirds of the Sandhills, but appears to extend eastward into northeast Nebraska along the south side of the Niobrara River.

EPA ECOREGIONS: 44a, 44d

ENVIRONMENTAL DESCRIPTION: This community occupies broad to narrow, nearly level interdunal valleys and upland stream terraces in the Sandhills. Soils are well-drained fine sands and loamy fine sands formed in eolian sand. These sites are never flooded, and depth to water table is *ca.* 1.5–2 m below the surface.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Herbaceous: yarrow (*Achillea millefolium*), western ragweed (*Ambrosia psilostachya*), white sage (*Artemisia ludoviciana*), blue grama (*Bouteloua gracilis*), prairie sandreed (*Calamovilfa longifolia*), sun sedge (*Carex heliophila*), Scribner's panicum (*Dichanthelium oligosanthes* var. *scribnerianum*), Canada wildrye (*Elymus canadensis*), stiff sunflower (*Helianthus pauciflorus*), needle-and-thread (*Hesperostipa comata*), Junegrass (*Koeleria macrantha*), switchgrass (*Panicum virgatum*), western wheatgrass (*Pascopyrum smithii*), prairie coneflower (*Ratibida columnifera*), little bluestem (*Schizachyrium scoparium*), Missouri goldenrod (*Solidago missouriensis*), stiff goldenrod (*S. rigida*), scarlet globe mallow (*Sphaeralcea coccinea*), sand dropseed (*Sporobolus cryptandrus*)

DIAGNOSTIC SPECIES: *Bouteloua gracilis*, *Hesperostipa comata*, *Panicum virgatum*, *Schizachyrium scoparium*

VEGETATION DESCRIPTION: Total cover in this community is relatively high and is dominated by a mixture of tall warm-season grasses 1–2 m high (most commonly switchgrass, with prairie sandreed common in places), mid grasses 0.5–1 m tall including sand dropseed and little bluestem (with cool-season needle-and-thread and western wheatgrass sometimes present), and an underlayer <0.5 m tall dominated by the warm-season blue grama and the cool-season sun sedge (with the cool-season grasses Scribner's panicum and Junegrass conspicuous). Herbaceous perennials are common, and include yarrow, western ragweed, white sage, prairie coneflower, scarlet globe mallow, hemp dogbane (*Apocynum cannabinum*), Flodman's thistle (*Cirsium flodmanii*), prairie ragwort (*Packera plattensis*), scarlet gaura (*Gaura coccinea*), clammy groundcherry (*Physalis heterophylla*) and many others. Shrubs are relatively short (<1 m tall) and scattered, with leadplant (*Amorpha canescens*), dwarf prairie rose (*Rosa arkansana*), and western wild rose (*R. woodsii*) among the more prevalent species. Disturbed sites are fairly susceptible to invasion by weedy native annuals including plains sunflower (*Helianthus petiolaris*), Texas croton (*Croton texensis*), and Rocky Mountain beeplant (*Peritoma serrulata*), in addition to alien species.

OTHER NOTEWORTHY SPECIES: Information not available.

STATE RANK: S4

RANK JUSTIFICATION: Although this community is widespread in the western Sandhills it is frequently subject to heavy grazing and subsequent invasion by alien species.

INVASIVE SPECIES OF CONCERN: Kentucky bluegrass (*Poa pratensis*) is frequently common in this community, and smooth brome (*Bromus inermis*) has been recorded from some formerly farmed sites. Leafy spurge (*Euphorbia esula*) may be locally problematic.

GLOBAL RANK: G3

COMMENTS: This community is included in the Prairie Sandreed – Needle-and-thread Prairie of NatureServe, which serves as a catch-all for upland sand prairie with finer soil particle size than Sandhills Dune Prairie. Unlike the Western and Eastern Sand Prairie communities, the Sandhills Dry-Valley Prairie is dominated by switchgrass, rather than needlegrass (*Hesperostipa* spp.) or prairie sandreed, and usually has an herbaceous component similar to that of Loess Mixed-grass Prairie. Westward, it tends to gradually merge into Western Sand Prairie as conditions become drier.

Blowouts are occasionally present in this community, and their bottoms are often close to the water table. Some blowouts in the dry valleys of Arapaho Prairie in Arthur County are dominated by patches of willow (*Salix interior* and *S. famelica*), and Pool (1914) reported submersed aquatic plants established in some.

EXEMPLARY SITES: Ungrazed and lightly grazed examples of this community are found at Arapaho Prairie in Arthur County, Valentine National Wildlife Refuge in Cherry County, and

Crescent Lake National Wildlife Refuge in Garden County. Well-managed grazed examples are present at the Niobrara Valley Preserve in Brown County.

## SANDSAGE PRAIRIE

ELEMENT CODE: C EGL001459

GLOBAL NAME: =? *Artemisia filifolia* / *Andropogon hallii* Shrubland (Sand Sagebrush / Sand Bluestem Shrubland)

OTHER NAMES: =Sand-sage Community (Ramaley 1939)

SYSTEM PLACEMENT: Western Great Plains Sand Prairie

RANGE: This community occurs in the Panhandle along the western edge of the Sandhills in Box Butte and Morrill counties, on sand dunes in southern Sioux County, and as isolated stands associated with the Wildcat Hills escarpment in Banner and Scotts Bluff counties. It is most extensive in southwestern Nebraska in Chase, Dundy, and Perkins counties, with small outliers extending into western Hitchcock and Hayes counties.

EPA ECOREGIONS: 25b, 25f, 25g, 44a

ENVIRONMENTAL DESCRIPTION: In southwestern Nebraska, this community occurs on nearly level ground to rolling and choppy dunes. In the Panhandle the community is generally confined to larger sand dunes. Soils are well-drained fine sands and loamy sands formed in eolian sand.

COWARDIN WETLAND SYSTEM: Upland

### MOST ABUNDANT SPECIES:

Shrub: sandsage (*Artemisia filifolia*)

Herbaceous: western ragweed (*Ambrosia psilostachya*), western sagewort (*Artemisia campestris*), blue grama (*Bouteloua gracilis*), cheatgrass (*BROMUS* spp.), prairie sandreed (*Calamovilfa longifolia*), sun sedge (*Carex heliophila*), desert goosefoot (*Chenopodium pratericola*), annual buckwheat (*Eriogonum annuum*), needle-and-thread (*Hesperostipa comata*), sand muhly (*Muhlenbergia pungens*), sand dropseed (*Sporobolus cryptandrus*), prairie spiderwort (*Tradescantia occidentalis*), yucca (*Yucca glauca*)

DIAGNOSTIC SPECIES: *Artemisia filifolia*, *Calamovilfa longifolia*, *Chenopodium cycloides*, *Eragrostis secundiflora* var. *capitata*, *Hesperostipa comata*

VEGETATION DESCRIPTION: As defined here, this community is variable in overall species composition, but is generally dominated by a tall grass layer 1-2 m tall intermixed with mid-grasses 0.5–1 m tall. Prairie sandreed and needle-and-thread are among the most frequently

encountered dominants, though in places, sand lovegrass (*Eragrostis trichodes*) may be abundant. Blue grama and sun sedge usually dominate the <0.5 m tall short graminoid underlayer. On wind-blown dune crests, sand muhly and sand bluestem (*Andropogon hallii*) may be common locally, and other perennial grasses such as purple three-awn (*Aristida purpurea*), junegrass (*Koeleria macrantha*), and squirreltail (*Elymus elymoides*) are sometimes frequent. Common annual grasses include sixweeks fescue (*Festuca octoflora*) and slender paspalum (*Paspalum setaceum*), though many sites are heavily infested with cheatgrass (mostly *Bromus japonicus*). A dense shrub layer of sandsage ca. 1 m tall is fairly extensive in many sites in southwest Nebraska (especially those that have a history of severe overgrazing), but more commonly it is not sufficiently dense to impact the herbaceous component. *Yucca* may also be present, especially on steep slopes and dunes. Conspicuous herbaceous species include many typical of Sandhills Dune Prairie, including sand-lily (*Mentzelia nuda*), desert goosefoot (*Chenopodium pratericola*), sandhills fleabane (*Erigeron bellidiastrum*), Plains sunflower (*Helianthus petiolaris*), and prairie spiderwort (*Tradescantia occidentalis*). In southwestern Nebraska, Southern Plains species are important constituents of the flora of this community, and include Sandhills goosefoot (*Chenopodium cycloides*), windmill grass (*Chloris verticillata*), red lovegrass (*Eragrostis secundiflora* var. *capitata*), smooth four-o'clock (*Mirabilis glabra*), othake (*Palafoxia sphacelata*) and James' rushpea (*Pomaria jamesii*). Species diversity is relatively low (in Panhandle sites) to relatively high (in southwestern Nebraska).

**OTHER NOTEWORTHY SPECIES:** Uncommon species known from this community include *Chenopodium cycloides*, *C. subglabrum*, *Dalea cylindriceps*, *Eragrostis secundiflora* var. *capitata*, *Linum berlandieri*, *Mirabilis glabra*, *Penstemon ambiguus*, *Phemeranthus calycinus*, *Pomaria jamesii*, and *Ratibida tagetes*.

**STATE RANK:** S3

**RANK JUSTIFICATION:** Many sandsage prairies in southwestern Nebraska have been converted to center pivot irrigated cropland in recent decades, but recent moratoriums on irrigation well development in southwestern Nebraska make it likely that agricultural conversion will decrease. Significant tracts of this community remain intact, but quality of many sites is negatively impacted by heavy grazing, which increases sandsage density (as does fire suppression). In southwestern Nebraska, herbicide application to control sand sage is a common practice.

**INVASIVE SPECIES OF CONCERN:** Cheatgrasses (*Bromus japonicus*, *B. tectorum*) are abundant in many sites.

**GLOBAL RANK:** G3

**COMMENTS:** Although the dominant species of this community are fairly consistent through Nebraska, sites in the Republican River drainage are more species-rich due to the presence of a Southern Great Plains floristic element absent from the more northerly occurrences. Although the global name for this community is *Artemisia filifolia* / *Andropogon hallii* Shrubland, sand bluestem is generally not a major component of the community in Nebraska, and is most common on disturbed sandy sites such as blowout margins, choppy dune slopes, and dune crests.

The relationship of Nebraska's sandsage prairie to the *Artemisia filifolia* / *Calamovilfa longifolia* Shrubland community of South Dakota should be examined. Neither Ramaley (1939) nor Daley (1972) noted any differences between the sandsage prairie communities of southwest Nebraska and those in adjacent Colorado.

EXEMPLARY SITES: The north side of Enders Reservoir Wildlife Management Area in Chase County.

## WESTERN SAND PRAIRIE

ELEMENT NAME: CEGLO01473

GLOBAL NAME: <*Calamovilfa longifolia* – *Hesperostipa comata* Herbaceous Vegetation (Prairie Sandreed – Needle-and-thread Prairie)

OTHER NAMES: >Colluvial sand prairie (1<sup>st</sup> ed.), >Pine Ridge Sandy Slope Prairie (1<sup>st</sup>-3<sup>rd</sup> ed.), >Western Sandy Slope Prairie (2<sup>nd</sup>-3<sup>rd</sup> ed.)

SYSTEM PLACEMENT: Western Great Plains Sand Prairie

RANGE: This community occurs primarily in the High Plains of the Nebraska Panhandle, and also along the western periphery of the Nebraska Sandhills and as outliers westward. It may also occur north of the Niobrara River in Cherry and Keya Paha counties, but more study is needed.

EPA ECOREGIONS: 25d, 25f, 25g, 43i?

ENVIRONMENTAL DESCRIPTION: This community occurs on level to steep slopes of various aspects that are associated with and below Tertiary sandstone outcrops and escarpments, and on nearly level to gently rolling sands of eolian origin. Soils are well-drained fine sands and loamy fine sands formed in colluvial and eolian sand.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Herbaceous: blue grama (*Bouteloua gracilis*), prairie sandreed (*Calamovilfa longifolia*), needle-and-thread (*Hesperostipa comata*)

DIAGNOSTIC SPECIES: *Calamovilfa longifolia*, *Hesperostipa comata*

VEGETATION DESCRIPTION: This community is fairly densely vegetated by tall and mid-grasses, primarily prairie sandreed and needle-and-thread. An underlayer of blue grama may be present, but usually is not extensive. Western wheatgrass (*Pascopyrum smithii*) may be prominent on more level sites at the base of slopes. On steeper slopes the vegetation is more open and often contains sand bluestem and species typical of sandsage prairie. Generally,

needle-and-thread becomes more prominent on finer soils. Shrubs are scattered and infrequent to absent, with skunkbrush sumac (*Rhus aromatica* var. *trilobata*) the most common species. These areas are often highly susceptible to invasion by cheatgrasses (*Bromus japonicus*, *B. squarrosus*, *B. tectorum*) and may be quite weedy. Species diversity is low to moderate (higher on steep slopes).

OTHER NOTEWORTHY SPECIES: Information not available

STATE RANK: S3?

RANK JUSTIFICATION: This community is poorly studied, and its range, extent, and condition in Nebraska are poorly known. Many sites are extensively invaded by alien grasses.

INVASIVE SPECIES OF CONCERN: Cheatgrasses are often abundant, and Kentucky bluegrass (*Poa pratensis*) may dominate some sites, especially in the Pine Ridge.

GLOBAL RANK: G3

COMMENTS: This community was formerly defined to include only sandy grassland on slopes associated with escarpments, but it has been noted to also occur on eolian sand dunes in Sioux County (Steinauer 2004). It frequently intergrades with Threadleaf Sedge Western Mixed-grass Prairie and Sandsage Prairie wherever these communities come in contact in the Panhandle. Tolstead (1942) observed that similar prairies in Cherry County are earlier successional stages of Threadleaf Sedge Western Mixed-grass Prairie. That community may occur on steep uneroded slopes of escarpments (Steinauer 2004), but probably does not establish in areas subject to continuous erosion. Examples of this community in the Pine Ridge frequently have finer, more moisture-retentive soils and may contain more mesophytic tall grasses such as big bluestem (*Andropogon gerardii*) and other species typical of eastern prairies. These were recognized as Pine Ridge Sandy Slope Prairie in previous editions of the classification but are now included here. Most of these sites are extensively invaded by Kentucky bluegrass.

Sand prairies along the northwest periphery of the Sandhills in the Panhandle are often dominated by needle-and-thread and blue grama, and contain herbaceous species typical of mixed-grass prairie in the Panhandle, such as purple locoweed (*Oxytropis lambertii*), standing milkvetch (*Astragalus laxmannii* var. *robustior*), Platte lupine (*Lupinus plattensis*), combleaf evening primrose (*Oenothera coronopifolia*), sweet sand verbena (*Abronia fragrans*), and Plains beebalm (*Monarda pectinata*). These sites were formerly included in the Sandhills Dry Valley Prairie community, but more closely resemble Western Sand Prairie in overall species composition and are now included here.

EXEMPLARY SITES: Agate Fossil Beds National Monument in Sioux County.

## **THREADLEAF SEDGE WESTERN MIXED-GRASS PRAIRIE**

ELEMENT CODE: CEG002037



GLOBAL NAME: *Hesperostipa comata* - *Bouteloua gracilis* - *Carex filifolia* Herbaceous Vegetation (Needle-and-Thread - Blue Grama Mixed-grass Prairie)

OTHER NAMES: <Western Mixed-grass Prairie (1<sup>st</sup>-3<sup>rd</sup> ed.)

SYSTEM PLACEMENT: Northwestern Great Plains Mixed-grass Prairie, Western Great Plains Mixed-grass Prairie

RANGE: This community is common in the High Plains of the Nebraska Panhandle from the Pine Ridge southward and in southwestern Nebraska in Chase, Dundy, Hayes, Hitchcock and Keith counties. It also occurs in isolated areas in northeastern Cherry and northern Keya Paha counties, and extends north of the Pine Ridge in scattered places. It may also occur in isolated places in the central Nebraska Loess Hills as in Custer County.

EPA ECOREGIONS: 25, 27e?, 43

ENVIRONMENTAL DESCRIPTION: This community occurs on level uplands and gentle to moderate slopes of various aspects. Soils are well drained and relatively shallow to deep fine sandy loams and silt loams formed in weathered Tertiary sandstones and siltstones, loess, or eolian sand.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Herbaceous: blue grama (*Bouteloua gracilis*), prairie sandreed (*Calamovilfa longifolia*), threadleaf sedge (*Carex filifolia*), sixweeks fescue (*Festuca octoflora*), needle-and-thread (*Hesperostipa comata*)

DIAGNOSTIC SPECIES: *Carex filifolia*, *Hesperostipa comata*

VEGETATION DESCRIPTION: This community is dominated by short and mid-height (0.5-1 m) cool-season graminoids, primarily threadleaf sedge, along with the warm-season blue grama, and a sparse to moderate layer of mid-grasses ca. 1 m tall, usually dominated by needle-and-thread. Ungrazed sites in the Panhandle are dominated almost entirely by threadleaf sedge and/or needle-and-thread, which decrease with grazing. Blue grama and buffalo grass (*Buchloë dactyloides*) increase under high grazing intensity and heavily grazed sites may be dominated by a cover of short warm-season grasses. Prickly-pear (*Opuntia* spp.) is also often common on heavily grazed sites. Other grasses frequent in this community include prairie sandreed, six-weeks fescue, western wheatgrass (*Pascopyrum smithii*), sand dropseed (*Sporobolus cryptandrus*), green needlegrass (*Nassella viridula*) and purple three-awn (*Aristida purpurea*). Shrubs are scattered in this community, the most common being skunkbrush sumac (*Rhus aromatica* var. *trilobata*), with winterfat (*Kraschenninikovia lanata*) abundant at some sites. Sandsage (*Artemisia filifolia*) may be common in instances in which this community occurs on deep sandy soils. The subshrubs fringed sage (*Artemisia frigida*) and broom snakeweed (*Gutierrezia sarothrae*) are also common. The most common associated herbaceous species are

those typical of other mixed-grass prairies in the state and include scarlet gaura (*Gaura coccinea*), dotted gayfeather (*Liatris punctata*), skeletonplant (*Lygodesmia juncea*), lemon scurfpea (*Psoraleidium lanceolatum*), scarlet globe mallow (*Sphaeralcea coccinea*) and cutleaf ironplant (*Xanthisma spinulosum*).

This community frequently occurs in very shallow soils of ridge crests, butte tops and on steep uneroded slopes where it may be associated with rock outcrops. Such areas tend to have higher species diversity due to inclusions of species associated with the Rock Outcrop community. In general, species diversity is low in ungrazed and heavily-grazed sites, and moderate in moderately grazed sites.

**OTHER NOTEWORTHY SPECIES:** Species uncommon in this community include *Astragalus pectinatus*, *Coryphantha missouriensis*, *Erigeron caespitosus*, *E. flagellaris*, *Juniperus horizontalis*, *Pediomelum linearifolium*, *Potentilla hippiana*, and *Pseudoroegneria spicata*.

**STATE RANK:** S3S4

**RANK JUSTIFICATION:** This community is still fairly common in western Nebraska, especially in Sioux County and along the breaks of the North Platte River. Many sites have been degraded by overgrazing.

**INVASIVE SPECIES OF CONCERN:** Cheatgrasses (*Bromus japonicus*, *B. tectorum*) may be common and weedy, especially in heavily grazed areas.

**GLOBAL RANK:** G5

**COMMENTS:** This community tends to intergrade with sand prairie wherever the two come into contact, and it may be found on eolian sand in southern Sioux, northwestern Morrill and southwestern Box Butte counties, where it is extensively transitional to Sandsage Prairie (Steinauer 2004). Similarly Harrison (1980) describes sites that appear to be intermediate with Sandhills Dune Prairie along the central Niobrara River. In southwestern Nebraska, this community is found in association with Loess Mixed-grass Prairie, and is confined to gentle and moderate mid to upper slopes and hilltops, with loess prairie occurring on disturbed steep slopes (Steinauer 2004).

Within the range of this community, western wheatgrass dominated prairie is frequently found on fine-textured soils of lower slopes. In previous classifications and elsewhere (Steinauer 2004), such areas are interpreted as a degraded condition of this community, specifically past overgrazing followed by abandonment. These sites are now included as a separate community (Wheatgrass Western Mixed-grass Prairie) for reasons discussed there.

**EXEMPLARY SITES:** Scotts Bluff National Monument in Scotts Bluff County.

## **NORTHWESTERN MIXED-GRASS PRAIRIE**

**ELEMENT CODE:** CEGl001579, CEGl002270

GLOBAL NAME: >*Pascopyrum smithii* – *Bouteloua gracilis* – *Carex filifolia* Herbaceous Vegetation (Western Wheatgrass – Blue Grama – Threadleaf Sedge Prairie), >*Bouteloua gracilis* – *Buchloe dactyloides* Xeric Soil Herbaceous Vegetation (Blue Grama – Buffalograss Xeric Soil Short-grass Prairie)

OTHER NAMES: >Clay Pan Prairie (Rolfsmeier 1996), >Northwestern Mixed-grass Prairie/Rock Outcrop complex (Steinauer 2005)

SYSTEM PLACEMENT: Northwestern Mixed-grass Prairie

RANGE: This community occurs in the Hat Creek and White River basins in Dawes, Sheridan, and Sioux counties in extreme northwestern Nebraska.

EPA ECOREGIONS: 25a, 43g, 43h

ENVIRONMENTAL DESCRIPTION: This community usually occurs on level to gently rolling uplands, though in some areas associated with shale outcrops it may be rather steep. Soils are somewhat poorly drained silty clay loams and clay loams, formed in weathered Cretaceous Pierre Shale (and to a lesser extent siltstone in the vicinity of badlands).

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Herbaceous: blue grama (*Bouteloua gracilis*), buffalo grass (*Buchloë dactyloides*), threadleaf sedge (*Carex filifolia*), needle-and-thread (*Hesperostipa comata*), green needlegrass (*Nassella viridula*), western wheatgrass (*Pascopyrum smithii*)

DIAGNOSTIC SPECIES: *Artemisia tridentata*, *Bouteloua gracilis*, *Pascopyrum smithii*

VEGETATION DESCRIPTION: This community is dominated by short and mid grasses < 1 m tall. Western wheatgrass is co-dominant with an underlayer of blue grama. In some places, curly bluegrass (*Poa secunda*) and buffalo grass are locally common. Other graminoids found to a lesser extent include purple three-awn (*Aristida purpurea*), threadleaf sedge, green needlegrass, and needle-and-thread. Heavily grazed and/or formerly farmed sites are dominated by western wheatgrass and cheatgrasses (*Bromus japonicus*, *B. tectorum*) and have very low species diversity. Better quality sites include western wheatgrass, needle-and-thread, blue grama and cheatgrass (Steinauer 2005). There is some evidence to suggest that green needlegrass is a dominant in lightly grazed sites. Shrubs are uncommon, though in some places silver sagebrush (*Artemisia cana*) and big sagebrush (*A. tridentata*) are present and the subshrub broom snakeweed (*Gutierrezia sarothrae*) is sometimes common. Associated herbaceous species include wild onion (*Allium textile*), two-grooved milkvetch (*Astragalus bisulcatus*), Drummond's milkvetch (*Astragalus drummondii*), bushy flax (*Linum compactum*), woolly plantain (*Plantago patagonica*), and scarlet globe mallow (*Sphaeralcea coccinea*).

Three subtypes have been recognized that occur as small inclusions within this community. All are fairly distinct and may deserve future status as separate communities:

1) Clay pan prairie - may occur as a mosaic with Northwestern Mixed-grass Prairie (Rolfmeier 1996). Clay pans usually occur on gently sloping to nearly level ground on stream terraces and range in size from a few square meters to several hundred square meters. Most are sparsely vegetated with scattered grasses and herbs. The most conspicuous species are <0.5 m tall, and include blue grama, buffalo grass, slender plantain (*Plantago elongata*), poverty weed (*Monolepis nuttalliana*), spine-fruit prickly-pear (*Opuntia polyacantha*) and lichens. Other plants which may be locally abundant in the clay pans include yellow wild-parsley (*Lomatium foeniculaceum* var. *foeniculaceum*), leafy musineon (*Musineon divaricatum*), and branched false-goldenweed (*Oenopsis multicaulis*). Thickspike wheatgrass (*Elymus lanceolatus*) is the most frequent mid-grass, and is usually scattered in the clay pans. Shrubs are frequently present, but may be absent in areas. Big sagebrush is sometimes common, and silver sagebrush, fringed sage (*Artemisia frigida*), rubber rabbitbrush (*Ericameria nauseosa* var. *graveolens*) and greasewood (*Sarcobatus vermiculatus*) are sometimes present. The latter two are more common westward. Some clay pans are completely covered by short-grass prairie dominated by buffalo grass.

2) Pierre Shale Outcrop - corresponds to areas of Samsil-Shale Outcrop polygons and is mostly present in extreme northern Sioux and northwestern Dawes counties. The outcrops frequently occurs on hilltops with shallow soils overlying Pierre Shale, and the majority of sites are dominated by threadleaf sedge, and sideoats grama (*Bouteloua curtipendula*), often with western wheatgrass and blue grama as co-dominants. Other common species include broom snakeweed, buffalo grass, bushy flax, fringed sage, Plains prickly-pear (*Opuntia tortispina*), dotted gayfeather (*Liatris punctata*) and scarlet globe-mallow (Steinauer 2005). Yucca (*Yucca glauca*) is often associated with these sites as well.

Steep, eroding slopes of weathered Pierre Shale are sometimes sparsely-vegetated by Indian ricegrass (*Achnatherum hymenoides*), green needlegrass, and sideoats grama, often with other scattered herbs including false boneset (*Brickellia eupatorioides*), few-flower false buckwheat (*Eriogonum pauciflorum* var. *pauciflorum*), Maximilian's sunflower (*Helianthus maximiliani*), and ten-petal blazing-star (*Mentzelia decapetala*).

3) Chalk Prairie - occurs on silty clay loam soils (Penrose and Minnequa silty clay loams and Enning-Minnequa complex) associated with chalk/shale exposures in northwestern Sheridan and northeastern Dawes counties. Occurrences of this association are generally less than 10 acres in size with the largest documented area covering approximately 200 acres. These sites are very similar to Loess Mixed-grass Prairie of central Nebraska. Its dominant species include side oats grama (*Bouteloua curtipendula*) and little bluestem (*Schizachyrium scoparium*), often with abundant Junegrass (*Koeleria macrantha*) and yucca (*Yucca glauca*). Other common species include western wheatgrass, dotted gay feather, nine-anther prairie clover (*Dalea enneandra*), aromatic aster (*Symphotrichum oblongifolium*), slender-flower scurfpea (*Psoralidium tenuiflorum*), purple coneflower (*Echinacea angustifolia*), stiff sunflower (*Helianthus pauciflorus*), smooth blue aster (*Symphotrichum laeve*), and blue grama, with big bluestem (*Andropogon gerardii*) often locally common. Other unusual prairie types are present in this area, with sideoats

grama consistently among the dominant species, which may include green needlegrass, needle-and-thread, western wheatgrass, and blue grama.

**OTHER NOTEWORTHY SPECIES:** Uncommon species found in this community include *Coryphantha missouriensis*, *Erigeron divergens*, *Eriogonum gordonii*, *Fritillaria atropurpurea*, *Lappula fremontii*, *Mertensia lanceolata*, *Myosotis verna*, *Nuttallanthus texana*, and *Oenothera biennis*.

**STATE RANK:** S3

**RANK JUSTIFICATION:** This community is fairly extensive in the northwestern portion of the state. Many sites have been farmed at one time (and subsequently abandoned) and overgrazed by livestock. These sites are highly susceptible to invasive species.

**INVASIVE SPECIES OF CONCERN:** These sites are highly susceptible to invasion by alien annuals and biennials, with Japanese brome (*Bromus japonicus*) and sweetclovers (*Melilotus albus*, *M. officinalis*) the most abundant.

**GLOBAL RANK:** G4

**COMMENTS:** The description of this community is modified from Tolstead (1941) based on recent observations. Clay pan inclusions are treated by NatureServe as *Bouteloua gracilis* – *Buchloe dactyloides* Xeric Soil Herbaceous Vegetation, and the Pierre Shale/chalky shale inclusions may belong to Little Bluestem – (Sideoats Grama, Blue Grama) – Threadleaf Sedge Herbaceous Vegetation, but more information is needed.

**EXEMPLARY SITES:** Pasture 1N on the Oglala National Grasslands contains examples of this community with inclusions of the Pierre Shale Outcrop types.

## **WHEATGRASS WESTERN MIXED-GRASS PRAIRIE**

**ELEMENT CODE:** C EGL001578, C EGL002034

**GLOBAL NAME:** ?=*Pascopyrum smithii* – *Bouteloua gracilis* Herbaceous Vegetation (Western Wheatgrass – Blue Grama Mixed-grass Prairie), ?=*Pascopyrum smithii* – *Hesperostipa comata* Central Mixedgrass Herbaceous Vegetation (Western Wheatgrass – Needle-and-thread Mixed-grass Prairie)

**OTHER NAMES:** >Wheatgrass Basin Prairie (1<sup>st</sup>, 2<sup>nd</sup> ed.), <Western Mixed-grass Prairie (1<sup>st</sup>-3<sup>rd</sup> ed.)

**SYSTEM PLACEMENT:** Northwestern Great Plains Mixed-grass Prairie, Western Great Plains Mixed-grass Prairie

RANGE: This community occurs in the High Plains region of western Nebraska, and appears to be more common northward. It may also be present north of the Pine Ridge and eastward in the eastern Nebraska loess hills, but its eastern limit is unknown.

EPA ECOREGIONS: 25, 27e?, 43g

ENVIRONMENTAL DESCRIPTION: This community occurs primarily on lower slopes and level bottoms, but also on gently rolling topography. Soils are well drained and relatively deep loams, sandy loams and silt loams formed mostly in colluvium from Tertiary sandstone and siltstone outcrops, sometimes mixed with loess.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Herbaceous: blue grama (*Bouteloua gracilis*), needle-and-thread (*Hesperostipa comata*), little barley (*Hordeum pusillum*), little bluestem (*Schizachyrium scoparium*), western wheatgrass (*Pascopyrum smithii*)

DIAGNOSTIC SPECIES: *Bouteloua gracilis*, *Pascopyrum smithii*

VEGETATION DESCRIPTION: This community is dominated by mid-height (0.5-1 m) cool-season graminoids, primarily western wheatgrass and/or needle-and-thread, and short, warm-season blue grama. Shrubs are uncommon or absent, and overall species diversity is fairly low. Among the scattered herbaceous plants are scarlet gaura (*Gaura coccinea*), fringed puccoon (*Lithospermum incisum*), skeletonplant (*Lygodesmia juncea*), common peppergrass (*Lepidium densiflorum*) and narrow-leaf four-o'clock (*Mirabilis linearis*). Often cheatgrass (*Bromus tectorum*, *B. japonicus*) may be common in areas that are heavily grazed, while Kentucky bluegrass (*Poa pratensis*) may be abundant in some areas.

OTHER NOTEWORTHY SPECIES: none recorded

STATE RANK: S4

RANK JUSTIFICATION: Though its whole extent is unknown, this community is fairly widespread and most examples are degraded, with some perhaps representing abandoned cropland. In some cases it may represent a degraded condition of Threadleaf Sedge Mixed-grass Prairie, though it was apparently a former matrix type in some areas of the Panhandle.

GLOBAL RANK: G5

COMMENTS: This community has formerly been interpreted as a persistent degraded phase of Threadleaf Sedge Western Mixed-grass Prairie in which western wheatgrass replaces the sedge as a result of heavy grazing (even though both are palatable to cattle). Areas within threadleaf sedge dominated prairie that are heavily grazed have been observed, but they tend to be occupied by blue grama – buffalo grass short-grass disclimax. It appears this community is a phase of

prairie that occupies areas in which finer sediments have accumulated in the soils, creating conditions favoring western wheatgrass, which also is dominant on the fine-textured soils of extreme northwest Nebraska. Although erosion due to human disturbance may increase the extent of this community (some abandoned cropfields may contain a degraded version of it), this community appears to be a persistent, naturally-occurring grassland type. It appears to be the matrix community of the now mostly-farmed tablelands of southern Dawes County (Steinauer 2005), and historical reports indicate it was the prevailing grassland type from Alliance south to the North Platte River breaks (Bessey 1898).

EXEMPLARY SITES: Small sites are observable at Scotts Bluff National Monument in Scotts Bluff County.

### **GREAT PLAINS GRAVEL/COBBLE PRAIRIE**

ELEMENT CODE: not yet assigned

GLOBAL NAME: not yet assigned

OTHER NAMES: <Mixed Prairie (Churchill *et al.* 1988), >Northern Sand/Gravel Prairie (1<sup>st</sup>-3<sup>rd</sup> ed.), <Southern Sand/Gravel Prairie (1<sup>st</sup>-2<sup>nd</sup> ed.), >Gravelly Western Mixed Grass Prairie (Steinauer 2005)

SYSTEM PLACEMENT: Western Great Plains Mixed-grass Prairie

RANGE: This community is concentrated primarily in north-central Nebraska from northern Brown County discontinuously eastward into northeastern Holt County, with outliers eastward in western Knox, and northwest Antelope counties. A second concentration is found in southwest Nebraska, primarily in Deuel and Keith counties, though small isolated examples may be found westward into Cheyenne, Kimball, and Morrill counties.

EPA ECOREGIONS: 25d, 25f, 25h, 42p, 44a, 44c

ENVIRONMENTAL DESCRIPTION: This community occurs on fairly level to rolling topography associated with river bluffs and terraces. In northern Nebraska, soils are formed in Pliocene Long Pine Gravels that are associated with ancient stream terraces, and are particularly abundant south of the Niobrara River. In southwest Nebraska, this community occurs on coarse sand and gravel soils (Blueridge, Dix, Eckley soils) associated with the bluffs of the North Platte River, South Platte River, Pumpkin Creek and Lodgepole Creek in Keith, Deuel, Cheyenne, Kimball Banner and Morrill counties. Soils tend to be rapidly drained.

COWARDIN WETLAND SYSTEM: Upland

#### MOST ABUNDANT SPECIES:

Herbaceous: western ragweed (*Ambrosia psilostachya*), fringed sage (*Artemisia frigida*), blue grama (*Bouteloua gracilis*), sideoats grama (*B. curtipendula*), prairie sandreed (*Calamovilfa longifolia*), needle-and-thread (*Hesperostipa comata*), hairy golden-aster (*Heterotheca villosa*), prickly-pears (*Opuntia* spp.), ledge spike-moss (*Selaginella rupestris*), little bluestem (*Schizachyrium scoparium*), sand dropseed (*Sporobolus cryptandrus*), stiff greenthread (*Thelesperma filifolium* var. *intermedium*), rayless greenthread (*T. megapotamicum*)

DIAGNOSTIC SPECIES: *Artemisia frigida*, *Bouteloua gracilis*, *Phemeranthus parviflorus*, *Selaginella rupestris*

VEGETATION DESCRIPTION: This community is sparsely to moderately vegetated by an open layer of mixed-grasses usually partly reflecting the species composition of the surrounding prairie. Prairie sandreed is the only common tall grass. Most of the graminoid component is made up of mid grasses *ca.* 1 m tall, including needle-and-thread and (in southwest Nebraska) little bluestem and sideoats grama. Blue grama is the most abundant short grass. Shrubs are not usually present, though subshrubs such as fringed sage (*Artemisia frigida*) and yucca (*Yucca glauca*) may be locally common, and leadplant (*Amorpha canescens*) is common locally in southwest Nebraska. The many sites often have a turf-like underlayer of the lycophyte ledge spike-moss. An array of herbaceous perennials and annuals are usually present, but most species are not abundant. The most common species include western ragweed, hairy golden-aster, and stiff greenthread in northern Nebraska, with stiff greenthread, rayless greenthread, prickly-pear, goldenaster and fringed sage common in the southwest. Species diversity is moderate to quite high.

OTHER NOTEWORTHY SPECIES: *Dalea cylindriceps* and *Echinocereus viridiflorus* are associated with these sites in southwest Nebraska. *Phemeranthus calycinus* may be found on sites in northern Nebraska.

STATE RANK: S3

RANK JUSTIFICATION: This community is fairly widespread but not particularly abundant wherever it occurs. In most sites the greatest threat is from overgrazing, though a few sites have been converted to gravel quarries.

GLOBAL RANK: GNR

COMMENTS: This community combines the Northern Sand/Gravel Prairie of previous classifications with the western component of the Southern Sand/Gravel Prairie which was uncomfortably grouped with the gravelly prairies of southeast Nebraska in the first two editions of this classification. As currently defined, these areas represent gravelly inclusions within mixed-grass prairie, with the southwestern examples usually found in a matrix of Threadleaf Sedge Western Mixed-grass Prairie, and the northern ones in a sand prairie matrix. Some sites are apparently transitional to sand prairie, such as the ones in Morrill County, but most sites represent species-rich islands within mixed-grass prairie communities and serve as home to



species not otherwise found in those communities. The placement of this community into *Pascopyrum smithii* – *Hesperostipa comata* Central Mixed-grass Herbaceous Vegetation by NatureServe is highly doubtful.

EXEMPLARY SITES: The Niobrara Valley Preserve in Brown and Cherry counties has small examples of the northern phase, and slightly more extensive ones occur at Long Pine State Recreation Area in Brown County and Grove Lake Wildlife Management Area in Antelope County. The best examples of the southwestern prairies are found on private property, and the Wagon Box Ranch in northwestern Cheyenne County and Trailer Park Gulch in Deuel County support the best examples.

## WESTERN FLOODPLAIN TERRACE GRASSLAND

ELEMENT CODE: CEG001580, CEG001583

GLOBAL NAME: >*Pascopyrum smithii* – *Distichlis spicata* Herbaceous Vegetation (Western Wheatgrass – Saltgrass Saline Prairie), >*Pascopyrum smithii* – *Nassella viridula* Herbaceous Vegetation (Western Wheatgrass – Green Needlegrass Mixedgrass Prairie)

OTHER NAMES: =alkaline floodplain community (Hildebrand 1997), >alkaline intermittent stream bottom (1<sup>st</sup> ed.), >wheatgrass basin prairie (1<sup>st</sup>, 2<sup>nd</sup> ed.)

SYSTEM PLACEMENT: Northwestern Great Plains Riparian

RANGE: This community is found along rivers and in stream valleys through at least the western half of the Panhandle from Dawes and Sioux counties southward to Kimball County.

EPA ECOREGIONS: 25d, 25g, 43

ENVIRONMENTAL DESCRIPTION: This community occurs on nearly level ground in floodplains of rivers and streams, including ephemeral streams. These areas may flood briefly in spring or following heavy rains but are usually somewhat well-drained. Soils are slightly to moderately alkaline clay loams, silt loams, and sandy loams formed in alluvium.

COWARDIN WETLAND SYSTEM: Upland (but may be briefly inundated after infrequent heavy rains)

MOST ABUNDANT SPECIES:

Herbaceous: inland saltgrass (*Distichlis spicata*), green needlegrass (*Nassella viridula*), western wheatgrass (*Pascopyrum smithii*), Kentucky bluegrass (*POA PRATENSIS*)

DIAGNOSTIC SPECIES: *Cirsium flodmanii*, *Equisetum laevigatum*, *Glycyrrhiza lepidota*, *Pascopyrum smithii*

VEGETATION DESCRIPTION: This community is dominated by herbaceous graminoids *ca.* 1 m tall with western wheatgrass the dominant native species. Two intergrading phases are recognized:

- 1) western wheatgrass – green needlegrass (Kentucky bluegrass) phase - is dominated primarily by western wheatgrass, with green needlegrass common in silty and clay soils, and Kentucky bluegrass frequently abundant as well. Scattered cottonwood (*Populus deltoides*) trees and patches of shrubs, most commonly wolfberry (*Symphoricarpos occidentalis*), are typical, though silver sagebrush (*Artemisia cana*) may be frequently common in the Oglala National Grasslands. Native perennials are scattered to common, particularly near streambanks, and include wild licorice (*Glycyrrhiza lepidota*), prairie coneflower (*Ratibida columnifera*), Flodman's thistle (*Cirsium flodmanii*), and white sage (*Artemisia ludoviciana*). Grazed areas may contain much blue grama (*Bouteloua gracilis*), and many sites are commonly infested with alien species. Species diversity is low to moderate.
- 2) western wheatgrass – inland saltgrass phase - which occurs in slightly more alkaline soils, is dominated by western wheatgrass and inland saltgrass, and contains fewer woody and herbaceous species, though other halophytic graminoids such as scratchgrass (*Muhlenbergia asperifolia*) and alkali sacaton (*Sporobolus airoides*) may be present. This area is prone to disturbance and invasion by Canada thistle and Russian orache (*Atriplex heterosperma*), and in general has very low species diversity.

OTHER NOTEWORTHY SPECIES: Information not available

STATE RANK: S3

RANK JUSTIFICATION: Although the overall range of this community is unknown, it is fairly extensive where it occurs, though frequently degraded.

INVASIVE SPECIES OF CONCERN: Grazed sites may be infested by smooth brome (*Bromus inermis*), sweetclovers (*Melilotus* spp.), Canada thistle (*Cirsium arvense*), cheatgrass (*Bromus* spp.) and Kentucky bluegrass.

GLOBAL RANK: G4

COMMENTS: This is a very heterogeneous community that will probably need to be split into separate communities in the future. The wheatgrass –green needlegrass phase of this community is similar to the Wheatgrass Basin Prairie of the second edition of this classification (which in turn was often confused with the Wheatgrass Playa Grassland in practice). Both are probably best included in the *Pascopyrum smithii* – *Nassella viridula* Herbaceous Vegetation of NatureServe and are therefore combined here. The distinctions between the alkaline phase of this community and the Western Alkaline Meadow community need to be investigated. The extremes are distinct, but in many places (such as the Oglala National Grasslands) they mix together to such a degree as to be nearly inseparable.

EXEMPLARY SITES: Extensive occurrences of this community are found along the Niobrara River at Agate Fossil Beds National Monument in Sioux County.

## SILVER SAGEBRUSH SHRUB PRAIRIE

ELEMENT CODE: CEG001072

GLOBAL NAME: =? *Artemisia cana* / *Pascopyrum smithii* Shrubland (Silver Sagebrush / Western Wheatgrass Shrubland)

OTHER NAMES: >Basin silver sagebrush/Western wheatgrass community (Jones & Walford 1995); >Silver sagebrush shrubland (1<sup>st</sup> ed.); >Hat Creek Basin Terrace Prairie, >Sideoats-Sandreed Terrace Prairie (2<sup>nd</sup> ed.)

SYSTEM PLACEMENT: Northwestern Great Plains Riparian

RANGE: This community is known only from the White River and Hat Creek drainages in Dawes and Sioux counties.

EPA ECOREGION: 43g

ENVIRONMENTAL DESCRIPTION: This community occurs on terraces in the floodplains of intermittent streams, and perhaps also on adjacent uplands. Soils are moderately deep, poorly drained loams, silty loams, and sandy loams formed in alluvium. These sites may be briefly inundated following heavy rains.

COWARDIN WETLAND SYSTEM: Upland (but may be briefly inundated after infrequent heavy rains)

MOST ABUNDANT SPECIES:

Shrub: silver sagebrush (*Artemisia cana*)

Herbaceous: blue grama (*Bouteloua gracilis*), buffalograss (*Buchloë dactyloides*), needle-and-thread (*Hesperostipa comata*), green needlegrass (*Nassella viridula*), western wheatgrass (*Pascopyrum smithii*), sand dropseed (*Sporobolus cryptandrus*)

DIAGNOSTIC SPECIES: *Artemisia cana*, *Hesperostipa comata*, *Pascopyrum smithii*, *Sporobolus cryptandrus*

VEGETATION DESCRIPTION: This community is dominated by mid and short-grasses  $\leq 1$  m tall. Western wheatgrass is usually dominant, with needle-and-thread conspicuous and co-dominant, while blue grama and buffalo-grass are abundant locally in some sites. Other grasses frequently present include sand dropseed and green needlegrass, and at a few sites (particularly in sandy loams) prairie sandreed (*Calamovilfa longifolia*) may be abundant. In the Hat Creek basin of Nebraska, silver sagebrush is usually present in this community, though it rarely occurs

at a density high enough for this community to be regarded as shrubland. Herbaceous plants are scattered to infrequent, and those most frequently encountered include slender-flower scurfpea (*Psoralidium tenuiflorum*), prickly pears (*Opuntia polyacantha* and *O. tortispina*), skeletonplant (*Lygodesmia juncea*), scarlet globe mallow (*Sphaeralcea coccinea*), and scarlet gaura (*Gaura coccinea*).

In the adjacent White River Drainage this community is replaced by a sideoats-sandreed phase dominated by sideoats grama (*Bouteloua curtipendula*) and/or little bluestem (*Schizachyrium scoparium*), with prairie sandreed often common. It tends to have a lower density of shrubs, with wolfberry (*Symphoricarpos occidentalis*) sometimes locally common with silver sagebrush. These sites also tend to have a slightly higher species diversity, with frequently represented plants including fringed sage (*Artemisia frigida*), white sage (*A. ludoviciana*), broom snakeweed (*Gutierrezia sarothrae*), slender-flower scurfpea (*Psoralidium tenuiflorum*), and yucca (*Yucca glauca*). These sites intergrade near the divide of the two drainages. Species diversity is low to moderate overall.

OTHER NOTEWORTHY SPECIES: Information not available

STATE RANK: S2

RANK JUSTIFICATION: Although it barely enters the state, this community appears widespread in the Hat Creek Basin and is protected in several sites in the Oglala National Grassland. It is susceptible to degradation by overgrazing.

INVASIVE SPECIES OF CONCERN: Invasive alien species are usually present and may be common, with sweetclovers (*Melilotus* spp.) and Japanese brome (*Bromus japonicus*) the most frequent.

GLOBAL RANK: G4

COMMENTS: Silver sagebrush rarely occurs at densities high enough to be regarded as shrubland, and occurs in more than one grassland type as well (it is also common in the Western Floodplain Terrace Meadow community, at least in the Hat Creek Basin). Hildebrand's (1997) report of silver sagebrush shrubland in Nebraska appears to represent this community. This community is at the eastern limit of its distribution in extreme northwestern Nebraska, but may also occur in Dawes, Scotts Bluff, and Sheridan counties. The *Nassella-Pascopyrum-Artemisia cana* terrace prairie community of Rolfsmeier (1998) is included here until further study can determine its proper disposition.

The White River phase of this community is included with the Silver Sagebrush shrubland of the Hat Creek drainage because it occupies a similar position in the landscape, and the two have been observed to mix together along Whitehead Creek north of Toadstool geologic park in Sioux County. The differences in its species composition may be due to the influence of species associated with nearby communities of the Pine Ridge.

EXEMPLARY SITES: Extensive examples of the Hat Creek phase are found along Hat Creek in Pasture 15 of the Oglala National Grasslands in northern Sioux County, and examples of the

White River phase are best developed along Sand Creek east of Toadstool Rd. in Pasture 40W of the Oglala National Grasslands in Dawes County.

## **GREASEWOOD SHRUB PRAIRIE**

ELEMENT CODE: CEGl001508

GLOBAL NAME: =*Sarcobatus vermiculatus* / *Pascopyrum smithii* – (*Elymus lanceolatus*)  
Shrub Herbaceous Vegetation (Greasewood – Western Wheatgrass Shrub Prairie)

OTHER NAMES: =Black greasewood/western wheatgrass community (Jones & Walford 1995),  
=Arvada shrub prairie (2<sup>nd</sup> ed.)

SYSTEM PLACEMENT: Northwestern Great Plains Riparian

RANGE: This community is probably restricted to the Hat Creek Basin in northern Sioux County, but is also possible in northern Dawes and Sheridan counties, and in Scotts Bluff County.

EPA ECOREGIONS: 43g

ENVIRONMENTAL DESCRIPTION: This community occurs in nearly level ground on upland terraces adjacent to stream valleys in the Hat Creek Basin. Soils are poorly drained alkaline clay and silty clay loams formed in weathered shale (all known Nebraska occurrences are in loams of the Arvada series). Salt crusts may form in slight depressions.

COWARDIN WETLAND SYSTEM: Upland (but may be briefly inundated after infrequent heavy rains)

MOST ABUNDANT SPECIES:

Shrub: rubber rabbitbrush (*Ericameria nauseosa* var. *graveolens*), greasewood (*Sarcobatus vermiculatus*)

Herbaceous: blue grama (*Bouteloua gracilis*), buffalograss (*Buchloë dactyloides*), inland saltgrass (*Distichlis spicata*), spine-fruit prickly pear (*Opuntia polyacantha*), western wheatgrass (*Pascopyrum smithii*), alkali sacaton (*Sporobolus airoides*)

DIAGNOSTIC SPECIES: *Opuntia polyacantha*, *Pascopyrum smithii*, *Sarcobatus vermiculatus*, *Sporobolus airoides*

VEGETATION DESCRIPTION: The vegetation of this community is relatively sparse and dominated by mid grasses < 1 m tall. Western wheatgrass is by far the most common species. Other common graminoids that may be abundant locally include blue grama, buffalograss, and inland saltgrass along with alien species such as cheatgrasses (*Bromus japonicus*, *B. squarrosus*,

and *B. tectorum*). A medium-tall (0.5–1.5 m) shrub overlayer of greasewood is sometimes present, but cover is rarely dense enough to qualify as shrubland. Rabbitbrush may also be common locally, along with four-wing saltbush (*Atriplex canescens*). Many sites contain no shrub layer, but have an abundance of prickly pear. These sites are commonly associated with clay pans. Few other plants are present in this community, though two-grooved milkvetch (*Astragalus bisulcatus*) is one of the more conspicuous ones. Species diversity is low.

OTHER NOTEWORTHY SPECIES: Information not available

STATE RANK: S2

RANK JUSTIFICATION: This community is of limited extent in Nebraska, and may be subject to heavy grazing.

INVASIVE SPECIES OF CONCERN: Cheatgrass (*Bromus japonicus*, *B. tectorum*) is problematic in grazed sites.

GLOBAL RANK: G4

COMMENTS: This community is poorly studied and may be a combination of several types or subtypes. The NatureServe name seems to apply to temporarily flooded sites, but most Nebraska sites are on high upland terraces. A few areas of steep eroded clay banks covered with greasewood are known along Indian Creek and near Hat Creek in Sioux County, and probably are best regarded as a phase of this community. At least in the Oglala National Grasslands, prairie dogs are often associated with this community.

EXEMPLARY SITES: Extensive sites are found in Pastures 1N and 15 in the Oglala National Grasslands in Sioux County.

## WETLAND SPARSELY VEGETATED COMMUNITIES

### PERENNIAL SANDBAR

ELEMENT CODE: CEG001203

GLOBAL NAME: <*Salix exigua* / Mesic Graminoids Shrubland (Coyote Willow / Mesic Graminoids Shrubland)

OTHER NAMES: =Perennial mudflat (Currier 1982), =willow meadow (Morrison 1935), =willow sandbar (1<sup>st</sup> ed.).

SYSTEM PLACEMENT: Eastern Floodplain Wetland, Western Great Plains Floodplain

RANGE: This community is found in the channels of streams and braided rivers throughout the state.

EPA ECOREGIONS: 25, 27, 42, 43?, 44, 47

ENVIRONMENTAL DESCRIPTION: This community is found on sandbars, islands, and shorelines of streams and rivers. Soils are poorly developed and composed of sand with lesser amounts of clay, silt, and gravel formed in alluvium. Drainage varies with soil texture and height above the rivers' surface.

COWARDIN WETLAND SYSTEM: Palustrine emergent, temporarily and seasonally flooded.

MOST ABUNDANT SPECIES:

Shrub: false indigobush (*Amorpha fruticosa*) [saplings], cottonwood (*Populus deltoides*) [saplings], willows (*Salix amygdaloides*, *S. famelica*, *S. interior*) [saplings]

Herbaceous: beggar-ticks (*Bidens* spp.), sedges (*Carex emoryi*, in particular), bald spikerush (*Eleocharis erythropoda*), field horsetail (*Equisetum arvense*), rushes (*Juncus* spp.), blue lobelia (*Lobelia siphilitica*), common water-horehound (*Lycopus americanus*), winged loosestrife (*Lythrum alatum*), smartweeds (*Persicaria* spp.), three-square bulrush (*Schoenoplectus pungens*), late goldenrod (*Solidago gigantea*), prairie cordgrass (*Spartina pectinata*), prairie wedgegrass (*Sphenopholis obtusata*), cocklebur (*Xanthium strumarium*)

DIAGNOSTIC SPECIES: *Salix interior*, *Spartina pectinata*

VEGETATION DESCRIPTION: The vegetation of this herbaceous community is quite variable, and is generally dominated by short shrubs, sapling trees, and grasses *ca.* 1 m tall. Shrubs in this community are young saplings with sandbar willow (*Salix interior*) usually the common species, and these are often co-dominant with tall perennial graminoids such as prairie cordgrass, sedges, horsetails (*Equisetum* spp.) or numerous coarse perennial herbs including goldenrods (*Solidago* spp.) and asters (*Symphotrichum* spp.). Occasionally introduced grasses such as redtop (*Agrostis gigantea*) or Kentucky bluegrass (*Poa pratensis*) may be abundant. Cover varies from relatively dense to somewhat sparse and shrub and herbaceous strata are intermingled and of equal height, so that this community is not truly a shrubland. In some sites, the woody component may be fairly sparse, but is generally always present. Annuals of sandbars and mudflats are often present, but not dominant, and include tall, coarse annuals such as beggarticks, smartweeds, and cockleburs, which may be nearly as tall as the shrub layer. Species diversity is low to moderate.

OTHER NOTEWORTHY SPECIES: Information not available

STATE RANK: S3S4

RANK JUSTIFICATION: The overall extent of this community in Nebraska is not well known. Reduced river flows may make the floods necessary to maintain this community infrequent.

INVASIVE SPECIES OF CONCERN: Purple loosestrife (*Lythrum salicaria*) may invade this community and displace the native species.

GLOBAL RANK: G5

COMMENTS: This community is similar to wet meadow and wet prairie communities, but usually with a more pronounced woody component. Many sites represent early successional stages of sandbar willow shrubland, but sandbar willow is not ubiquitous in all sites. Perennial Sandbar is a heterogeneous community that covers all river channel communities dominated by perennial hydrophytes. Frequent flooding may prevent this community from undergoing succession in some sites. More study of this community type is needed. Though it has been included in the *Salix exigua* / Mesic Graminoids Shrubland community, not all sites appear to belong to that community.

EXEMPLARY SITES: Many sites are present along the Loup and Platte rivers.

### **SANDBAR/MUDFLAT**

ELEMENT CODE: CEG002049

GLOBAL NAME: Riverine Sand Flats-Bars Sparse Vegetation

OTHER NAMES: =Annual mudflat (Currier 1982)

SYSTEM PLACEMENT: Eastern Floodplain Wetland, Western Great Plains Floodplain

RANGE: This community occurs within the channel of larger streams and rivers throughout the state.

EPA ECOREGIONS: 25, 27, 42, 43, 44, 47

ENVIRONMENTAL DESCRIPTION: This community occurs within the channel of braided streams and rivers, which are subject to regular flooding. Sandbars are formed when receding floodwaters deposit sand and lesser amounts of clay, silt, and cobbles in the streambed, and may rise up to one meter above the water surface. Soils are often undeveloped or poorly developed due to the ephemeral nature of sandbars and usually consist of sand, silt or gravel formed in alluvium. Drainage varies with soil texture and elevation above the water surface. Sandbars are usually first formed in June, and are highly vulnerable to undercutting and erosion throughout the year. Many sandbars survive only to the following spring. This community also occurs on the banks of rivers and streams as water levels fall late in the season and during drought.

COWARDIN WETLAND SYSTEM: Riverine unconsolidated bottom, temporarily to seasonally flooded



#### MOST ABUNDANT SPECIES:

Herbaceous: beggarticks (*Bidens* spp.), flatsedges (*Cyperus* spp.), large barnyard grass (*ECHINOCHLOA CRUS-GALLI*), teal lovegrass (*Eragrostis hypnoides*), Carolina lovegrass (*E. pectinacea*), bearded sprangletop (*Leptochloa fusca*), smartweeds (*Persicaria* spp.), Plains cottonwood (*Populus deltoides*) [seedlings], bog yellowcress (*Rorippa* spp.), willows (*Salix* spp.) [seedlings], sand dropseed (*Sporobolus cryptandrus*), cocklebur (*Xanthium strumarium*)

DIAGNOSTIC SPECIES: *Cyperus squarrosus*, *C. diandrus*, *C. erythrorhizos*, *Echinochloa crusgalli*, *Eragrostis pectinacea*, *Lipocarpa micrantha*

VEGETATION DESCRIPTION: The vegetation is highly variable due to the ephemeral, successional nature of the community. Recently exposed sandbars are initially devoid of vegetation, but are soon colonized by opportunistic annual herbs and graminoids, usually under 0.5 m tall. Lower areas adjacent to the river channel are dominated by hydrophytic species, while higher areas of the sandbar are dominated by plants tolerant of the drier conditions present on the more rapidly drained soils. Species diversity is low to moderate.

OTHER NOTEWORTHY SPECIES: Uncommon species known from this community include *Fimbristylis autumnalis*, *Leucospora multifida*, *Myosotis laxa*, *Rotala ramosior*, and *Triglochin palustris*.

STATE RANK: S5

RANK JUSTIFICATION: This community is still fairly common along the Platte River, Loup River, unchannelized portions of the Elkhorn River and Missouri River, and their larger tributaries. In some areas this community has been impacted by channelization (especially along the Missouri River) and reduced stream flows and subsequent encroachment of woody vegetation (such as along the Platte River).

GLOBAL RANK: G4G5

COMMENTS: This community is rather short-lived and rarely persists more than a single season before it is either destroyed by flooding or succeeds to secondary communities such as Perennial Sandbar or Sandbar Willow Shrubland. Certain sites may have over 25% herbaceous cover in given years, but the overall vegetative cover is visibly sparser than in other wetland communities in the state.

EXEMPLARY SITES: The lower Platte River in eastern Nebraska.

### UPLAND SPARSELY VEGETATED COMMUNITIES

#### EASTERN SANDSTONE BLUFF AND CLIFF

ELEMENT CODE: CEG002045

GLOBAL NAME: =Sandstone Dry Cliff Sparse Vegetation (Midwest Dry Sandstone Cliff)

SYSTEM PLACEMENT: Western Great Plains Cliff and Outcrop

RANGE: This community is found most commonly in the Smoky Hills region in Jefferson County, and occasionally in the bluffs along the Missouri River, particularly in Dakota and Thurston County.

EPA ECOREGIONS: 27a, 47h, 47i

ENVIRONMENTAL DESCRIPTION: This community occurs on moderate (40-60%) or steep (60% or greater) slopes of sandstone (usually with interbedded shales), primarily of the Cretaceous Dakota Sandstone formation. Cliffs may range from 3 m to over 50 m high. Soils are poorly developed or absent.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Herbaceous: poorly known and variable

DIAGNOSTIC SPECIES: *Pellaea atropurpurea*

VEGETATION DESCRIPTION: Vegetation in this community is extremely sparse, and the steeper (cliff) sites are unvegetated or may contain scattered plants of purple cliffbrake (*Pellaea atropurpurea*), mosses and lichens. In the Smoky Hills, plants occurring on more gentle bluff slopes often have patches of sand covering the rock face with may be home to grasses typical of sandy prairie, such as three-awns (*Aristida* spp.) and hairy grama (*Bouteloua hirsuta*), occurring occasionally with frostweed (*Crocanthemum bicknellii*), slender knotweed (*Polygonum tenue*), and other herbs found in sandy tall-grass prairie. Some sites may occur within forest or woodland and have ferns associated with them, such as Mackay's brittle fern (*Cystopteris tenuis*). Species diversity is usually quite low.

OTHER NOTEWORTHY SPECIES: *Aristida purpurascens*, *Crocanthemum bicknellii*, *Cystopteris tenuis*, and *Pellaea atropurpurea*.

STATE RANK: S4

RANK JUSTIFICATION: Although the range and extent of this community is limited, it has been impacted little by direct human disturbance, though fire suppression has allowed woody encroachment of some sites.

INVASIVE SPECIES OF CONCERN: Smooth brome (*Bromus inermis*) is sometimes associated with eroding Dakota Sandstone cliffs in Kansas, but has not been seen in Nebraska sites.

GLOBAL RANK: G4G5

COMMENTS: Some outcrops of Permian and Pennsylvanian sandstone may occur associated with forest in extreme southeast Nebraska, with Indian Cave in Richardson County being the best-known example. These sites may be included here or in the forest community in which they occur. Shaded examples of rock outcrops often have a different species composition and may deserve to be separated into a different community. Seeps are often associated with the bases of Dakota Sandstone bluff slopes in the Smoky Hills.

EXEMPLARY SITES: Steele City Canyon in Jefferson County and the Winnebago Reservation in Thurston County have examples of sandstone cliffs, and Rock Glen Wildlife Management Area in Jefferson County has examples of sandstone bluff slopes.

### **NORTHERN CHALK BLUFF AND CLIFF**

ELEMENT CODE: CEG002046

GLOBAL NAME: =?Limestone-Dolostone Great Plains Xeric Cliff Sparse Vegetation (Great Plains Xeric Limestone - Dolostone Cliff)

SYSTEM PLACEMENT: Western Great Plains Cliff and Outcrop

RANGE: This community occurs along the south side of the Missouri River valley in Cedar and Knox counties in northeast Nebraska, and in the Chadron Dome – Limekiln Creek area in northeastern Dawes and northwestern Sheridan counties.

EPA ECOREGIONS: 25a, 47k

ENVIRONMENTAL DESCRIPTION: This community occurs on moderate (40-60%) or steep (60% or greater) slopes of chalk (usually with interbedded shales). In northeast Nebraska, these cliffs are associated with Niobrara Chalk, and the geology of the northwest Nebraska sites is still under study. Cliffs may range from 3 m to over 50 m high. Soils are poorly developed or absent.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Shrub: skunkbrush sumac (*Rhus aromatica* var. *trilobata*)

Herbaceous: Indian ricegrass (*Achnatherum hymenoides*), few-flower false buckwheat (*Eriogonum pauciflorum* var. *pauciflorum*), broom snakeweed (*Gutierrezia sarothrae*), ten-petal blazing-star (*Mentzelia decapetala*), little bluestem (*Schizachyrium scoparium*)

DIAGNOSTIC SPECIES: *Mentzelia decapetala*, *Eriogonum pauciflorum* var. *pauciflorum*, *Stanleya pinnata*

VEGETATION DESCRIPTION: Vegetation in this community is sparse, and the steeper (cliff) sites are unvegetated, or may contain scattered plants of ten-petal mentzelia (*Mentzelia decapetala*) in addition to lichens. In northwestern Nebraska, this community occurs on eroded slopes, ridge tops, and gullies. The most common species present include dwarf prairie rose (*Rosa arkansana*), sand cherry (*Prunus pumila*), ten-petal blazing-star, few-flowered false buckwheat, Great Plains bladderpod (*Physaria arenosa* var. *argillosa*), butte candle (*Cryptantha celosioides*), broom snakeweed, little bluestem, Indian rice grass, and skunkbrush sumac. Prince's plume (*Stanleya pinnata*) is common and conspicuous in this area, but rare to absent elsewhere in the state. Species diversity of cliffs is extremely low, and the diversity of the northwestern Nebraska bluffs is low to moderate.

OTHER NOTEWORTHY SPECIES: *Linum lewisii*, *Lomatium nuttallii*, *Physaria arenosa* var. *argillosa*, *Stanleya pinnata*

STATE RANK: S5

RANK JUSTIFICATION: Although the range and extent of this community is limited, it has been impacted little by disturbance.

INVASIVE SPECIES OF CONCERN: Cheat grass (*Bromus japonicus*, *B. tectorum*) may become established wherever a shallow layer of soil is present.

GLOBAL RANK: GNR

COMMENTS: The northeast and northwest Nebraska examples of this community are quite different, with the western examples often having more species in common with badlands than with other rock outcrop communities. The Niobrara Chalk cliffs of the upper Missouri definitely fit within the global community, but the northwestern ones may have more in common with areas peripheral to the Black Hills in South Dakota. It appears it may be best to split this community, but more data are needed. Steinauer (2005) reports juniper encroachment as a threat to the chalky bluffs of northwestern Nebraska, but historical reports suggest that this area has long been known for its groves of red-cedar (*cf.* Tolstead 1942).

Chalky cliffs associated with the Republican River in Franklin and Webster counties may need to be separated into a "Southern Chalk Bluff and Cliff community" that has affinities to communities in Kansas. Pierre Shale exposures are also present along the upper Republican, lower Niobrara and Keya Paha rivers, as well as on the Pierre Shale Plains. At present these sites are considered inclusions within prairie communities. Though most examples are easily eroded and weedy, some examples in extreme northwestern Nebraska contain unique suites of species including Gordon's false-buckwheat (*Eriogonum gordonii*).

EXEMPLARY SITES: A number of cliffs are present along the south side of Lewis & Clark Lake in Knox County. The northwestern Nebraska sites are all on private lands.

## WESTERN SANDSTONE CLIFF

ELEMENT CODE: C EGL005257

GLOBAL NAME: =Sandstone Great Plains Dry Cliff Sparse Vegetation (Great Plains Dry Sandstone Cliff)

OTHER NAMES: =Dry Cliff (1<sup>st</sup>-3<sup>rd</sup> ed.)

SYSTEM PLACEMENT: Western Great Plains Cliff and Outcrop

RANGE: This community is restricted to the unglaciated Great Plains, and is primarily associated with escarpments in the Panhandle, especially the Pine Ridge and Wildcat Hills. It is present locally in the central Niobrara River valley.

EPA ECOREGIONS: 25, 43r

ENVIRONMENTAL DESCRIPTION: This community occurs on steep (60% or greater) slopes of sandstone or siltstone escarpments. In the northern Panhandle, most cliffs are associated with sandstones and siltstones of the Tertiary Arikaree Group, and in the Niobrara River valley, with the Rosebud formation of the White River Group. Cliffs may range from 3m to over 100 m high. Soils are not developed.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Herbaceous: ten-petal blazing-star (*Mentzelia decapetala*), smooth beardtongue (*Penstemon glaber*).

DIAGNOSTIC SPECIES: *Mentzelia decapetala*, *Penstemon glaber*

VEGETATION DESCRIPTION: Vegetation in this community is extremely sparse, and many sites are unvegetated. Plants occurring in this community are usually scattered perennial herbs that often do not flower. Occasionally grasses and other herbaceous or woody species typically associated with outcrops may be present on narrow ledges. Species diversity is extremely low.

OTHER NOTEWORTHY SPECIES: Certain species of lichens may be restricted to these habitats.

STATE RANK: S5

RANK JUSTIFICATION: Although the range and extent of this community is limited, it has been impacted little by disturbance.

INVASIVE SPECIES OF CONCERN: Occasionally cheatgrasses (*Bromus* spp.) may occur in unconsolidated colluvium on slopes and ledges.

GLOBAL RANK: G4G5

COMMENTS: Vegetation associated with cliffs in the central Niobrara valley is poorly known.

EXEMPLARY SITES: Scotts Bluff National Monument in Scotts Bluff County.

## **ROCK OUTCROP**

ELEMENT CODE: CEG002047

GLOBAL NAME: =Siltstone - Sandstone Rock Outcrop Sparse Vegetation (Siltstone – Clay Rock [?] Outcrop)

SYSTEM PLACEMENT: Western Great Plains Cliff and Outcrop

RANGE: This community is found on escarpments mostly in the Panhandle and southwest Nebraska.

EPA ECOREGIONS: 25a, 25c, 25d, 25f

ENVIRONMENTAL DESCRIPTION: This community occurs on nearly level to moderately steep (40% grade) upper and middle slopes on irregularly eroded rocky escarpments or ravines, but may also be present on ridgecrests. Substrates are generally Tertiary Sandstones of the Arikaree or Ogallala Groups, though some sparsely-vegetated siltstone bluffs may also be included here. Soils are poorly developed to absent, and consists of very shallow sandy loams or silty loams.

COWARDIN WETLAND SYSTEM: Upland

MOST ABUNDANT SPECIES:

Shrub: skunkbrush sumac (*Rhus aromatica* var. *trilobata*)

Herbaceous: standing milkvetch (*Astragalus laxmannii* var. *robustior*), tufted milkvetch (*A. spatulatus*), sideoats grama (*Bouteloua curtipendula*), blue grama (*B. gracilis*), mountain cat's-eye (*Cryptantha cana*), thickspike wheatgrass (*Elymus lanceolatus*), Hooker's sandwort (*Eremogone hookeri*), few-flower false buckwheat (*Eriogonum pauciflorum* var. *gnaphlodes*), broom snakeweed (*Gutierrezia sarothrae*), ten-petal blazing-star (*Mentzelia decapetala*), rock muhly (*Muhlenbergia cuspidata*), sand muhly (*M. pungens*), James' nailwort (*Paronychia jamesii* var. *depressa*), Hood's phlox (*Phlox hoodii*), lemon scurfpea (*Psoralidium lanceolatum*), stemless tetraeneuris (*Tetraeneuris acaulis*)

DIAGNOSTIC SPECIES: *Astragalus spatulatus*, *Cryptantha cana*, *Ericameria parryi* var. *howardii*, *Linanthus caespitosus*, *Paronychia jamesii* var. *depressa*, *P. sessiliflora*, *Penstemon eriantherus*, *P. glaber*, *Phlox hoodii*, *Stephanomeria runcinata*, *Tetraneuris acaulis*

VEGETATION DESCRIPTION: This community is sparsely to moderately vegetated by a mixture of short shrubs (<1 m tall), mid and short grasses, and forbs. The shrub component frequently consists of widely scattered individuals of skunkbrush sumac, though Parry's rabbitbrush (*Ericameria parryi* var. *howardii*) is common in the Wildcat Hills and mountain mahogany (*Cercocarpus montanus*) is present in some sites. Herbaceous perennials are usually more abundant than grasses in sites with little or no soil development. Hooker's sandwort, few-flower false buckwheat, and Hood's phlox are among the most abundant. Where a shallow layer of soil has developed, grasses are usually more abundant, with blue grama and thickspike wheatgrass among the more common species. Inclusions of Western Mixed-grass Prairie may be present in this community where the soil is slightly deeper. Species diversity in this community varies from relatively low to relatively high.

OTHER NOTEWORTHY SPECIES: Uncommon species found in this community include *Astragalus hyalinus*, *Ericameria parryi* var. *howardii*, *Erigeron ochroleucus*, *E. radicans*, *Eriogonum brevicaulis*, *E. cernuum*, *Fritillaria atropurpurea*, *Ipomopsis spicata*, *Linanthus caespitosus*, *Linum puberulum*, *Lomatium nuttallii*, *Oxytropis multiceps*, *Phacelia hastata*, *Physaria brassicoides*, *Potentilla hippiana*, *Stenotus armerioides*, and *Stephanomeria runcinata*.

STATE RANK: S4

RANK JUSTIFICATION: Though the range and extent of this community is limited, it has been little impacted by disturbance.

INVASIVE SPECIES OF CONCERN: Cheatgrasses (*Bromus japonicus*, *B. tectorum*) often establish where sediment collects on outcrops.

GLOBAL RANK: G4?

COMMENTS: This community, as currently defined, covers mostly level or gently sloping sandstone outcrops, as well as steep outcrops <3 m tall. It also includes all siltstone outcrops, including some tall enough to be classified as cliffs, though at present no global community designation exists for siltstone bluffs or cliffs. Such areas in the Pine Ridge and Wildcat Hills are often occupied by mixed-woodland of Rocky Mountain red-cedar (*Juniperus scopulorum*) and Ponderosa pine (*Pinus ponderosa*).

EXEMPLARY SITES: Mitchell Pass at Scotts Bluff National Monument in Scotts Bluff County.

## BADLANDS

ELEMENT CODE: C EGL002050, C EGL005270

GLOBAL NAME: =Eroding Great Plains Badlands Sparse Vegetation (Eroding Great Plains Badlands); =*Eriogonum pauciflorum* – *Gutierrezia sarothrae* Badlands Sparse Vegetation (Wild Buckwheat – Snakeweed Badlands Sparse Vegetation)

SYSTEM PLACEMENT: Western Great Plains Badlands

RANGE: This community occurs in Dawes, Scotts Bluff, and Sioux counties in the Panhandle.

EPA ECOREGIONS: 25f, 43g, 43h

ENVIRONMENTAL DESCRIPTION: This community is found on moderate to steep, highly erodible slopes of siltstone, clay, or clay with cobbles. There is little to no soil development. Most sites are bordered by level, mixed-grass prairie.

COWARDIN WETLAND SYSTEM: Upland

### MOST ABUNDANT SPECIES:

Shrub: silver sagebrush (*Artemisia cana*), winged saltbush (*Atriplex canescens*), rubber rabbitbrush (*Ericameria nauseosa*)

Herbaceous: silver orache (*Atriplex argentea*), thickspike wheatgrass (*Elymus lanceolatus*), few-flower false buckwheat (*Eriogonum pauciflorum* var. *pauciflorum*), poverty weed (*Monolepis nuttalliana*), Russian thistles (*KALI* spp.)

DIAGNOSTIC SPECIES: *Astragalus multiflorus*, *Atriplex canescens*, *Ericameria nauseosa*, *Eriogonum pauciflorum* var. *pauciflorum*

VEGETATION DESCRIPTION: This community is mostly unvegetated, though locally, vegetative cover may be sparse to moderate. The dominant vegetation of badland slopes mostly consists of scattered shrubs to 0.5 m tall. The most common shrubs are saltbush and rubber rabbitbrush, and in a few sites, greasewood (*Sarcobatus vermiculatus*) is present. Herbaceous species are scattered to locally common, and often consist of annual Chenopodiaceae such as silver orache, poverty weed, and Russian thistles. The vegetation of level badland washes found below the steep, highly erodible slopes is frequently denser and more diverse. Grasses typical of Northwestern Mixed-grass Prairie, such as thickspike wheatgrass, western wheatgrass (*Pascopyrum smithii*) and curly bluegrass (*Poa secunda*) may be frequent. Patches of silver sagebrush may also be common. Herbaceous perennials are conspicuous in badland washes and include poison milkvetch (*Astragalus racemosus* var. *longisetus*), pulse milkvetch (*A. multiflorus*), butte candle (*Cryptantha celosioides*), few-flower false buckwheat, and silky locoweed (*Oxytropis sericea*). Annuals including stickseeds (*Lappula* spp.) and curly-top gumweed (*Grindelia squarrosa*) are also frequent. Species diversity is low to moderate.



OTHER NOTEWORTHY SPECIES: Uncommon species present in this community include *Lappula fremontii*, *Fritillaria atropurpurea*, *Physaria arenosa* var. *argillosa*, and *Oenopsis multicaulis*.

STATE RANK: S3

RANK JUSTIFICATION: This community type has a limited range and extent in the state, but is not heavily impacted by agricultural practices, including cattle grazing. Invasion of badland washes by alien species is a potential threat.

INVASIVE SPECIES OF CONCERN: The potentially invasive saltlover (*Halogeton glomeratus*) has invaded badland washes and appears to be rapidly spreading. Cheatgrasses (*Bromus japonicus*, *B. tectorum*) are often well-established.

GLOBAL RANK: G4G5

COMMENTS: Both global names seem to fit this community, one designating the dominant vegetation, the other the sparse nature of that vegetation.

EXEMPLARY SITES: Toadstool Geologic Park in the Oglala National Grasslands in Sioux County.

## **RIVERINE GRAVEL FLATS**

ELEMENT CODE: CEG005223

GLOBAL NAME: =Riverine Gravel Flats Great Plains Sparse Vegetation

OTHER NAMES: =Western Gravel Flats (3<sup>rd</sup> ed.)

RANGE: This community occurs along the Platte River and North Platte River from Dawson County westward, but is most extensive in the drainage of the South Platte River in Deuel and Keith counties.

ECOREGIONS: 25f, 25h, 27d

ENVIRONMENTAL DESCRIPTION: This community occurs as patches or bands on level ground usually on the first terrace of rivers or in level canyon bottoms. Soils are poorly developed or absent, rapidly drained, and consist of gravel and cobbles with lesser amounts of sand, formed in alluvium. Depth to the water table varies, but these sites may be subject to periodic brief flooding after rains, but are so rapidly drained that hydrophytic species cannot become established.

COWARDIN WETLAND SYSTEM: Upland

**MOST ABUNDANT SPECIES:**

Herbaceous: purple three-awn (*Aristida purpurea*), common ragweed (*Ambrosia artemisiifolia*), western sagewort (*Artemisia campestris* var. *caudata*), blue grama (*Bouteloua gracilis*), spurges (*Euphorbia glyptosperma*, *E. serpyllifolia*), slender snake cotton (*Froelichia gracilis*), Plains sunflower (*Helianthus petiolaris*), golden-asters (*Heterotheca* spp.), Plains prickly pear (*Opuntia tortispina*), slender knotweed (*Polygonum ramosissimum*), sand dropseed (*Sporobolus cryptandrus*), purple sandgrass (*Triplasis purpurea*)

**DIAGNOSTIC SPECIES:** *Artemisia campestris* var. *caudata*, *Euphorbia serpyllifolia*, *Pectis angustifolia*, *Sporobolus cryptandrus*

**VEGETATION DESCRIPTION:** The vegetation of this community is relatively sparse and often consists of nearly equal cover of tufted annual and perennial grasses and annual or biennial herbs under 1 m tall. Sand dropseed is usually the most common grass, though blue grama is sometimes frequent. In canyon bottoms, patches of taller grasses typical of adjacent slopes, such as prairie sandreed (*Calamovilfa longifolia*) and sand bluestem (*Andropogon hallii*), may be conspicuous. Annual and perennial herbs are common and conspicuous, the most frequent being sand-lily (*Mentzelia nuda*), golden-asters, common ragweed (*Ambrosia artemisiifolia*), lemon pectis, and western sagewort. Common invasive exotics include slender Russian thistle (*Kali collina*) and cheatgrasses (*Bromus* spp.). In some sites along the Platte River, cottonwoods (*Populus deltoides*) may be scattered, and in some places may be sufficiently dense to classify the community as open woodland. Shrubs are scattered and uncommon, with false indigobush (*Amorpha fruticosa*) the most frequently encountered in riverine sites. Species diversity is low to moderate.

**OTHER NOTEWORTHY SPECIES:** Large-spike prairie-clover (*Dalea cylindriceps*) has been found in this community in Lincoln County.

**STATE RANK:** S2?

**RANK JUSTIFICATION:** The full extent of this community in Nebraska is not known. Reduced river flows and decreased frequency of flooding may cause some riverine sites to succeed to woodland. Heavy grazing pressure in canyon bottoms may degrade some sites.

**INVASIVE SPECIES OF CONCERN:** Some sites along the Platte River have been invaded by salt-cedar (*Tamarix ramosissima*).

**GLOBAL RANK:** G?

**COMMENTS:** In previous versions of this classification, this community was arbitrarily defined to include gravel flats associated with large rivers. It now includes gravel draws in canyon bottoms associated with lower Lodgepole Creek and the western Platte rivers that are similarly subject to periodic flooding and have similar species composition. Upland sites were previously included in the Southern Sand/Gravel Prairie based on minor floristic similarities, but are now included in the Great Plains Gravel/Cobble Prairie community.

**EXEMPLARY SITES:** Extensive examples of riverine gravel flats are on the south side of the North Platte River near the Sutherland Canal Diversion Dam in Keith County. An example of the canyon bottom type is found on the south end of Ash Hollow State Historical Park.

## CHAPTER 4: REFERENCES

- Aikman, J. M. 1929. Distribution and structure of the forests of eastern Nebraska. *Botanical Seminar, University of Nebraska Botanical Survey, New Series* 5:1-75.
- Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneedon, and A. S. Weakly. 1998. *International classification of ecological communities: terrestrial vegetation of the United States, Volume II. The National Vegetation Classification System: list of types*. The Nature Conservancy, Arlington, Virginia, USA.
- Bates, J. M. 1894. Notes on the trees of northern Nebraska. *American Naturalist* 28:1-34-1036.
- Bessey, C.E. 1898. Some characteristics of the foothill vegetation of western Nebraska. *The American Naturalist* 32:111-113.
- Beightol, D. A. and T. B. Bragg. 1993. Woody vegetation of a disjunct bur oak (*Quercus macrocarpa*) forest in east central Nebraska. *Transactions of the Nebraska Academy of Sciences* 20:41-46.
- Bleed, A. and M. Ginsberg. 1990. Lakes and wetlands. Pp. 115-122 in Bleed, A. and C. Flowerday, eds., *Atlas of the Sand Hills*. Resource Atlas No. 5a. Conservation and Survey Division, University of Nebraska-Lincoln: 265pp.
- Burzlaff, D. F. 1962. A soil and vegetation inventory and analysis of three Nebraska Sandhills range sites. *University of Nebraska College of Agriculture Research Bulletin* 206: 33pp.
- Chapman, S., J. Omernik, J. Freeouf, D. Huggins, J. McCauley, G. Freeman, G. Steinauer, R. Angelo, and R. Schlepp. 2001. *Ecoregions of Nebraska and Kansas (color poster with map, descriptive text, summary tables, and photographs)*: Reston, Virginia, U.S. Geological Survey (map scale 1:1,950,000).
- Churchill, S. P., C. C. Freeman, and G. E. Kantak. 1988. The vascular flora of the Niobrara Valley Preserve and adjacent areas in Nebraska. *Transactions of the Nebraska Academy of Sciences* 16:1-15.
- Comer, P., D. Faber-Langendoen, R. Evans, S. Gawler, C. Josse, G. Kittel, S. Menard, Pyne, M. Reid, K. Schulz, K. Snow, and J. Teague. 2003. *Ecological Systems of the United States: A Working Classification of U.S. Terrestrial Systems*. NatureServe, Arlington, Virginia.
- Costello, D. F. 1931. Comparative study of river bluff succession on the Iowa and Nebraska sides of the Missouri River. *Botanical Gazette* 91:295-307.

- Currier, P. J. 1982. *The floodplain vegetation of the Platte River: phytosociology, forest development, and seedling establishment*. Ph.D. dissertation, Iowa State University, Ames: 317pp.
- Daley, R. H. 1972. *The native sand sage vegetation of eastern Colorado*. M. S. thesis, Colorado State University, Fort Collins: 62pp.
- Eilers, L.J. and D.M. Roosa. 1994. *The Vascular Plants of Iowa*. Iowa City, University of Iowa Press, 304pp.
- Faber-Langendoen, D. (editor). 1999. *International classification of ecological communities: terrestrial vegetation of the Midwestern United States*. The Nature Conservancy, Midwest Conservation Science Department, Minneapolis, MN.
- Flahault, C. and C. Schroter. 1910. Rapport sur la nomenclature phytogéographique. (Phytogéographique Nomenclatur.) *Actes III Congr. Int. Bot. Bruxelles* 1:131-164.
- Frolik, A.L., and F.D. Keim. 1933. Native vegetation in the prairie hay district of north central Nebraska. *Ecology* 14:298-305.
- Gersib, R. A. and G. A. Steinauer. 1991. A biological inventory and general assessment of eastern Nebraska saline wetlands in Lancaster and southern Saunders counties. *Transactions of the Nebraska Academy of Sciences*, 18:37-44.
- Gilbert, M. C. 1989. *Ordination and mapping of wetland communities in Nebraska's rainwater basin region*. Report to the U. S. Army Corps of Engineers, Omaha District, Nebraska: 48p. plus appendices.
- Gilbert, M. C. and R. G. Stutheit, eds. 1994. *Resource categorization of Nebraska's Eastern saline wetlands*. Prepared for the Eastern Nebraska Saline Wetlands Interagency Study Project, U. S. Army Corps of Engineers, Omaha District, and Nebraska Game & Parks Commission. 18 pp.
- Grossman, D. H., D. Faber-Langendoen, A.W. Weakly, M. Anderson, P. Bourgeron, R. Crawford, K. Goodin, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M., Reid, and L. Sneedon. 1998. *International classification of ecological communities: terrestrial vegetation of the United States. Volume I: The national vegetation classification system: development, status, and applications*. The Nature Conservancy, Arlington, VA. 126 pp.
- Grossman, D. H., K.L. Goodin, and C.L. Reuss (editors). 1994. Rare plant communities of the conterminous United States: an initial survey. The Nature Conservancy, Arlington, VA.
- Hanson, H. C. 1918. The invasion of a Missouri River alluvial flood plain. *The American Midland Naturalist* 5:196-201.

- Hardy, J. and R. R. Weedon. 1995. *Oglala National Grasslands badlands vegetation survey, May-August 1995*. Interim report to the Nebraska Game & Parks Commission, Lincoln: 17pp.
- Harrison, A. T. 1980. *The Niobrara Valley Preserve: Its biogeographic importance and description of its biotic communities*. A working report to the Nature Conservancy Midwest Regional Office, Minneapolis, Minnesota: 116pp.
- Hildebrand, T. J. 1997. *Ecological evaluation: Oglala Pasture IN potential research natural area, Nebraska National Forest, Sioux County, Nebraska*. Report to The Nature Conservancy Midwest Regional Office, Minneapolis, Minnesota: 22pp. plus appendices.
- Hopkins, H. H. 1951. Ecology of the native vegetation of the loess hills in central Nebraska. *Ecological Monographs* 21:125–147.
- Hulett, G. K., C. D. Sloan, and G. W. Tomanek. 1968. The vegetation of remnant grasslands in the loessial region of northwestern Kansas and southwestern Nebraska. *The Southwestern Naturalist* 13:377–391.
- Jones, G. P. and G. M. Walford. 1995. *Major riparian vegetation types of Eastern Wyoming*. Report to the Wyoming Department of Environmental Quality Water Quality Division. 245pp.
- Kantak, G. E. 1995. Terrestrial plant communities of the middle Niobrara Valley, Nebraska. *The Southwestern Naturalist* 40:129–138.
- Kaul, R. B., Challaiah, and Keeler, K. H. 1983. Effects of grazing and juniper-canopy closure on the prairie flora in Nebraska high-plains canyons. *Proceedings of the seventh North American Prairie Conference*:95–105.
- Kaul, R. B. and S. B. Rolfsmeier. 1987. The characteristics and phytogeographic affinities of the flora of Nine-Mile Prairie, a western tall-grass prairie in Nebraska. *Transactions of the Nebraska Academy of Sciences* 15:23–35.
- Kaul, R. B., G. E. Kantak, and S. P. Churchill. 1988. The Niobrara River Valley, a postglacial migration corridor and refugium of forest plants and animals in the grasslands of North America. *Botanical Review* 54:44–81.
- Kaul, R. B. 1990. Plants. Pp. 127–142 in A. Bleed and C. Flowerday, eds., *An Atlas of the Sandhills*. Resource Atlas No. 5a, Conservation and Survey Division, University of Nebraska, Lincoln, Nebraska.
- Kaul, R.B. and S.B. Rolfsmeier. 2003. *Native vegetation of Nebraska*. Map, 1:1,000,000. Conservation and Survey Division, Institute of Agriculture and Natural Resources, University of Nebraska—Lincoln.

- Keeler, K. H., A. T. Harrison, and L. S. Vescio. 1980. The flora and Sandhills prairie communities of Arapaho Prairie, Arthur County, Nebraska. *The Prairie Naturalist* 12:65–79.
- Kiener, W. 1951. P. A. Rydberg's "Report of a botanical exploration, made in western Nebraska in the summer of 1891, as a special agent of the Department of Agriculture." *Nebraska History* 32:217-239.
- Lauver, C. L., K. Kindscher, D. Faber-Langendoen, and R. Schneider. 1999. A classification of the natural vegetation of Kansas. *The Southwestern Naturalist* 44:421-443.
- Lawrey, J. D. 1971. *The Missouri River floodplain plant communities from Yankton, South Dakota to Rulo, Nebraska: their successional relationships and effects of river bank stabilization*. M. A. thesis, University of South Dakota, Vermillion: 52pp.
- Matherne, A. M. 1994. *Freshwater and saline floodplain wetlands of the North Platte River - sources and seasonal dynamics: Kiowa Wildlife Management Area, Morrill, NE*. Report to the Nebraska Game and Parks Commission: 19pp. plus appendices.
- McAtee, W. L. 1920. *Wild-duck foods of the Sandhill region of Nebraska*. United States Department of Agriculture Bulletin 794, part II, pp. 37-79.
- McCarragher, D. B. 1977. *Nebraska's Sandhills Lakes*. Nebraska Game and Parks Commission, Lincoln. 67pp.
- Morrison, J. L. 1935. *The development and structure of the vegetation on the sandbars and islands in the Lower Platte*. M. A. thesis, University of Nebraska--Lincoln: 72pp.
- National Wetlands Inventory. 1995. *Rock Creek, Nebraska Wetland Trend Study 1937 to 1987*. Unpublished report for the Nebraska Game & Parks Commission. 9pp.
- Grossman, D.H., K.L. Goodin, and C.L. Reuss. 1994. *Rare plant communities of the conterminous United States, and initial survey*. The Nature Conservancy, Arlington, VA. 620pp.
- NatureServe. 2007. *International Ecological Classification Standard: Terrestrial Ecological Classifications*. NatureServe Central Databases. Arlington, VA, U.S.A. Data current as of 15 April 2007.
- NatureServe. 2008. *International Ecological Classification Standard: Terrestrial Ecological Classifications. Ecological Systems of Nebraska*. NatureServe Central Databases. Arlington, VA. Data current as of 29 January 2008.
- Nielsen, E. L. 1953. Revegetation of alkali flood plains adjoining the North Platte River, Garden County, Nebraska. *American Midland Naturalist* 49:915–919.

- Nixon, E. S. 1967. A vegetational study of the Pine Ridge of Northwestern Nebraska. *Southwestern Naturalist* 12:134–145.
- Novacek, J. M., D. Roosa, and W. M. Pusateri. 1985. The vegetation of the loess hills landform along the Missouri River. *Proceedings of the Iowa Academy of Sciences* 92:199-212.
- Pool, R. J. 1914. A study of the vegetation of the Sandhills of Nebraska. *Minnesota Botanical Studies* 4:189–312.
- Pool, R.J., J.E. Weaver, and F.C. Jean. 1918. Further studies in the ecotone between prairie and woodland. *University Studies of the University of Nebraska* 18(2):7-53.
- Pound, R. and F.E. Clements. 1900. *The Phytogeography of Nebraska*, 2<sup>nd</sup> ed. Lincoln, NE: Jacob North and Co.
- Ramaley, F. 1939. Sand-hill vegetation of northeastern Colorado. *Ecological Monographs* 9:1–51.
- Rand, P. J. 1973. *The woody phreatophyte communities of the Republican River Valley in Nebraska*. Final Report, Research Contract, United States Bureau of Reclamation. Botany Department, University of Nebraska-Lincoln. 110pp.
- Reynolds, H. C. 1942. *Flora of Richardson County, Nebraska*. M.S. thesis, University of Nebraska-Lincoln: 115pp.
- Rolfsmeier, S. B. 1988. The vascular flora and plant communities of Seward County, Nebraska. *Transactions of the Nebraska Academy of Sciences* 16:91–113.
- Rolfsmeier, S. B. 1989. *Species richness gradients of oak forest plants along the Missouri River in Nebraska and Iowa*. M.S. thesis, University of Nebraska-Lincoln: 95pp.
- Rolfsmeier, S. B. 1991. *The flora and plant communities of the Ceresco saline basins, southern Saunders County, Nebraska*. Unpublished report to the Lower Platte South Natural Resources District. 24 pp.
- Rolfsmeier, S. B. 1992. *A preliminary survey of the vegetation of the playa wetlands of Deuel, Keith, and Perkins counties in southwest Nebraska*. Report to the Nebraska Game and Parks Commission: 23 pp.
- Rolfsmeier, S. B. 1993a. The saline wetland-meadow vegetation and flora of the North Platte river valley in the Nebraska Panhandle. *Transactions of the Nebraska Academy of Sciences* 20:12–24.
- Rolfsmeier, S. B. 1993b. *Analyses of the natural vegetation at Kiowa Basin, Scotts Bluff County, Nebraska*. Report to the Nebraska Game and Parks Commission: 12 pp. plus map.



- Rolfsmeier, S. B. 1996. *A survey of the vegetation of clay pans and associated communities on the Oglala National Grasslands, Nebraska*. Report to the Nebraska Game and Parks Commission: 21pp.
- Rolfsmeier, S. B. 1996. *Wildcat Hills rare plant survey final report*. Report to the Nebraska Game & Parks Commission, Lincoln: 24pp.
- Rolfsmeier, S. B. 1998. *A vegetation survey of selected riparian areas on the Oglala National Grasslands in Dawes and Sioux Counties, Nebraska*. Unpublished report to the Nebraska Natural Heritage Program, Game & Parks Commission, Lincoln: 22pp. plus maps.
- Rolfsmeier, S.B. 2007. *Homestead National Monument of America bur oak forest restoration plan: reference condition and management considerations*. Unpublished report to the National Park Service, 67p.
- Rolfsmeier, S.B. and L. Stewart-Phelps. 2007. *Botanical Survey of Fuel Reduction Areas on the Pine Ridge Ranger District of the Nebraska National Forest*. Unpublished report to the Pine Ridge District of the Nebraska National Forest, 27p.
- Rothenberger, S. J. 1994. Floristic analysis of the C. Bertrand and Marian Othmer Schultz Prairie, a mixed-grass prairie in south-central Nebraska. *Transactions of the Nebraska Academy of Sciences* 21:21–30.
- Schacht, W. H., J. D. Volesky, D. Bauer, A. J. Smart, and E. M. Mousel. 2000. Plant community patterns on upland prairie in the eastern Nebraska Sandhills. *The Prairie Naturalist* 32:43-48.
- Shirk, C. J. 1924. *An ecological study of the vegetation of an inland saline area*. Unpublished doctoral dissertation, University of Nebraska-Lincoln. 126 pp.
- Steiger, T. L. 1930. Structure of prairie vegetation. *Ecology* 11:170–217.
- Steinauer, G. 1989. Characterization of the natural communities of Nebraska. Appendix D., p. 103-114 in: M. Clausen, M. Fritz, and G. Steinauer. *The Nebraska Natural Heritage Program, two-year progress report*. Unpubl. doc.
- Steinauer, G. A. 1992. Sandhills fens. *NEBRASKAland* 70:16–31.
- Steinauer, G. A. 1995. *Identification of and conservation strategy for Sandhills fens in Cherry County, Nebraska*. Report to the Nebraska Game & Parks Commission: 101pp.
- Steinauer, G. A., S. B. Rolfsmeier, and J. Phillips Hardy. 1996. Inventory and floristics of Sandhills fens in Cherry County, Nebraska. *Transactions of the Nebraska Academy of Sciences* 23:9–21.

- Steinauer, G. S. and S. B. Rolfsmeier. 1995. *Rare plant survey of selected areas of the McKelvie National Forest*. Report to the U. S. Forest Service: 27pp.
- Steinauer, G. A., S. B. Rolfsmeier, and J. Phillips Hardy. 1996. Inventory and floristics of Sandhills fens in Cherry County, Nebraska. *Transactions of the Nebraska Academy of Sciences* 23:9–21.
- Steinauer, G. and S. Rolfsmeier. 1997. *Terrestrial natural communities of Nebraska*. Nebraska Game and Parks Commission, Lincoln, NE. 117 pp.
- Steinauer, G. and S. Rolfsmeier. 2000. *Terrestrial natural communities of Nebraska*. Nebraska Game and Parks Commission, Lincoln, NE. 143 pp.
- Steinauer, G. 2002. *Rapid Ecological Assessment of the Northern Mixed-grass Prairie Ecoregion (Nebraska Portion)*. Unpublished report to The Nature Conservancy, 22p. plus appendices
- Steinauer, G and S. Rolfsmeier. 2003. *Terrestrial natural communities of Nebraska. (Version III – June 30, 2003)*. Nebraska Game and Parks Commission, Lincoln, NE. 162 pp.
- Steinauer, R.F. 2004. *2004 Plant Community Field Surveys in Western Nebraska*. Unpublished report to the Nebraska Game & Parks Commission.
- Steinauer, R.F. 2005. *2005 Plant Community Field Surveys in Western Nebraska*. Unpublished report to the Nebraska Game and Parks Commission, 20p.
- Steinauer, R. F. 2006. *2006 Vegetation Survey of the Valentine National Wildlife Refuge*. Unpublished report to the Nebraska Game & Parks Commission. 28p.
- Steinauer, R.F. 2007. *2007 Plant Community Survey of the Wildcat Hills: Banner & Scotts Bluff Counties, Nebraska*. Unpublished report to the Nebraska Game & Parks Commission, 16p.
- Sutherland, D. M. and S. B. Rolfsmeier. 1989. The vascular plants of Keith County, Nebraska. *Transactions of the Nebraska Academy of Sciences* 17:83–101.
- The Nature Conservancy. 1995. *Vegetation Classification of Scotts Bluff National Monument*. Report to the National Biological Survey Vegetation Mapping Program: 59pp.
- The Nature Conservancy. 1997. *Vegetation Classification of Agate Fossil Beds National Monument*. Report to the National Biological Survey Mapping Program.
- Tolstead, W. L. 1941. Plant communities and secondary succession in south-central South Dakota. *Ecology* 22:322–328.

- Tolstead, W. L. 1942. Vegetation of the northern part of Cherry County, Nebraska. *Ecological Monographs* 12:257–292.
- Tolstead, W. L. 1947. Woodlands in northwestern Nebraska. *Ecology* 28:180–188.
- Ungar, I. A., W. Hogan and M. McClelland. 1969. Plant communities of saline soils at Lincoln, Nebraska. *American Midland Naturalist* 82:564–577.
- Vaubel, J. A. 1975. *Vegetation development in relation to age of river stabilization structures along a channelized segment of the Missouri River*. M. A. thesis, University of South Dakota, Vermillion: 108pp.
- Weaver, J. E. and W. E. Bruner. 1948. Prairies and pastures of the dissected loess plains of central Nebraska. *Ecological Monographs* 18:507–549.
- Weaver, J. E. 1958. Native grassland of southwestern Iowa. *Ecology* 39:733–750.
- Weaver, J. E. 1960. Comparison of vegetation of Kansas-Nebraska drift-loess hills and loess plains. *Ecology* 41:73–88.
- Weaver, J. E. 1960. Flood plain vegetation of the central Missouri Valley and contacts of woodland with prairie. *Ecological Monographs* 30:37–64.
- Weaver, J. E. 1965. *Vegetation of Nebraska*. Lincoln, University of Nebraska Press, 185pp.
- Webber, H.J. 1889. The flora of central Nebraska. *American Naturalist* 23:633-636.
- Webber, H.J. 1890a. The flora of central Nebraska [continued]. *American Naturalist* 24:76-78.
- Webber, H.J. 1890b. A catalogue of the flora of Nebraska. *Report to the Nebraska State Board of Agriculture 1889*. p177-302.
- Wilson, R. E. 1970. Succession in stands of *Populus deltoides* along the Missouri River in southeastern South Dakota. *The American Midland Naturalist* 83:330–342.

